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SPRING TRADE SPECIAL

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 19, No. 1. NEW YORK, MARCH, 1915 Monthly, $1.00 per year Single Copy 10 Cents

649953

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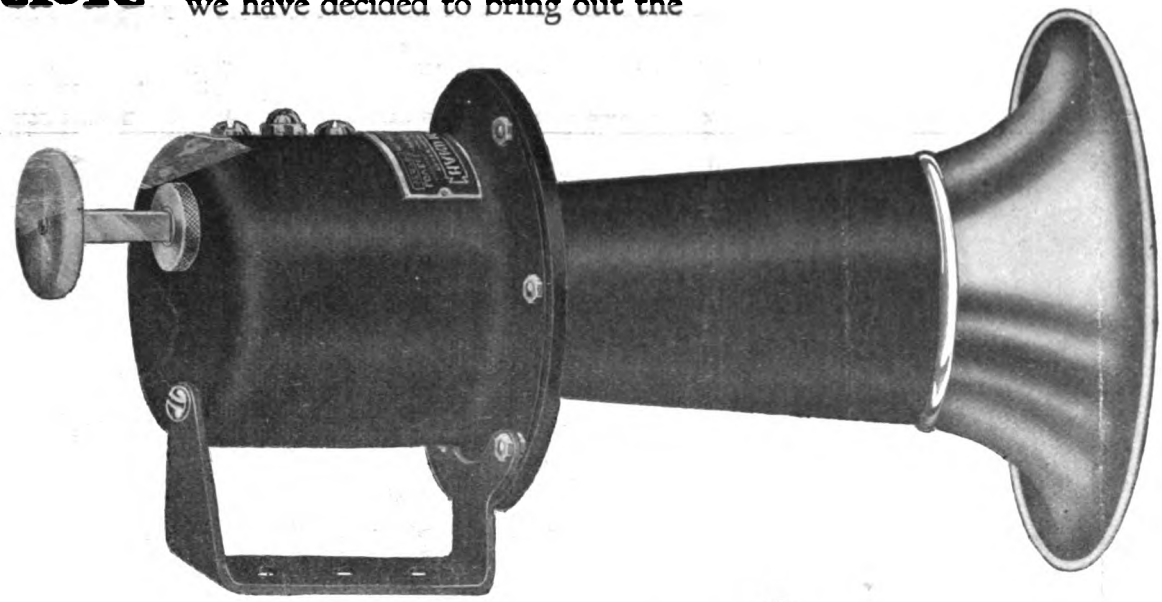
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We still think

that hand signals are makeshifts; that car owners will be far better satisfied from every standpoint with motor-driven Klaxons.

but there are some car owners who still want hand signals and want them at a low price.

therefore we have decided to bring out the



Now Ready Hand Klaxonet

$4

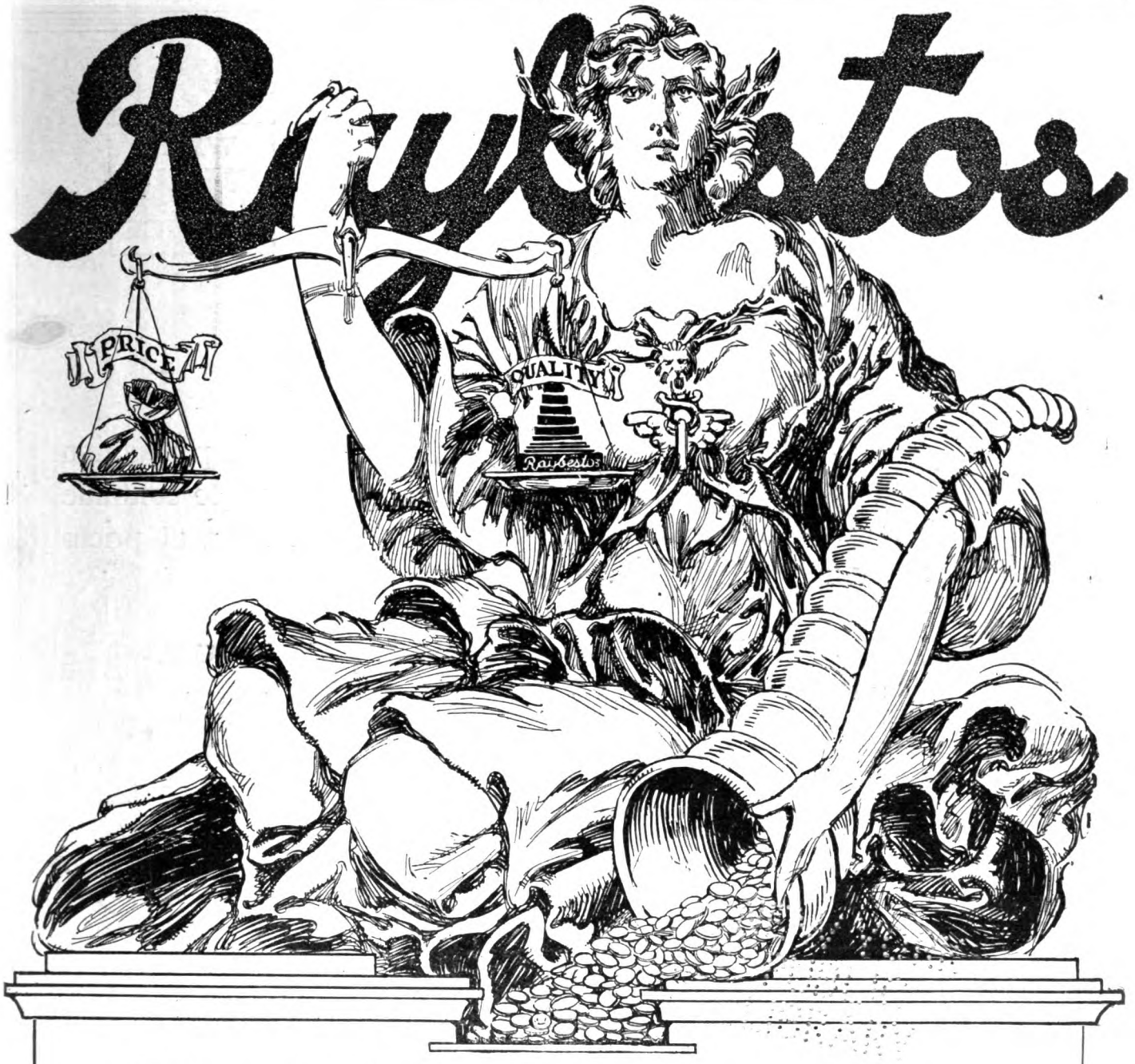
Klaxon Permanent Guarantee; Klaxon Quality; Klaxon Note; Brass projector (not steel); Oval bell. Finished in black and nickel, black and brass, all black.

LOVELL-McCONNELL MFG·COMPANY
MAKERS OF THE "KLAXON"·NEWARK·N·J·

Deliveries May 1st

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Raybestos



Price and Quality Must Balance

The quality of the brake lining you sell must be consistent with the price you charge for it, or you will not be able to hold your trade.

This is so—and nobody knows it better than you. That Price and Quality must balance is just as true with net prices as it is with list prices.

What is the Quality of brake linings which list the same as RAYBESTOS, and in some cases higher, but are offered you at a lower net price?

What do you suppose is the lowest net price?

How do you know when you get it?

How long before juggled discount prices will affect you?

RAYBESTOS schedule of prices—both net and list—are fixed, uniform to all—and at all times consistent with RAYBESTOS Quality.

The Royal Equipment Company

1358 Bostwick Avenue Bridgeport, Conn.

732

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WITH FISK SERVICE

FISK TIRES

WITH FISK SERVICE

At New Low Prices

WE HAVE A BIG plant, big facilities, big volume in production and a big and growing organization that will enable us to continue to build tires of established Fisk Quality and to sell them at prices which set new and wonderful standards for value.

Note These Prices For Comparison

Size	Plain Tread Casing	Non-Skid Casing	Tubes
3 x 30	$ 9.00	$ 9.45	$2.35
3½ x 30	11.60	12.20	2.70
4 x 33	19.05	20.00	3.85
4 x 34	19.40	20.35	4.00
4½ x 36	27.35	28.70	5.20
5 x 37	32.30	33.90	6.25

"If You Pay More Than Fisk Prices You Pay For Something That Does Not Exist." Better Tires Cannot Be Bought At Any Price.

IN THE TIRE WORLD the name FISK stands for Quality, Mileage and Satisfaction. It stands for an organized service that is unequalled in the tire industry and for an ideal that is inspired by the belief that **satisfied customers** are of the first and greatest importance.

You Can Buy Fisk Tires At All Dealers

THEY JOIN US, in reducing the profits on the individual sale to the minimum, in their willingness to depend for success on the increased volume of business.



THE FISK RUBBER COMPANY

Factory and Home Office **Chicopee Falls, Mass.**

Fisk Branches in All Principal Cities

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Don't Throw Away Your Half-Worn Tires

They're Still Good for 5,000 Miles

European Methods of Half-Soling Tires Makes Them Run 10,000 to 15,000 Miles. Signed Guarantee for 5,000 Miles Without Puncture. Skidding Rendered Impossible.

You Take No Risk—We Ship On Approval

The man who throws away his half-worn tires or sells them to the junk man for a few cents a pound is just as extravagant as the man who throws away his shoes when the first sole gets thin.

For over three years European motorists have been "half-soling" their tires, just as we half-sole our shoes. As a result, they are getting 10,000 to 15,000 miles out of ordinary pneumatic tires, while American motorists are getting from 3,000 to 5,000 miles—and what is just as important, they have almost entirely eliminated punctures, blow-outs and rim cuts with their ever constant dread. To say nothing of making skidding impossible.

Save $50 to $200 a Year

Figure this out by the individual—how it affects you—your pocketbook.

Every mile you travel on the bare tire is costing you from 1½c. to 4c. in tire wear alone, to say nothing of the lost time and expense for the repair of punctures and blow-outs.

Just stop for a moment and consider what it means to you to get 10,000, 12,000 or 15,000 miles out of your tires and at the same time drive your car without the constant nerve-racking dread of tire trouble and skidding.

In round numbers it means a saving of $50 to $200 each year—a saving sufficient to pay your gas and oil bills each month. Yet this saving is not all—the tire vacation and relief from skidding assured you certainly means a gratification which cannot be estimated in dollars and cents.

No More Skidding

Durable Treads are as sure footed as a Rocky Mountain burro, and they're supremely convenient.

They are studded with sharp-edged steel rivets which dig right down through the mud and slush and get to earth every time. In London and Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of the steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and—what is more important, you receive perfect non-skid service while your tires are protected instead of injured. They cover the tire completely, extending entirely around from rim to rim. Nothing can work its way in between. They afford a perfect protection—that's why we can guarantee them as we do.

No Matter How Cut or Worn They Are

No matter how cut or worn they are, you can get more mileage from them and the few cents the junk man would give you can be turned into dollars.

The strongest proof of the economy of Durable Treads is their unprecedented record of sales: 40% of the business comes direct from recommendations of users; in eight months the sale of Durable Treads increased over 700% in the United States alone.

Where is there an automobile accessory which has received such instant and country-wide endorsement?

Think of it—a 5,000 mile tire vacation—to be able to FORGET tires!

This is a pretty strong statement unsupported, but it's not merely a claim.

Durable Treads are delivered to you under a signed guarantee for 5,000 miles of wear without puncture.

This guarantee is an ironclad agreement—as good as a government bond and holds good whether your tires are new or old, tread worn, rut worn or rim cut

Special Discount Offer

To motorists in territory where Durable Treads are not as yet represented we offer a special introductory discount for advertising purposes, equal to the full dealer's profit.

We have made some strong statements in this advertisement. Make us prove them. You have everything to gain and absolutely nothing to lose, for all we ask is the opportunity to give you a demonstration at our own expense and risk.

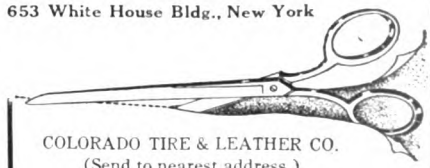
We have a catalog, sample and copy of written guarantee ready to send and they're yours free for the asking.

Don't let the tires on your car run another week in "bare-footed" condition—don't wait until you get your next puncture or blow-out.

Fill out and mail the coupon right now and you will hear from us within a week; no expense and no obligation to you.

Colorado Tire & Leather Co.

163 Tread Building, Denver, Colo.
403 Goetz Bldg., W. Austin Ave., Chicago, Ill.
653 White House Bldg., New York



COLORADO TIRE & LEATHER CO.
(Send to nearest address.)
163 Tread Building, Denver, Colo.
403 Goetz Building, W. Austin Ave., Chicago, Ill.
653 White House Building, New York.

Gentlemen: Please send your free catalog, sample and copy of written guarantee for 5,000 miles without puncture. This request carries no obligation.

Name .....

Address .....

City ..... State .....

My tire sizes are .....

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Look for this Display Case When you buy Spark Plugs

It holds the best plugs that skill can produce and money can buy. All over the country Supply Stores, Garages and Hardware Dealers are displaying this new Case, which contains the famous

BETHLEHEM FIVE POINT SPARK PLUG

"Guaranteed for the Life of the Car"

The one Plug that is guaranteed as to Quality and Service — the Plug that is properly built on correct mechanical principles.

Buy Bethlehem's and eliminate Spark Plug troubles.

In the Display Case is the right plug for every type of Motor.



Support the Dealer who is endeavoring to give Service. Price $1.25 each — Booklet free, which gives the reasons why Bethlehem's are better — why they are the most economical.

THE SILVEX COMPANY 171 Madison Avenue, New York

Factory: South Bethlehem, Pa.
Pacific Coast Branch: Oakland, Cal.
W. N. Davidson, Mgr.

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Push Cray Ford Tops Now and Double Your Profits

Here's a line you don't have to "talk up" to sell. It's got quality sticking out all over it. Whenever you see a Ford with an old, leaky, worn-out top, just remind the owner that you can furnish him a Cray Top complete with neat fitting side curtains, at a price so low he can't afford to do without one, and there ought to be a dozen or two jobs right in your locality, waiting to be sold. If you get busy you can sell them and if you sell the Cray top it's a **stay sold job.** Most garages overlook this profitable line—and few car owners know where to go to have new tops put on their machines. You can get the lion's share of the top business, and also many extra jobs for painting, repair work or auto supplies by putting forth a little extra effort right now, to let your customers know you can save them money on tops.

Cray Tops For Ford Cars

Made in Our Own Up-to-date Top Factory. Built Right Over Ford Body Frames—Guaranteed to Fit.



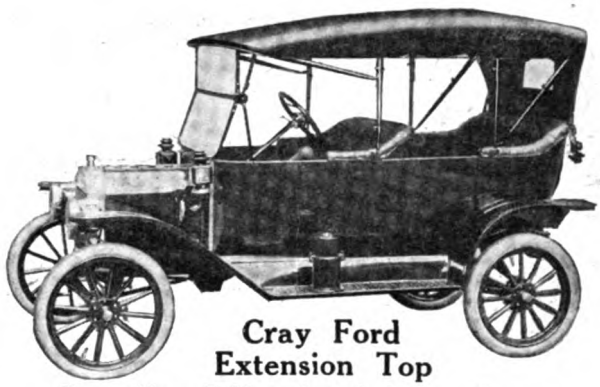
Cray Ford One-Man Top

The most easily operated One-Man Top made. Does not go up into the air when being folded, nor does it fall on the front seat, but maintains the same general level as when top is up and attached to windshield. Can be operated from outside, as well as inside of car. When up, top gives unobstructed side view from the driver's seat. It is staunch and rigid. Covered with mohair.

Made to fit 1913, 1914 and 1915 Ford Touring Cars only.



This actual photograph shows how easily the Cray One-Man Top can be raised and lowered. One man does the trick. Top is covered with Mohair. Side curtains are fastened inside. Has extra large celluloid lights in back and side curtains.



Cray Ford Extension Top

Heavy 32 oz. Rubber—Smooth Deck or Roof—Extra Quality Wood Bows—Best Grade Top Hardware · Shifting Handy Style Reinforced Bow Sockets—Large Celluloid Lights in Curtains—Heavy Harness Leather Straps—Best of Workmanship—Waterproof—Durable—Made to Measure—Fit Guaranteed—Quick Shipment.

Will fit 1912, 1913, 1914 and 1915 Model T Cars



Cray Slip Roof Outfit "A"

Consists of a new heavy rubber roof, quarters, back curtain and back stays, stitched and ready to slip over the old top frame. Easily put on. Makes an old top new at about one-third the price of a complete top. Made only for 1912, 1913 and 1914 Model T Touring Cars.

For best dealers' prices on our complete line of Ford Tops, Slip Roof Outfits, Recovering old Tops, and a full line of Auto Accessories, see our

FREE BOOK for Auto Repair Men

This Auto Repairers' Guide and Price Maker is issued in the interest of automobile repairers, dealers and garage men—it's free to the trade and sent to them only.

Contains 512 pages of bargains—about 3000 illustrations—a complete auto repairers' guide and price maker—quotes lowest wholesale prices on first quality automobile supplies, auto repairers' tools, tool kits, spark plugs, horns, lamps, pumps, springs, forgings, batteries, coils, switches, Ford tops and accessories, and in fact everything used on an auto.

Fill in, sign and mail the coupon.

CRAY BROTHERS

1119 W. 11th Street, Cleveland, Ohio

MANUFACTURERS AND JOBBERS, AUTO ACCESSORIES



MAIL THIS COUPON

CRAY BROTHERS, 1119 W. 11th Street, Cleveland, Ohio.

Please send me your Free Catalog with prices on Ford Tops and Other Accessories.

Name .....

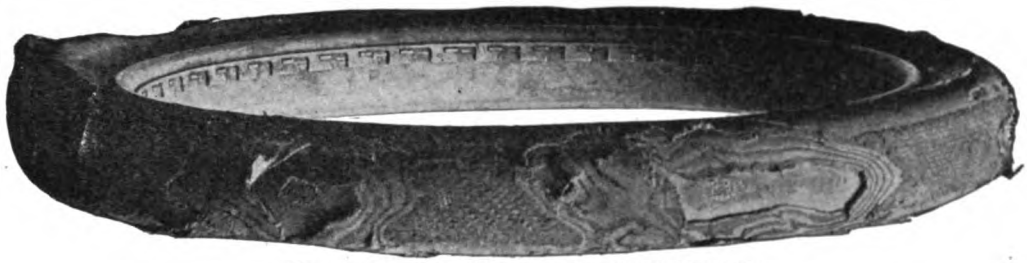
Occupation .....

Address .....

R. F. D. or Street .....

State .....

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Your tires may often be worn down like this without danger of blowout or tire trouble.

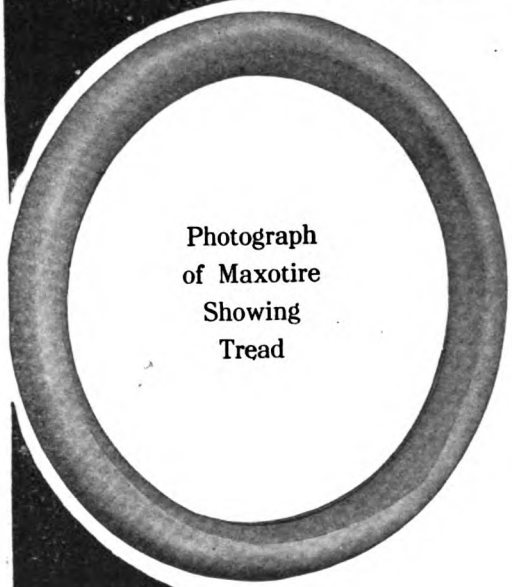
You may now run your tires until there is little left of the outside shoe.

The secret of it all lies in the MAXOTIRE which is in reality a perfect tire having a rubber tread, fabric and bead. The MAXOTIRE is so scientifically constructed that it fits the inside of your tire perfectly. It leaves ample space for your inner tube and protects it from being damaged in any way.

The layer of very tough rubber covering the tread surface of the MAXOTIRE acts as a cushion between the MAXOTIRE and the outside shoe.

When the tire strikes a stone or is put to any great strain, this elastic rubber between the two fabric bodies of the tire and the MAXOTIRE equalizes the strain of both and prevents fabric breaks as well as blowouts.

·MAXOTIRES·



Photograph of Maxotire Showing Tread

Nothing like the MAXOTIRE has ever been sold before

Rubber-treaded MAXOTIRES make your tires practically puncture-proof. Tacks cannot reach the tube, while spikes or nails are invariably turned aside.

When MAXOTIRES are placed in tires this tough rubber tread comes in contact with the inner surface or fabric of the tire. This rubber tread clings to the tire like an overshoe to the sidewalk. There is, consequently, no friction; no heat generated; and no chance for the MAXOTIRE to slip and injure the inner tube.

Smaller inner tubes are not required for use with MAXOTIRES; however, they can be used with success at a saving to you of about 25% of their cost.

USE MAXOTIRES

HAVE TWO TIRES PROTECTING YOUR INNER TUBES

Take No Chances This Spring. Equip your tires with MAXOTIRES before taking your car out. While your car has been standing idle during the **winter,** your tires have deteriorated. They are in much worse condition than the outside appears. Tires blow out in nearly every case before the tread is hardly worn. This is due entirely to internal weakness which no one is able to discover.

MAXOTIRES will make your tires **trouble proof** during the coming season and enable you to get the full wear out of every tire. They are not an experiment but the result of seven years' experimenting by the people who invented the first reinforcements for automobile tires.

AUTO OWNERS: See your dealer, he may have MAXOTIRES in stock (for many have), however, if he hasn't—write for our complete free illustrated catalog and prices, express prepaid.

K & W RUBBER COMPANY

8-20 3rd Street, Ashland, Ohio

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Power for Fords

An Ideal Selling Line for the Trade

THE Newest Bosch-Ford Attachment is an efficiency promoter; it makes possible an easy and mechanically correct installation of the Bosch Magneto on Fords, it results in a positive betterment of the car, it gives more power, more speed and more economy, and, due to even and positive ignition, reduces the wear on the engine and the car in general.

The Bosch Magneto Behind the Ford Gives Maximum Efficiency

The magneto is a Bosch Magneto, the same quality of workmanship and material as go into the Bosch Magneto supplied to the manufacturers of the highest class of automobiles. The few fittings that are necessary are made in the Bosch Factories, too.

If you sell automobile accessories, take advantage of this excellent proposition—the ability of the Bosch Attachment to meet every claim assures a satisfied customer, the type necessary for future existence. It is not a luxury—it's a necessity.

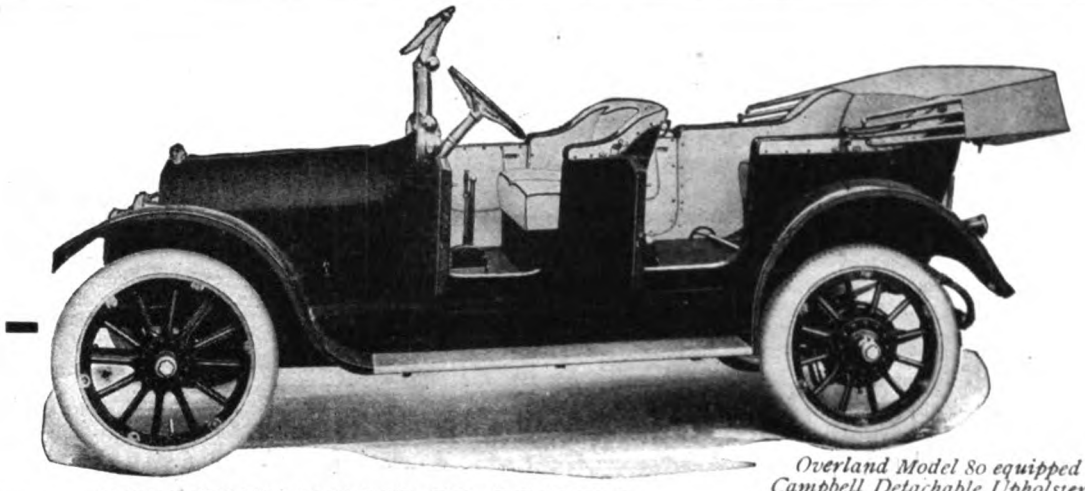
Stock a few of these attachments now. Your orders will have prompt attention and be shipped from a nearby supply station.

Be Satisfied **A Bosch-Ford Book on request** **Order Now**

BOSCH MAGNETO COMPANY, 202 West 46th Street, New York

CHICAGO DETROIT *Over 250 Service Stations Back Up Bosch Users* SAN FRANCISCO TORONTO

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Overland Model 80 equipped with Campbell Detachable Upholstery. Get the Campbell Agency for your car.

IMPORTANT NOTICE TO DEALERS

Reduced Prices!

ON CAMPBELL DETACHABLE UPHOLSTERY

This button guarantees fit, wear, satisfaction.

Owing to the enormous volume of business in 1914, we have been able to reduce our overhead and therefore selling costs on Detachable Upholstery 60%, and are giving the dealer the advantage of this saving.

And remember this! Every set of Campbell Detachable Upholstery is cut, fitted and tailored as carefully as ever; better, in fact, because our methods are being constantly improved. The reduction in price **does not** in any way mean a sacrifice in the high quality of fit, workmanship and wear that have made Campbell the leader in the field.

Write us for new price list and our money-making agency plan. It means little or no investment for you and big profits. Write us today.

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES



The Big-Selling Cleaner

Takes grease, dirt, dust, oil, out of tops, upholstery, slip covers and rugs. Non-explosive, will not injure waterproofed materials. Retails for 25 cents per quart, enough to clean a touring car top.

Write for Catalog and Trade Discounts

We have an interesting story to tell every garage man, supply dealer, repair and paint shop man, and car agent. Our guarantee of satisfaction, together with our unexcelled line of accessories, is a strong asset to you and your business. We have thousands of enthusiastic dealers. Get in line. Get our proposition. Write today to



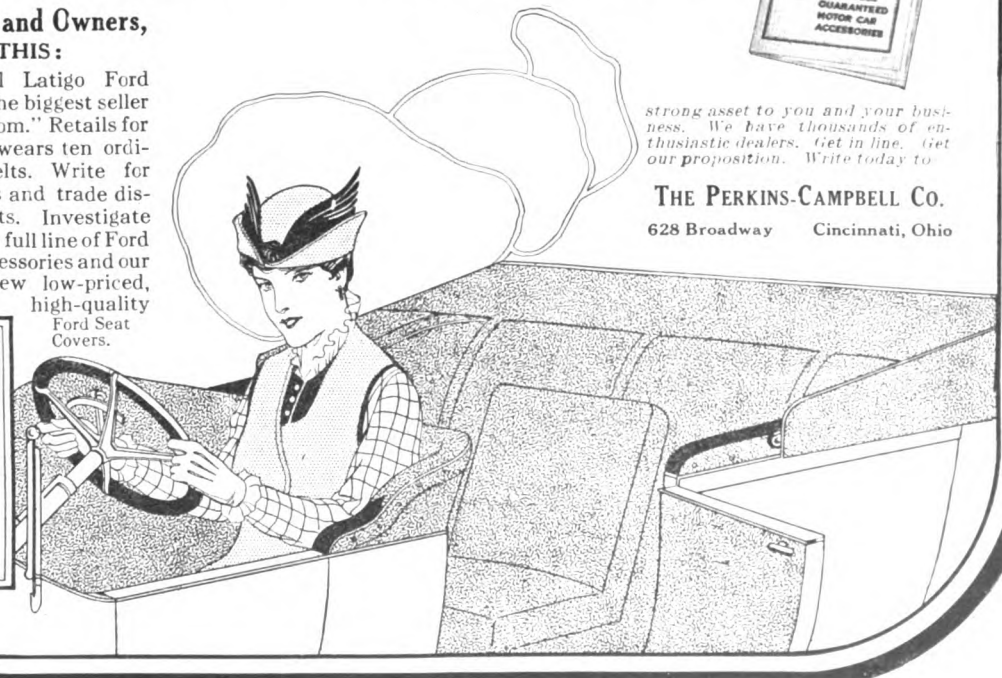
THE PERKINS-CAMPBELL CO.
628 Broadway Cincinnati, Ohio

Ford Dealers and Owners, READ THIS:

The Campbell Latigo Ford Fan Belt is the biggest seller in "Ford-dom." Retails for 50c. Outwears ten ordinary belts. Write for details and trade discounts. Investigate our full line of Ford accessories and our new low-priced, high-quality Ford Seat Covers.



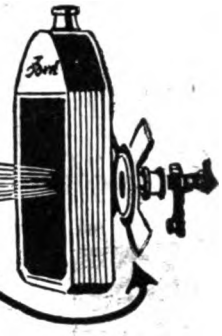
CAMPBELL ESTABLISHED 1879
makes sure you're satisfied



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OAKES Beartone

Sounds Thru Radiator



Beartone is in center of cooling fan on motor—in front of motor—under the hood—directly behind the radiator. Other horns are at side of motor and behind fan, which forces back their volume of sound. Touch a button at driver's seat and the Beartone gives any volume or range desired.

for FORD

The Beartone can be interchanged with fan on your Ford by anyone in a jiffy. Replaces "horns," as the self starter has replaced cranking.

The diaphragm is fastened to the central portion of the cooling fan assembly, rotating with it. Inside the fan is a stationary piece which causes the diaphragm to vibrate when brought in contact with the latter. This stationary part is operated by a small lever at back of fan bracket.

BEARTONE GIVES YOU

Safety—Dependable, never-failing warning sounds every time you touch the button at the driver's seat.

VOLUME

Any volume the occasion requires, and any range needed, from a polite whisper to a loud, long-ranged piercing warning.

FAN

You get the best fan, THE OAKES—a *unit* with a horn. Once you put the Oakes Fan on your Ford you will never have to replace it.

LOGICAL

The Beartone Horn Fan is in a logical position, under the hood in front of the motor, not at the side and behind where the pressure decreases the volume.

EFFICIENCY

The Beartone Horn Fan actually increases the efficiency of your motor.

The Beartone pulls more air thru the radiator, keeping it perfectly cool, saving oil consumption, etc.

MECHANICAL

The Beartone is not an electrical horn. It has the same mechanical operation as a high grade motor-driven horn, but with no battery expense, and at a low first cost.

SIMPLE

The Beartone has no complicated mechanism; has no parts to get out of order and give trouble. Requires no adjusting.

TROUBLEPROOF

The Beartone gives you freedom from trouble; never fails to sound. Boys cannot abuse it when car is standing idle.

DOES AWAY WITH:

Motor battery, wires, complicated mechanism, battery expense. No motor to stick in cold weather. No drain on your lights.



Lucrative Dealers' Proposition—
Write At Once.

THE OAKES COMPANY
INDIANAPOLIS

OAKES

Canadian Branch,
Beartone Manufacturing Co.
Berlin, Ontario

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Easy Starting in Cold Weather

is only one of the advantages of equipping your car with a



Price $16.00
With K-W Autolock Switch

MASTER VIBRATOR



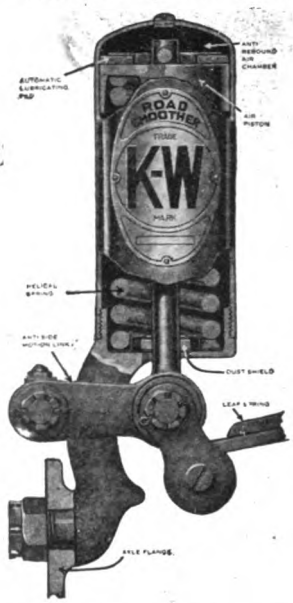
Price $15.00
With Regular Kick Switch

OTHER ADVANTAGES ARE

Perfect Ignition—More Power **A Hotter Spark**
One Adjustment Instead of Four
A Smoother Running Engine **Cleaner Spark Plugs—No Worry**
Less Carbon Deposits—Less Gasoline Used

The K-W Master Vibrator contains a large, powerful condenser—of proper capacity—and exceptionally large, solid platinum iridium contact points—a combination that insures a hot spark. Over 125,000 Master Vibrator users have learned the value of this hot spark.

In buying your Master Vibrator be sure you get a K-W. Look for the K-W Trade-Mark and the serial guarantee number. They protect you against imitations. If your dealer can't supply you, we will send one direct, postpaid, on receipt of price. Write for "That Satisfied Feeling" Folder.



$15 SET OF FOUR
One For Each Wheel
All Ready To Attach

If your dealer can't supply you, sent direct on receipt of price. Write for booklet, "Taking Out The Bumps."

Checking Rebound

Is just as vital to Your Comfort as Easing the Bound

ROAD SMOOTHERS

Reg. U. S. Pat. Office

Quickly Applied To Your Ford Car

effectively check the rebound of the springs by means of the anti-rebound air chamber with its smooth fitting piston. It is this checking of the rebound that gives K-W Road Smoothers maximum comfort. For you see the helical spring takes up the shock, and the anti-side-motion links prevent side-motion, that make for your safety and save the parts of your car.

The three essential features are found *only* in K-W Road Smoothers. And this maximum comfort is *lasting* because, like all K-W products, K-W Road Smoothers are built of the highest grade of materials, thoroughly tested and perfectly built.

Every K-W Road Smoother is built of the right materials—high-grade, heat-treated drop-forgings; electric-smelted, chrome-vanadium steel springs (not ordinary spring steel); and extra heavy phosphor-bronze bushings throughout give long, lasting service and make possible our broad guarantee.

Beware of imitations. The K-W is the *only* Road Smoother. K-W Road Smoothers are sold by dealers who know the difference, everywhere.

NEW YORK:
E. J. Edmond Co.,
1783 Broadway

THE K-W IGNITION Co.
2817 CHESTER AVE. CLEVELAND, OHIO. U.S.A.

BOSTON:
Walter J. Forbes,
243 Columbus Ave.

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Non-Skid Wrapped Tread

Mattson Unguaranteed Tires

Experienced Motorists in ever increasing numbers are turning toward

MATTSON
Unguaranteed Tires

They have discovered that they average better value—service and cost considered—than other kinds.

Nobody knows the life of a tire because nobody can foresee the conditions under which they will be used.

Under favorable conditions a tire will last longer—*guaranteed or unguaranteed*—than under unfavorable conditions.

MATTSON Unguaranteed Tire prices have decided thousands of motorists to try them. The Results MATTSON Tires give invariably decide them to keep on using them.

With increased and improved facilities—made necessary by the growing demand—we are entering upon our ninth year in the manufacture of unguaranteed tires.

While we sell only at wholesale we will be glad to tell you where you can get Unguaranteed Tires.

This information will be valuable, for you can save considerable in your tire expense by using MATTSON Unguaranteed Tires—Plain Wrapped or Non-Skid Treads.

Ask your dealer about the other famous MATTSON Rubber Accessories.

- ¶ High Grade Guaranteed red inner tubes.
- ¶ Reliners, Heavy, Medium, Light, Extra.
- ¶ Service tread boots — Lace-on — Hook-on.
- ¶ Blow-out patches.
- ¶ Repair Stocks for casings and tubes.
- ¶ Cementless patches.
- ¶ Hose connections for radiators, lamps, etc.

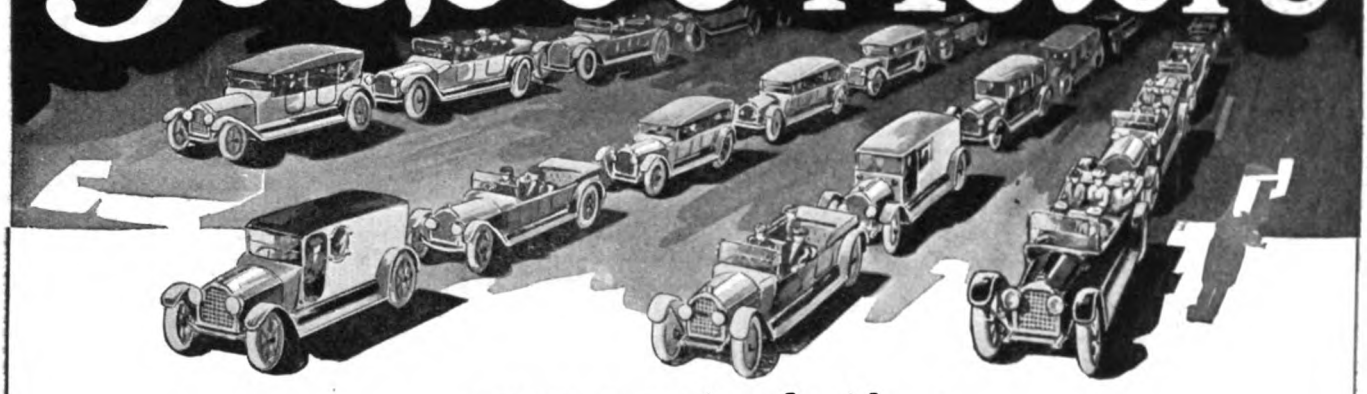
MATTSON RUBBER CO.

— Lodi —

Bergen County New Jersey

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300,000 Motors



are now equipped with

Made in All Sizes **LEAK-PROOF** Easily Adjusted

Piston Rings

MADE BY McQUAY-NORRIS MFG. CO.

¶ Think of what this means. One automobile or motor truck in every five of those in use today has LEAK-PROOF Piston Rings in its engine. And—bear this in mind—in every instance these rings were put in by the owners to replace the inefficient piston rings originally installed by the manufacturer. As a result, 300,000 owners are today securing more power, substantial saving in fuel, oil and motor wear and enjoying great relief from carbon trouble.

¶ LEAK-PROOF Piston Rings are designed to secure that perfect gas-tightness within the cylinder without which proper compression of the fuel charge is impossible—and faulty compression must cause reduced power. Further, they prevent the passing of surplus lubricating oil into the combustion chamber, which is responsible for excessive carbon deposit, and they are made to fit so exactly as to eliminate the undue wear that results in loss of all efficiency, frequent replacement expense and regrinding of cylinders.

¶ The great feature of the LEAK-PROOF Piston Ring is its strength and simplicity. It consists of two pieces only, made on the angle-iron principle, each half perfectly concentric and closely fitted around the other, closing up the expansion openings that are left unsealed in the ordinary one-piece ring, without requiring the use of any coupling joint. This is the patented feature of LEAK-PROOF—and marks its individuality. Being a two-piece concentric ring correctly distributed tension on the cylinder walls is secured without the weakness inherent in the multiple section ring.

When your car is overhauled have LEAK-PROOF Piston Rings installed.

Send for FREE Book—"To Have and to Hold Power"

It explains the theory and function of piston rings. It tells about the LEAK-PROOF **Ring** and why every motor should be equipped with them. How it will pay you in fuel economy and prolonged motor life. Write for it.

"Ask the User"

In use on Over 300,000 Motors



PISTON RINGS

Sold by all up-to-date dealers, garages, and repair shops

To avoid imitation and substitution, insist on LEAK-PROOF

Manufactured by

McQUAY-NORRIS MANUFACTURING CO., Dep't R, ST. LOUIS, MO.

Canadian Factory—W. H. Banfield & Sons, No. 120 Adelaide Street West, Toronto.

BRANCH OFFICES

New York—1919-29 Broadway, at 64th St.
Pittsburgh—902 Second National Bank Bldg.
Kansas City—513 New Nelson Bldg.
Chicago—Suite 718 Michigan Blvd. Bldg., Michigan Ave. and Washington St.
San Francisco—164 Hansford Bldg.
Los Angeles—224 Central Bldg.
Dallas—1509 Commerce St. 3-T

There's no leak-proof ring but the LEAK-PROOF Ring — insist

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Effective February 1

Reduction No. 3 On Goodyear Tires

Making Total Reductions 45 Per Cent in Two Years To Give Always the Most for the Money

We are glad again—for the third time in two years—to announce a big reduction on Goodyear tires, effective February 1st.

Goodyear policy on price is to give the utmost in a tire at the lowest possible profit. Our reductions are made to that end, without ever reducing the quality.

That always means, with our matchless output, more for the money than any other maker can give.

As rubber came down our prices came down. As our output multiplied, reducing factory cost, our prices came down with it. In two years our reductions—including the present—have totaled 45 per cent.

Last year we increased our output 26.6 per cent. A few days ago the embargo on rubber was modified so that supplies seem assured. The market price for rubber seems for a time established. Fabric costs less than last year. So under our minimum profit policy, we announce this new reduction.

Only Fair Basis

We consider profit margin on a tire the only fair price basis. We keep that margin just as low as our line allows.

While we do that, Goodyear tires will always undersell any tires that compare with them. That is because we have the largest output. We have a new factory, modernly equipped. And we have world-wide facilities for buying rubber, of our extra grade, at the lowest market price.

For a long, long time most tires have sold much above Goodyear prices. Some have sold one-third higher. A few have sold lower, as some always will, because of less rubber, less quality. But we can and do, under all conditions, give more for the money than any rival tire can offer.

The Best We Know

Goodyear Fortfied Tires offer the best we know. They are built to give you the lowest cost per mile. They minimize tire trouble in five costly ways employed by no other maker. And they are always the same, regardless of price reductions.

Most tires will always sell higher, because of smaller output. Some tires will always sell lower because of lower standards. But we promise you that none will ever give better than Goodyear value.

This policy has made Goodyears the largest-selling tires in the world. It will make them more so as more men find them out.

Ask your Goodyear dealer for our new price on the size you buy.

THE GOODYEAR TIRE & RUBBER CO.
Akron, Ohio

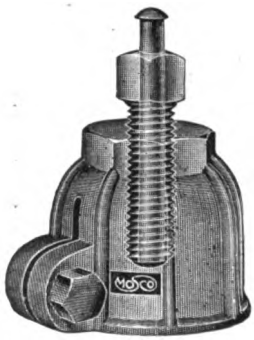
Makers of Goodyear Tire Saver Accessories and Goodyear Wing Carriage Tires and Other Types.



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FORD FITTINGS

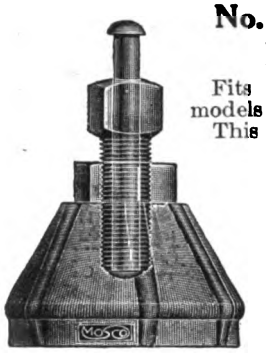


No. 2 WHEEL PULLER
for the Ford Car

This model has our new loose plunger feature as used in our No. 3 model. It also has an adjusting screw to provide for the variation in hub threads often found in the Ford car. No stripping of threads is possible with this puller. Made of semi-steel casting with carbon steel fittings.

Price $1.00

Patented March 24, 1914. Dec. 15, 1914.



No. 3 WHEEL PULLER
For Overland Cars

Fits all Overland 30 and 35 H. P. models of 1913, 1914 and 1915.

This puller has an absolutely new feature in the loose plunger which extends through the center of the screw, affording a means of starting off a wheel which is stuck or "frozen" to the axle. A sharp blow with a hammer against the end of plunger is a wonderful help.

$1.25 Each

Patented March 24, 1914. Dec. 15, 1914.

MOSCO GASOLENE GAUGE
For the Ford Car

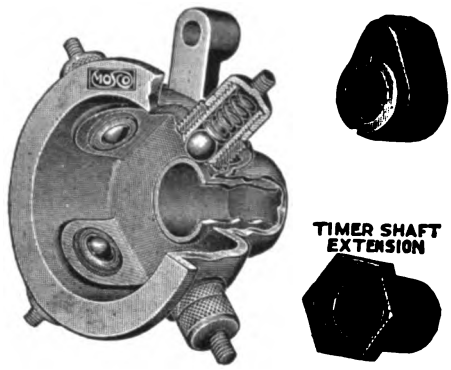


Dial cover ONLY removed for filling. This permits filling of tank without removing the device.

This is undoubtedly the best Gauge ever made for the Ford car as it has a number of advantages not found in others. There is no attaching work. The device is simply screwed into the tank in place of the present filler cap. The indicator automatically engages in correct position as the cap is screwed into place. The device occupies even less vertical space than the present filler cap. No other Gauge has so large an opening available for filling. This Gauge cannot be injured by the introduction of filling funnels or the nozzles used at filling stations. It can be used in the dark by feeling the location of the pointer on the dial.

PRICE $1.50

The New BEMUS TIMER
FORD CAR TYPE



BEMUS BALL CONTACT TIMER

Every practical man who knows the Ford car recognizes the fact that this short stroke, high-speed engine requires a Timer capable of rapid, snappy action in the making of contacts and yet having durability sufficient for thousands of miles of running without loss of efficiency.

THE BEMUS IS BEST FOR THE FORD
BECAUSE

CONTACT is made by a hardened tool-steel brush engaging steel balls with short, glancing impacts, both the brush and the balls turning each time so that fresh contact surfaces are continually engaged.

MOUNTING is direct on the time shaft by means of an extension piece. This brings each of the balls equi-distant from the brush. Result—absolute precision of timing.

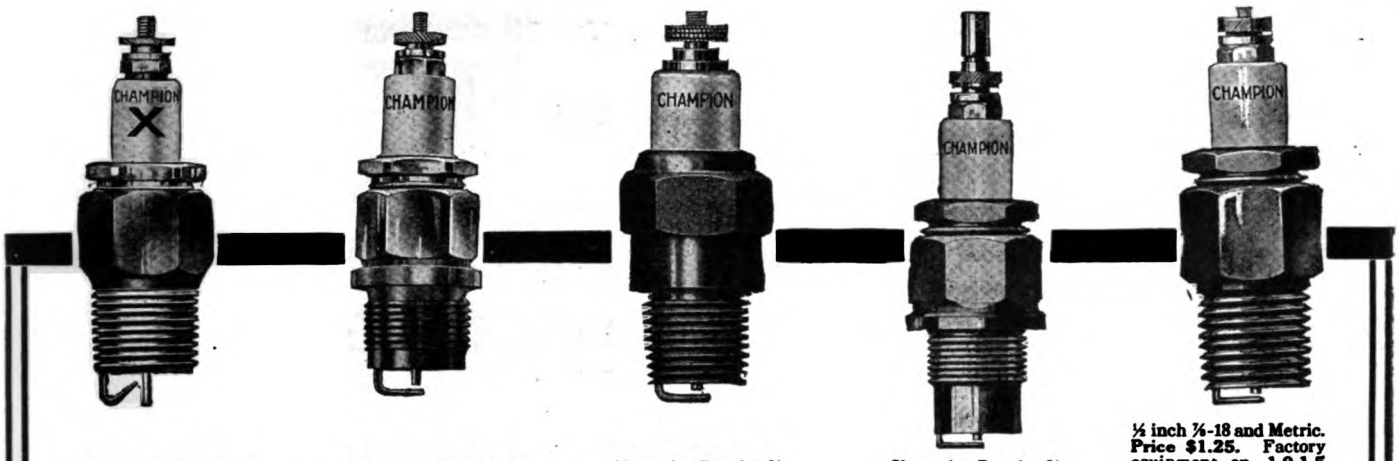
STARTING is facilitated in cold weather because these contacts do not hold a body of oil to prevent passage of current.

DURABILITY of unlimited extent is due to a construction which eliminates all wear of the insulation. The roller brush is reversible, and when worn on both sides may be replaced by the user together with new contact balls at an expense of a few cents.

PRICE $2.25

MOTOR SPECIALTIES COMPANY
MANUFACTURERS, WALTHAM, MASSACHUSETTS

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The "Ford" Plug—Special ¼ inch with Champion.
Plug adopted by the Ford Motor Company as standard equipment on Ford cars since 1911—Price 75c.

Champion Regular ½ inch. Price $1. Factory equipment on all Studebaker Cars. Factory equipment on all 1913 and 1914 Overland Cars. Nickel finish.

Champion Regular ⅞-18. Price $1. Factory equipment on Maxwell Cars. Nickel Finish.

Champion Regular ⅞-18 long. Price $1. Specially made for Buick Cars. Has Buick Terminal, long shell, conical porcelain. Nickel finish.

½ inch ⅞-18 and Metric. Price $1.25. Factory equipment on 1915 Overlands. Specially made for high power and racing cars. Extra heavy material throughout. Absolutely compression tight. Gun Metal finish.

Why Champion Spark Plugs Dominate the Field

For the last five years, the demand for Champion Spark Plugs has always far exceeded the supply.

Every year, the output has fallen short of the actual demand.

Why?

Because the manufacturers of Champion Plugs would not sacrifice quality to quantity. That they have chosen the right policy is evidenced by the fact that their output now exceeds over 26,000 plugs per day, and their factory has grown, from a small beginning, to be, by far, the largest and most perfectly equipped spark plug plant in the world.

Champion Spark Plugs stand for quality and efficiency. Their reputation for quality has been built and maintained by the use of not only the best materials, workmanship and superior design, but by the unsurpassed manufacturing facilities, which have enabled this product to be placed on the market in a uniformly perfected state.

Over three-quarters—seventy-five per cent of all the cars built in America are equipped at the factories with Champion Spark Plugs.

The engineers of these automobile manufacturers have found that Champions are the best adapted to their motors, and insure the greatest amount of efficiency and durability.

Ford, Overland, Studebaker, Maxwell, Metz and over fifty other famous cars go to their owners when new supplied with Champion Spark Plugs. This, alone, should be sufficient reason for the owners of any of these cars to see that all replacements are made with Champion Plugs.

There is a Champion Spark Plug made for every automobile, motor truck, motor boat, motorcycle, aeroplane and stationary motor.

See your dealer.

STRONGEST GUARANTEE EVER MADE:—Complete satisfaction to user, or free replacement, repairs, or your money back.

Champion Spark Plug Company

Largest Makers of Spark Plugs in the World.

119 UPTON AVENUE **TOLEDO, OHIO**

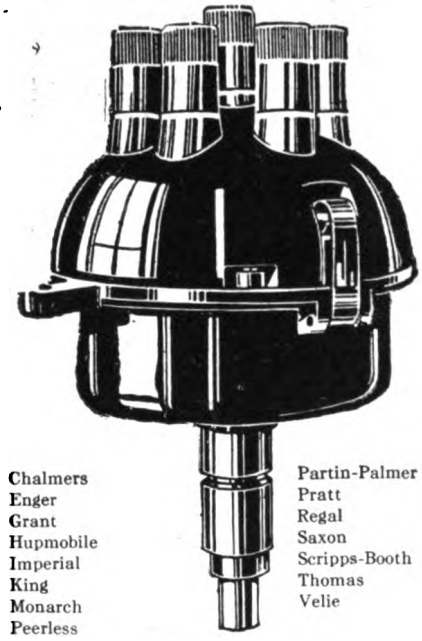
Fastest Selling—All-Year-Round Dealer Proposition

Used and Bought Exclusively by Over 75% of all Car Owners

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Atwater Kent

Ignition System



Chalmers
Enger
Grant
Hupmobile
Imperial
King
Monarch
Peerless
Partin-Palmer
Pratt
Regal
Saxon
Scripps-Booth
Thomas
Velie

SOME REPRESENTATIVE ATWATER KENT-EQUIPPED CARS

Straws from the Show

AT the Chicago Automobile Show seventy-seven cars were exhibited.

Of these 77 cars, 34 were magneto equipped, and 43 depended solely on battery ignition. While none of these battery-equipped cars had any other form of ignition, a considerable number of the magneto-equipped cars had auxiliary battery ignition.

Of the 43 cars using battery ignition exclusively, 20 used the Atwater Kent Ignition System. The others were divided between four different makes.

In a word, one-quarter of all the cars at the Show were exclusively Atwater Kent-Equipped.

The reason for its phenomenal growth in popularity is that Atwater Kent Ignition *rounds out the engine performance* at points where other systems leave it weak.

With Atwater Kent Ignition the engine *starts* much easier, *idles* more slowly and quietly, *pulls* stronger at low speeds, and *accelerates faster* than with the ordinary magneto equipment.

Constant spark heat at all speeds, accurate synchronism, correct automatic advance are the birthright of any engine. Atwater Kent Ignition gives them all with unfailing dependability. Its principle is basic.

Atwater Kent Mfg. Works 4933 STENTON AVENUE PHILADELPHIA, PA.

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Seven Killed for Seven Cents

An automobile manufacturer was making out the specifications for the coming year. It came to a choice of brake lining—Thermoid or some other.

Thermoid was conceded to be superior, but it cost seven cents more per car than a competing brake lining.

The cheap lining was the usual kind, with friction surfaces but friction-shy inside—a loosely woven fabric that could not possibly remain efficient beyond a limited period.

At least one of the manufacturer's cars was bought by a novice. He drove his car poorly—used his brakes constantly—took little care of it—knew nothing about its mechanism. He took the manufacturer's word that the car was mechanically perfect.

Without going into details, this owner met with a terrible accident in which seven people were killed. Examination demonstrated that the brake lining had become useless and at a critical instant *the brakes failed.*

If Thermoid had been used, the brakes would not have failed—could not have failed.

The manufacturer had sacrificed seven lives for seven cents.

Inasmuch as he makes many thousand cars a year, how many more frightful accidents may be charged to the false economy of his purchasing department?

When a manufacturer deliberately cheapens his car to the danger point, he is morally responsible for every accident that results from that sacrifice of essential quality.

It seems inconceivable that a manufacturer will, for seven cents, take chances with so vital a safeguard as the brakes of an automobile.

Yet it is done constantly.

A manufacturer cannot plead ignorance. His engineering department can prove in a few minutes the great superiority of Thermoid over any other brake lining. His engineers *know* and *concede* the superiority of Thermoid Brake Lining. His only possible reason for using a poorer brake lining is to save seven cents on every car.

Is it worth it?

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%

THERMOID RUBBER COMPANY, TRENTON, N. J.

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1915 TRADE APCO MARK NEW PRICES

Adjusting Cone	$0.20	Emergency Brake Shoes, Br.	$2.00	Oak Running Boards	$6.00	Speed Graduator	$0.50
Ball, Small	.02	Emergency Brake Shoes, Ir.	.50	Oil Cups	.05	Spring Leaf Separator	.50
Ball, Large	.04	Engine Bolts	.05	Oil Gauge	.25	Stationary Cone	.30
Ball Race, Small	.25	Exhaust Whistle	2.00	Piston Rings	.15	Starting Crank Holder	.25
Ball Race, Large	.35	Fan Belts	.40	Porcelains	.25	Starter	15.00
Ball Retainers	.05	Felt Washers per Dozen	.50	Push Rod	.20	Switch Key	.15
Battery Outfit, No. 3	2.00	Foot Accelerators	1.50	Radiator Compound	.75	Steering Gear Bushings	.10
Battery Outfit, No. 4	5.00	Front Number Holder	.25	Radiator Cap	.50	Steer. Rod Anti-Rattler No. 3,	.40
Bow Clamp	1.00	Gasoline Tank Gauge	2.00	Radius Rod Anti-Rattler No. 1,	.50	Steer. Rod Anti-Rattler No. 4,	.30
Brake Lining	.75	Gasoline Saver	3.00	Radius Rod Anti-Rattler No. 2,	.40	Tail Light, No. 1	1.50
Brake Rod Supports, Bronze	1.00	Gasket Sets	.40	Reverse Wrench	.25	Tail Light, No. 2	1.00
Brake Rod Supports, Steel	.50	Grease Cup Sets, Small	1.50	Rear Number Holder	.35	Tail Lamp Bracket	.75
Brake Rod Clevis Pin	.03	Grease Cup Sets, Large	2.25	Robe Rail, Brass	.75	Tire Grips	.30
Brass Polish	.25	Grease and Oil Gun	.50	Robe Rail, Black	.50	Valves	.25
Breather Pipe and Oil Filler	1.00	Headlight Brace	.50	Rubber Pedal Pads	.50	Valve Compound	.25
Bulbs, All Kinds	.30	Heel Rests	.50	Shock Absorbers, per Pair	7.50	Valve Grinders	.25
Clock, 8 day	2.50	Hose Clamps	.05	Socket Wrench, Single	.30	Valve Reseating Sets	2.50
Clock, 1 day	1.50	Hose Connections, Large	.15	Socket Wrench, Double	.40	Valve Spring Covers	1.50
Clutch Release	.50	Hose Connections, Small	.10	Socket Wrench, Triple	.50	Valve Spring Removers	.25
Cotter Pins	.25	Little Steersman	3.50	Special Piston Ring	.50	Valve Stem Adjusters	.40
Dash Lamp	1.50	Lighting Outfit, No. 1	10.00	Spindle Arm Bolts	.20	Wiring Assembly	1.00
Dash Oil Gauge	1.50	Lock Washers	.05	Spindle Body Bolts	.40	Windshield Cleaner	1.00
Door Stripe, Runabout	1.50	Master Vibrator	10.00	Spark Plugs	.50	Wheel Puller	.25
Door Stripe, Touring	2.00	Muffler Cut Out	.75	Speedometer Gears	.20		

Patronize the Dealer Who Gives you What you Ask For.

The store selling standard products is the store that is sought by the careful buyer. Such purchasers know what they want, and it is a waste of time for dealers to "talk" or attempt to push the sale of "Just as Good." Remember, when a dealer offers you an imitation article he makes a bigger profit, otherwise he would not handle it. What do you get if you handle his "Just as Good"? Certainly not the quality for which you pay. The name of a well-known maker on a product is the best assurance you have of the uniform quality of the product. Your salvation from injury or deception is to ask for products by name of Maker or Trademark Brand and the determination to demand that the dealer supply the identical product asked for. Good-service dealers will not attempt to offer you substitutes, because they appreciate your patronage and realize that the growth of their business depends upon giving customers what they ask for.

Insist on [redacted] Ford Specialties. *"Get What You Ask For."*

DEALERS and JOBBERS: Write for our discounts, they are right and the [redacted] goods will make friends for you.

AUTO PARTS COMPANY, - - PROVIDENCE, R. I.

The Largest Manufacturers of Ford Specialties in the World.

Light, Dim Or Extinguish Your Gas Lamps Instantly

from the driver's seat without stopping



Controller Cut Half Size

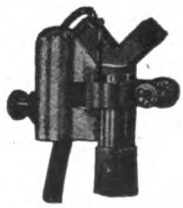
THE **INST LIGHTER** is the most convenient, successful and troubleproof device of iis kind. On the market five years; now used by over fifty thousand motorists.

This is a complete system, including gas controller, spark coil, lighters, heavy brass tubing, wire, cable, etc., etc. Absolutely safe, mechanically perfect, economical and 100% efficient.

Quickly pays for itself in gas saved. Unequalled convenience.

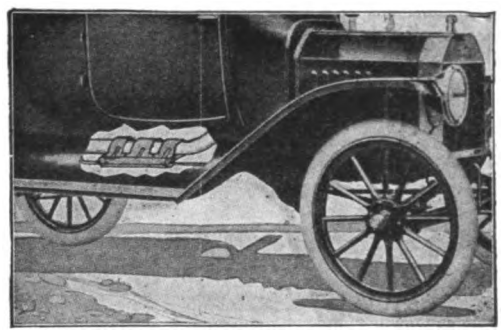
Standard Equipment on America's Foremost Cars

Write today for Profitable Agent's Proposition.



Lighter

1/3 Of Your GASOLINE SAVED BY THE



Economy Gasoline Improver

OR SUPER-CARBURETOR

Cold water will not give off steam, and the best carburetor on earth will not give off real vapor without the assistance of heat, at any time of the year. **Boiling Gasoline** is used at the big races in the middle of the summer.

The Economy Gasoline Improver uses waste heat from the surface of the exhaust pipe to heat the gasoline in the gasoline pipe before it enters the carburetor, greatly increasing the power, improving the running of the engine, decreasing the deposit of carbon and permitting a saving of **One-Third of Your Gasoline. YOU CAN SEE IT SAVE.**

We guarantee that with the **Economy Gasoline Improver** on your car you can turn off the flow of gasoline to the carburetor ⅓ after the engine is warmed up, and still get full efficiency.

PRICE $2.35 A Special Offer will be made once to each new dealer. Write for it.

Order through your dealer or direct from us. We ship by insured mail same day order is received. **We pay the postage.**

THE INST LIGHTER CO., 58 East Main Street, Columbus, Ohio

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You can put dollars into your pocket by reading and heeding this booklet!

—simply because it tells you what to **look** for and what to **look out** for in putting piston rings into your or your customers' cars. It also explains and illustrates the why and wherefore of gasoline, lubricant and power losses, irregular firing, overheating, carbonization, valve regrinding and cylinder reboring—and how these may best be avoided at a trifling initial expense that assures big ultimate savings and makes the motor able to climb big hills with less gear shifting.



Better tear off and return the coupon **today** for your copy of this booklet.

Up-to-date motorists and repair men who understand good piston ring service and its possibilities, quickly see the improvement effected in any motor by discarding leaky old style rings and installing

Micro
Piston Rings

These are the two-part pressure-tight rings without a break in continuity of the bearing surface—the ones **cast individually** from flexible close grained metal that **never breaks** in fitting and that stays in perfect cylinder contact when old as well as while new





Micro Piston Rings
The watchdog of a motor's power.

Your judgment in selecting Micro Rings will be more than vindicated on the first installation and you can make the trial at our risk. Business fairness, extensive manufacturing and rigid inspection to micrometer accuracy put backbone into our guarantee.

If your jobber cannot supply Micro Rings don't accept a substitute and be disappointed. Write us direct.

Micro Piston Ring Co.
1960 Broadway - New York

MICRO PISTON RING CO., 1960 Broadway, New York
Please send the booklet and prices on Micro Piston Rings.
NAME .....
ADDRESS .....
5

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A Blower and Tuyere Iron that Stand Without a Single Comparison for Producing a Strong Blast

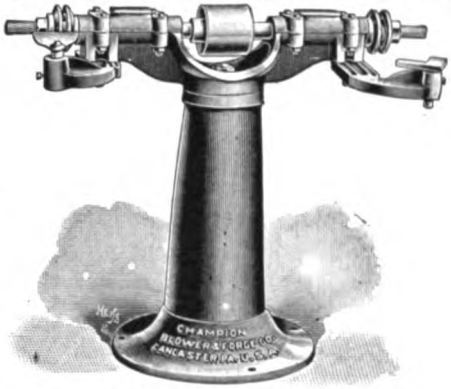
BE PROGRESSIVE, USE A No. 400



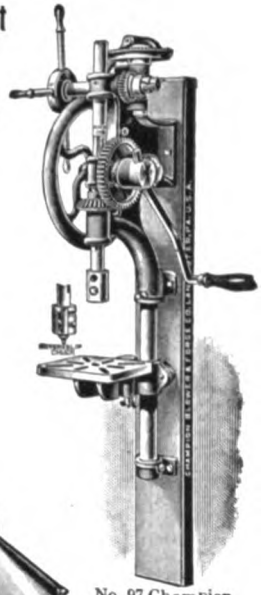
FAMOUS 400 Crank turns either way.



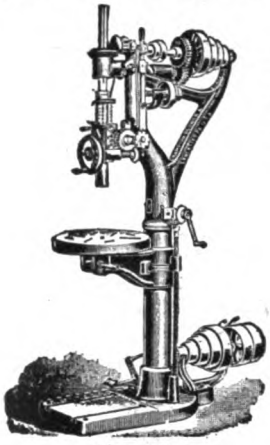
No. 408 Steel Blacksmiths' Forge.
Over one-half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.



No. 1 Champion Upright Column Grinder.
Capacity Two 18x3 inch wheels.



No. 97 Champion Hand-Feed and Quick Return Self-Feed Blacksmith Post Drill.



20-inch Drill.

20-inch Double Back Geared Upright Power Drill is furnished with three complete feeds and is suitably adapted for machine shop and garage use. If you are in need of a power or hand driven Drill write us for full information concerning our complete line.



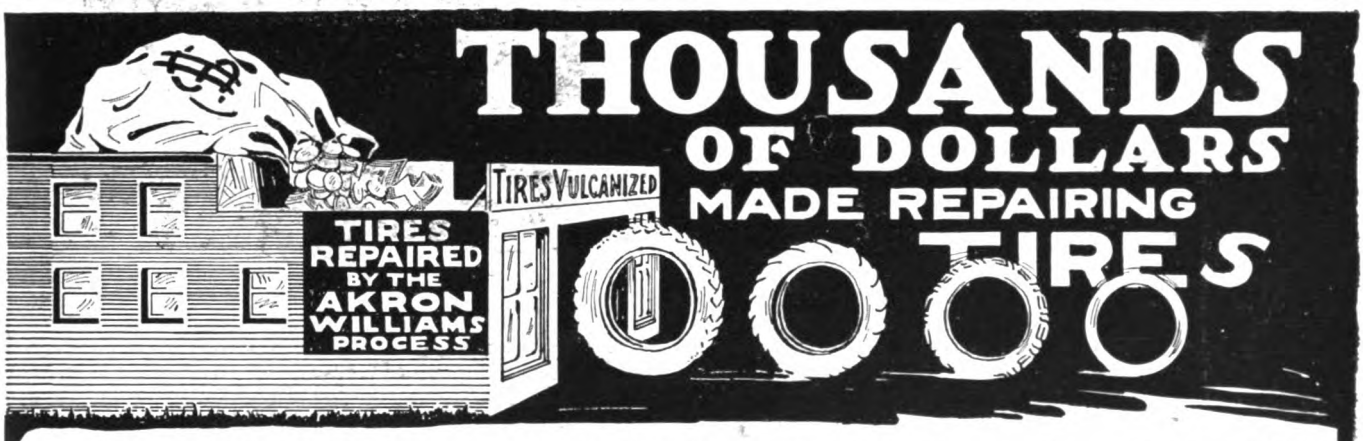
Screw Plates made in four Styles, cutting from ¼ inch to 1½ inch.

Before purchasing a **Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower or Electric Blower, write for our free catalogue,** which always shows the greatest variety of improved blacksmith tools built under one control in the world.

THE CHAMPION BLOWER & FORGE COMPANY, LANCASTER, PA., U. S. A.



No. 440 Electric Forge.



THOUSANDS OF DOLLARS MADE REPAIRING TIRES

The amount you can make in dollars repairing tires is measured by your own energy. You can make anywhere from $1500 to $3000 a year above expenses. Your investment to start in business is small, returns are quick and your income cash. Profits are large on every job you turn out. The tire repair business is in its infancy. It's growing every year, because more tires are being used every year. In almost every city and town there is a crying need for a good tire repair man. **That means opportunity for you.** Start in your home town if you want to. This is a new **money making business.** Don't delay getting busy. But above all be prepared with an equipment that means satisfactory work for your customers. Buy only an

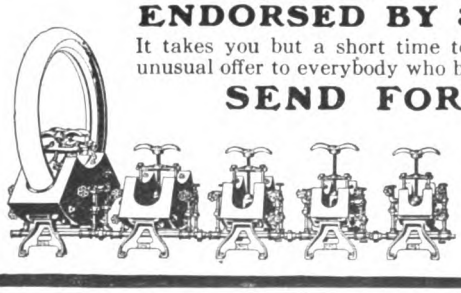
AKRON-WILLIAMS TIRE REPAIR EQUIPMENT

The better your equipment, the better your work and the greater volume of business. Let us start you in business right. Use an equipment which is

ENDORSED BY 30 LEADING TIRE MANUFACTURERS

It takes you but a short time to become an expert tire repair man. We help you here. We are making an unusual offer to everybody who buys an equipment. You can become an expert by our plan.

SEND FOR OUR 30 DAY SCHOOL PLAN



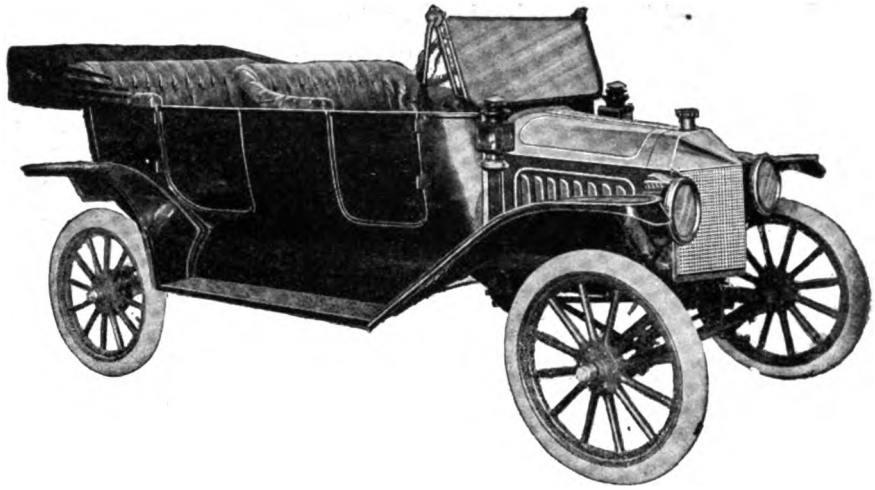
It means when you start in business, you start right. You are prepared to make money from the jump. No experimenting. No failures. You become a practical, first class repair man.

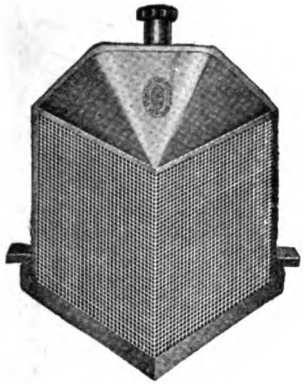
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WATERHOUSE & LESTER COMPANY, exclusive California distributors, SAN FRANCISCO and LOS ANGELES, CAL.

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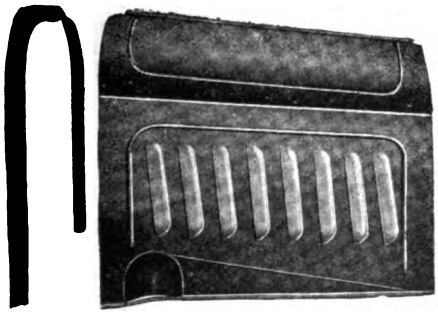




POINTED FRONT
Price $45.00 F. O. B. New York
Including extended starting crank



STRAIGHT FRONT
Price $35.00 F. O. B. New York
German Silver Radiators either type $5.00 extra



Price $8.00 F. O. B. New York
Including hood ledge, ready to install

Every Ford Owner A Possible Customer

Your market for Livingston Radiators and Livingston Sloping Hoods is limited only by the number of Ford cars in your territory.

We specialize in Honeycomb Radiators and Sloping Hoods for Ford cars.

Owing to a large demand and output, we have cut the cost of manufacturing to the minimum.

Livingston Radiators have been recognized for years by high class motor car manufacturers as superior in construction to all others.

Livingston Radiators are the most efficient for the following reasons:

1st. All the radiating surfaces are in direct contact with the circulating water, insuring direct radiation.

2nd. The water in the Livingston radiator travels around three sides of the square, in vertical and horizontal runs, making the length of the tube twice its height, thereby keeping the circulating water in contact with the air twice the length of time, giving increased efficiency with less weight.

POINTED FRONT.—The Livingston Pointed Front radiator will greatly improve the appearance of a Ford car by giving it long lines, and adding to its style, beauty and individuality.

LIVINGSTON SLOPING HOODS give the long stream line effect so much admired in cars of higher cost. They can be used in conjunction with any radiator built for Ford cars. Sides are ventilated to permit of additional cooling, by allowing the heat generated from the motor to escape from under the hood.

All Livingston products are sold under a "30-day guarantee." If not satisfactory, they can be returned to us any time within 30 days (transportation charges prepaid), and the money will be cheerfully refunded.

All Livingston products are absolutely interchangeable with radiators and hoods that are standard on the Ford job.

DEALERS—Hundreds of dealers are making added profits by selling Livingston Products.

WRITE FOR OUR PROPOSITION AND DISCOUNTS.

We create the demand for Livingston Products through judicious National advertising.

Write for Details

LIVINGSTON RADIATOR & MFG. CO.

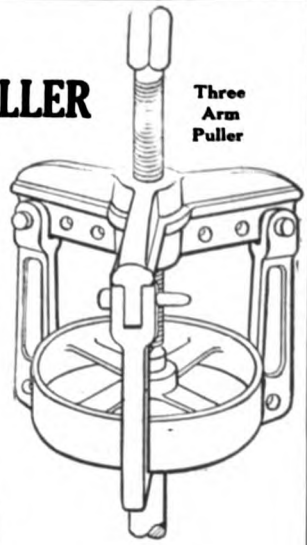
303 W. 75th Street, New York, N. Y.

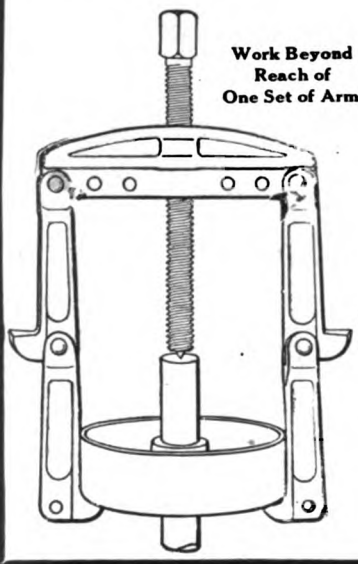
All types of radiators built and repaired

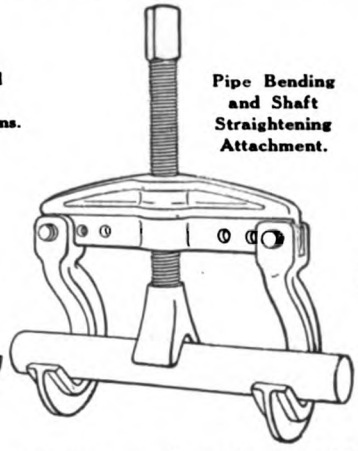
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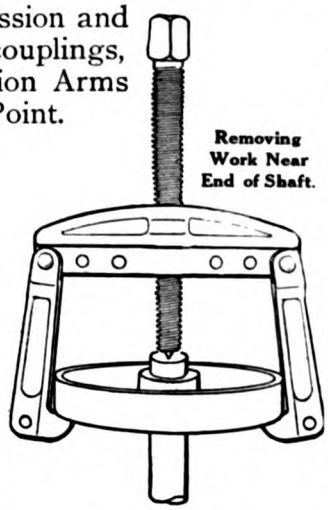
CRANE'S NEW MODEL PATENT WHEEL AND GEAR PULLER

For removing auto wheels, fly wheels, transmission and cam shaft gears, commutators, sprockets, collars, couplings, etc., with New Combination Hook and Extension Arms and Screw, with inserted Tempered Tool Steel Point.


Three Arm Puller


Work Beyond Reach of One Set of Arms.


Pipe Bending and Shaft Straightening Attachment.


Removing Work Near End of Shaft.

FULLY GUARANTEED

The point of the screw is flat with inserted tempered tool steel point. Will not spread centers. Works equally well on work without centers. The strain is taken on the flat point of screw. **Write for circular "D."**

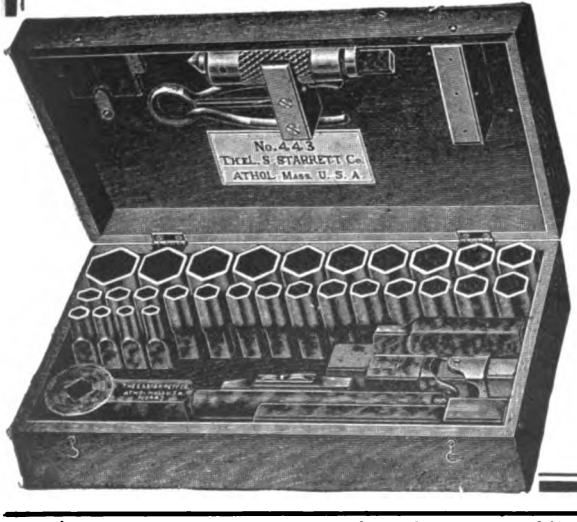
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A Complete Ratchet Wrench Set—$15.00

Pay Less — Get Less!

BY INVITATION MEMBER OF

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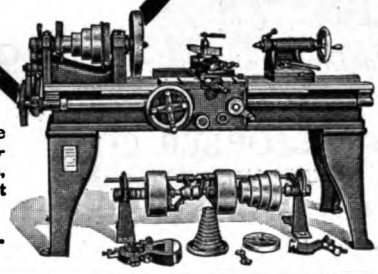
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should be on file in your shop no matter how large or small your repair business. Before you install any lathe look through this catalog first and note the saving our low prices insure. Then order your lathe from us. Sears, Roebuck and Co. lathes are carefully made and the quality is right. Guaranteed to give the best kind of service and satisfaction. We want you to have a copy of our Machinery and Tool Catalog No. 57A189. Sent free on request. Write for it today.

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Our prices on Lathes will save you $50.00 to $150.00



Our 16-Inch Screw Cutting Engine Lathe No. 9M4770½ shown here, 6-foot bed, 36 inches between centers, price, complete with compound rest and countershaft, only $252.00.

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describes how two men—one blind, one lame, accomplished a journey by mutual aid; which otherwise would have been impossible.

The blind man carried the lame man who steered the course—

In like manner

We Enable Two Weak Auto Tires

to continue their journey revived and strengthened by causing one to carry the other, which in turn protects its friendly helper from the shocks and thorns of the road.

That UNITY IS STRENGTH

is clearly demonstrated by the average mileage being from 2000 to 3000.

Write for particulars on our Reclaim System.

COWANS BROTHERS
150 West 55th Street, New York City

What's the Answer to the Tube Question?

Miller
Red Tubes

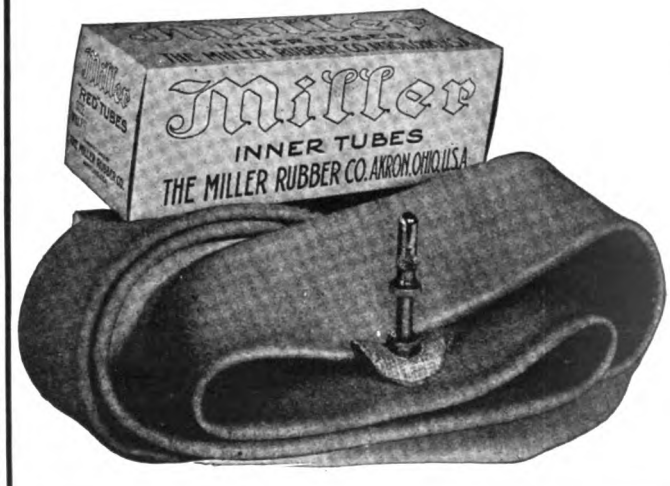
But they can't give You that feeling of Security and Freedom from Tube Troubles unless they're in Your Casings.

Miller Red Inner Tubes are made of pure gum, built heavy and strong, yet so exceptionally elastic that they do not lose their shape. Double reinforcement at the valve, by means of a large, strong base, gives additional protection where wear is most severe.

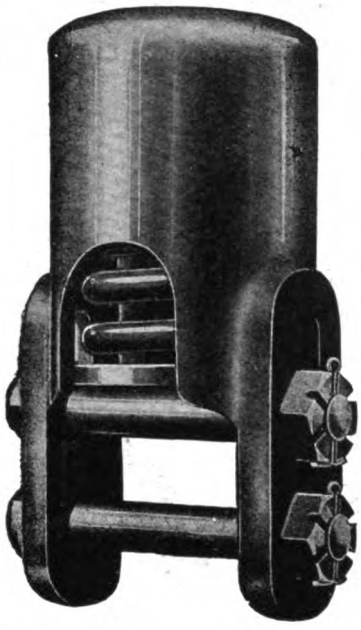
Miller "Hook Hold" Boots hold firmly after tire is inflated. Pluggum saves tire bills by giving a quick, permanent repair (without vulcanization), to cuts in casings. Both are built up to the Miller Standard of Quality.

The Miller Dealer has the size tube you need and a full line of tire accessories.

The Miller Rubber Co.
Akron, Ohio, U. S. A.



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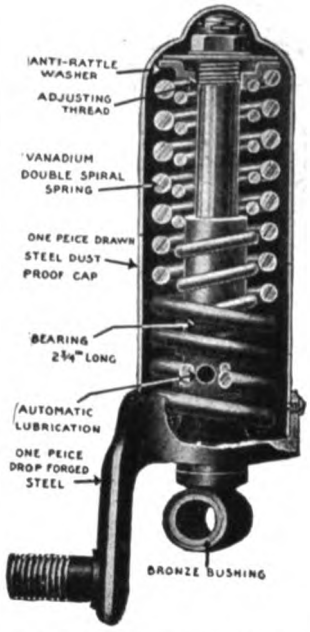


"COMFORT" SHOCK ABSORBERS

FOR FORD CARS

Differ from all other shock absorders, no matter what they cost, in these important details.

A DOUBLE SPIRAL SPRING.
ALL-STEEL DROP FORGINGS.
BEARING 2¾ INCHES LONG.
INCREASED LIFE TO FORD CARS.
AN AUTOMATIC ADJUSTER.
VANADIUM DOUBLE SPIRAL STEEL SPRINGS.



A LIFE GUARANTEE

It has extreme simplicity of construction, a single attachment. No effort required. The "Comfort" transforms a Ford car into a pleasure car of enjoyment.

"COMFORT JR."
PRICE PER SET OF FOUR
$5.00

Special Inducement to Dealers and Jobbers.
WRITE FOR PARTICULARS.

COMFORT SHOCK ABSORBER CO.,
HEMPSTEAD, L. I., NEW YORK.

Stewart Auto Accessories Co.,
Mid. West Dist. 1509 Michigan Ave., Chicago.

"COMFORT SR."
FRONT OR REAR
$6.00
FRONT AND REAR
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MAKE $250.00 A MONTH

REPAIRING AUTOMOBILE TIRES



Sounds like a lot of money—IT IS—A WHOLE LOT of MONEY to be earning CLEAR every month—yet it's what hundreds of men we have established in the Automobile Tire Repair Business are making. You let down the DRAWBRIDGE for SUCCESS to enter into your career by getting into business for yourself. The business for you is one where the investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase.

A HAYWOOD TIRE REPAIR EQUIPMENT

answers to all of these requirements of Old Dame Fortune—the certainty of success in this business is as sure as anything in this world can be—Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

HERE IS YOUR OPPORTUNITY!

Be first to enter this new, big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I have made as high as $18 in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as a side line in connection with auto business—garage, or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

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Young men and boys! repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business. **Auto owners**—repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow, investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.

The New Money-Making Business—Start Now.

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Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

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Kansas City :: Missouri



SAVE YOUR TIRES



Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

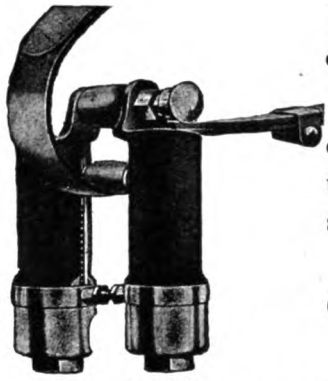
VULCANIZIT For inner tube punctures and blowouts,
KUTFILLER For filling cuts and other injuries,
SANBLIST A cure for sand-blisters, repairs blowouts,
NEWTRED For retreading worn tire sections,
PATCHIT Two colors, white and black, for repairing Hot-Water Bottles, Air-Cushions, Rubber Boots, Overshoes and kindred articles.
¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

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Send immediately for descriptive circular giving full particulars of all our special products.

SELF-VULCANIZING RUBBER WORKS, MORRISTOWN, N. J.



J. H. S.
Three-quarter elliptic springs

J. H. S.

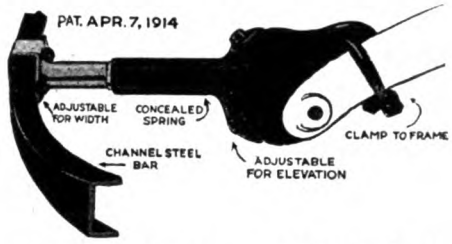
Backed by ten years of success in the manufacture of shock absorbers.

Indispensable for Comfort and Economy of Upkeep

Price $25.00—Any Car

30 DAYS' FREE TRIAL **YEAR GUARANTEE**

SAGER BUMPERS



Recognized as **best** and **oldest** in the trade.

Channel—Triangle—Square and Round Bars

List Price $5.00 and Upwards.

Big discounts to the trade.

Write also for a Bumper Rack

SAGER-FORD

$12.00 Set of Four

SAGER FEATURES

Drop forgings, heat treated.

Pressed steel shell, heavy gauge.

Dust proof.

Long helical springs, automatic in action.

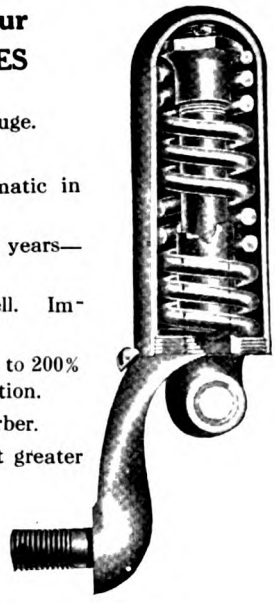
Sager has made springs 22 years—10 years for Shock Absorbers.

Triple lock on dust proof shell. Impossible to lose.

Bearing surface for pin 100% to 200% more than others. No side motion.

Only five parts to each absorber.

Simplicity and lightness, yet greater strength and durability.



30 DAYS' FREE TRIAL

Year Guarantee

J. H. SAGER CO.

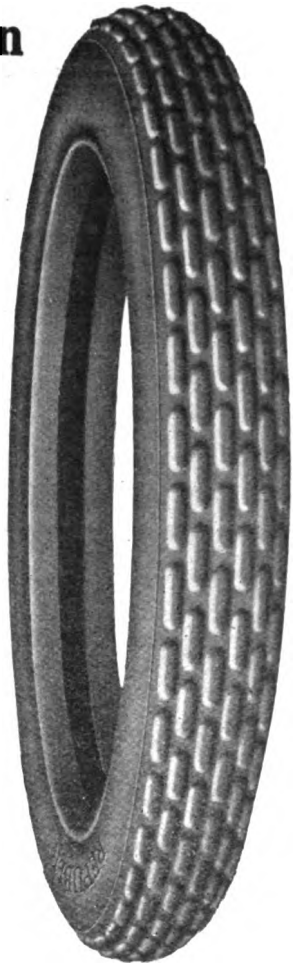
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"It's the best tire made. It's quality through and through. It delivers more miles of uninterrupted service per dollar invested than any tire made. It attracts the right kind of buyers and holds them.

"The Republic Staggard Tread is the original effective non-skid tire bearing patent dates. Its long, tough studs give the maximum of freedom from skidding, the greatest traction, and lowest mileage cost. It is the king of Tires."

If you are open to a money-making, profit-making tire agency, write us at once.

THE REPUBLIC RUBBER CO.
YOUNGSTOWN, OHIO

Branches and Agencies in the Principal Cities.

Republic Staggard Tread Pat., Sept. 15-22, 1908

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REPUBLIC TIRES

PLAIN, "WM" AND STAGGARD TREADS

TRADE MARK REGISTERED U. S. PATENT OFFICE

Perfection Auto Starter

FOR **FORD** CARS

OVER **8500** SOLD



Operates From Seat

Engine Starts At Once

A Light Push of the Lever with Your Foot—That's All.

So simple a child can use it. No gas to explode; no batteries to charge; no springs to wind up and no up-keep expense. Neat and out of the way.

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A Perfection Starter will make your auto pleasures complete. Catalog and Booklet, with full instructions for installation, sent free upon request. $25.00, anywhere in the United States.

50% TO AGENTS. SEND $12.50 FOR SAMPLE
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THE CANVAS TREAD TIRE

With its many layers made of rubber and rubberized canvas impregnated with tread stock in such a way that each layer is woven to the other with rubber and afterwards vulcanized, which makes a stronger and more serviceable tread than the all-rubber tread heretofore used. These layers will not separate, peel off, crack, split, or chunks come out, like the all-rubber tread by the constant vibration. All of these layers are non-skid, but yet a smooth tread, and each layer as they wear off becomes a non-skid and so on until the entire tread is worn out. It takes more than 1,500 miles to wear off one layer. Count the number of non-skid layers and you will see that this tread is good for more than 10,000 miles. It is a tougher tread and more serviceable than heretofore used in other makes of tires. It is the only non-skip tire all the way through ever made, no chains are necessary. It is what is known as a fast tire and takes less engine power and 25 per cent less gasoline. It is free from punctures, stone bruises and never gives any trouble. Try one of these tires with any other tire, which will quickly convince anyone. We only use the most expensive material that goes to make up a tire. If you paid us a $1,000 for a tire, we could not make a better one, because better material is not made. This tire is backed up by the highest percentage of mileage guarantee.

Send for booklet telling many other features and agent's proposition.

THE CANVAS TREAD TIRE COMPANY
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DU PONT FABRIKOID
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MOTOR QUALITY
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It is More Durable Than Coated Splits—the thin, fleshy sections split from the under side of animal hides and coated and embossed to look like grain leather.

It Costs Less Than Coated Splits.
It is Waterproof and Grease-proof—important and essential qualities not present in leather upholstery.

It is used by several of the leading automobile makers and giving excellent satisfaction.

Get Acquainted. Test It.
Ask For Samples.

DU PONT FABRIKOID CO.
Wilmington, Delaware
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National Rubber Tirefiller



Makes one tire last as long as two with the use of air, and during the whole life of the tire you will have no punctures, blowouts or rimcuts and no troublesome repairs. It is moulded and laid in your tires—not melted and poured in. It can be transferred from one set of tires to another. Its first cost is final. It is made of the best grade of soft cushion rubber. It is in use on all types and size cars. It is the only logical solution of the tire problem for all sizes and kinds of cars. It has been used over and over again, and there is no limit to the life of it.

Write today for full particulars and sample.

NATIONAL RUBBER FILLER COMPANY
MIDLOTHIAN, TEXAS

TRADE MARK
"SMILES AT MILES"

A SALES FACTOR!

"Guaranteed PUNCTURE-PROOF—yet Pneumatic!"

ROADSIDE DELAYS AND dilemmas put away and running cost kept under control. LEE Pneumatic Tires defeat trouble and expense by preventing Puncture and Blow-out. Most important tire advance since invention of pneumatic tube. Puncture-proof construction fully described in literature "I."

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Manufacturers of Rubber Goods since 1883
CONSHOHOCKEN, PA.

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LEE Tires
PNEUMATIC NON-SKID PUNCTURE-PROOF



Zig-Zag Tread
The Scientific Non-Skid

PUNCTURE PROOF
MILEAGE FIRST
GUARANTEED LEE PNEUMATIC TIRE

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Radically Different—The Sensation of 1914

Peco Spark Plugs are constructed on an entirely new principle which adapts them perfectly to either Two-Point or Single Ignition. They eliminate waste by burning all the gas.

"More Power to You"

—also greater economy—will come with their use. As there is no other Plug of the kind in existence, dealers are fast lining up. **Write for particulars.**

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2 to 24 Cubic Feet Free Air per Minute



"FREE AIR" ALWAYS ON TAP

Your customers expect it—your prospective customers deal where they can get it—then why not put in a

Curtis Common Sense Garage Pump

It will furnish all the air you need—costs little to install and operate—and its design is the result of our twenty years' compressor manufacturing experience.

Write us for prices.

Curtis Pneumatic Machinery Company

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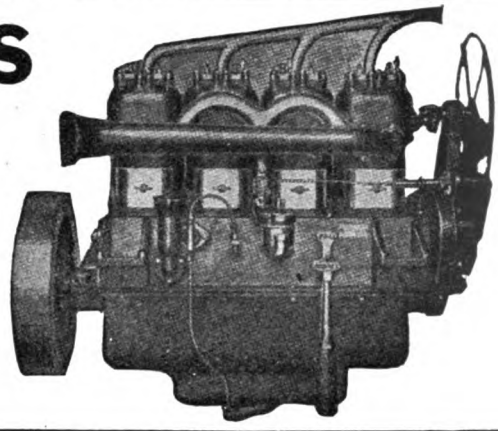
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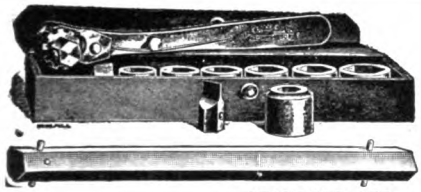
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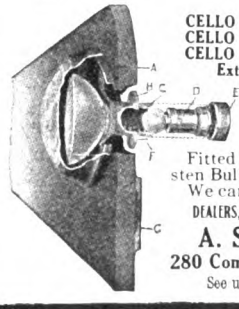
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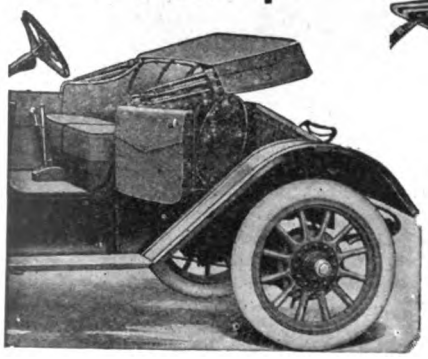
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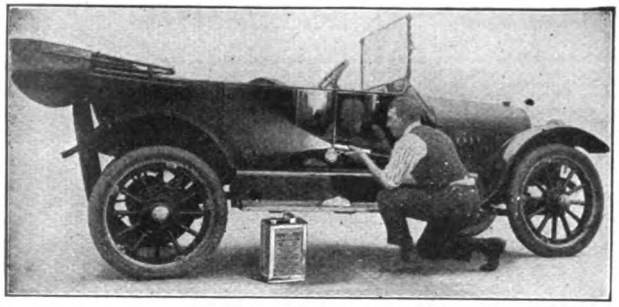
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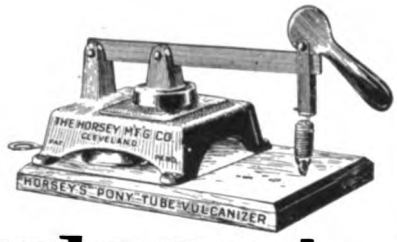


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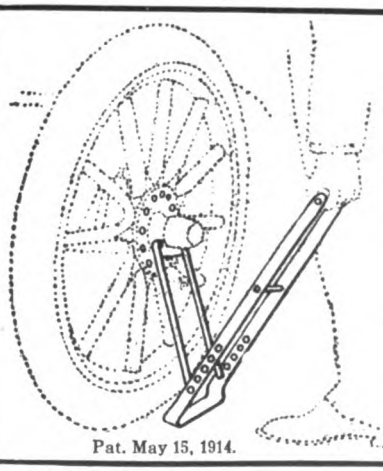


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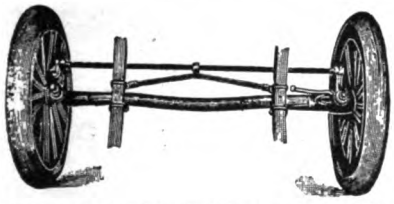
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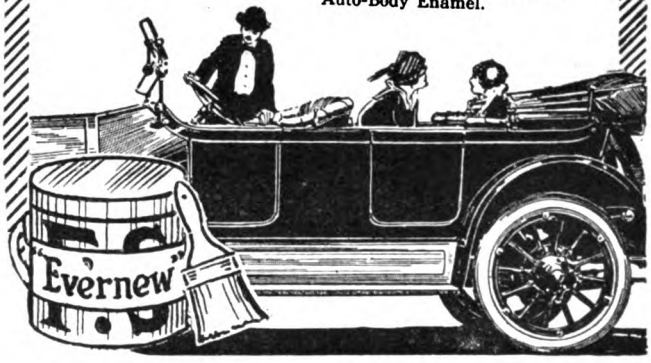
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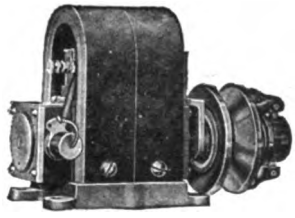
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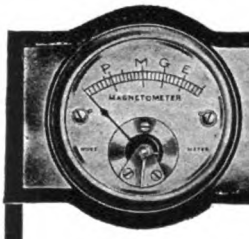
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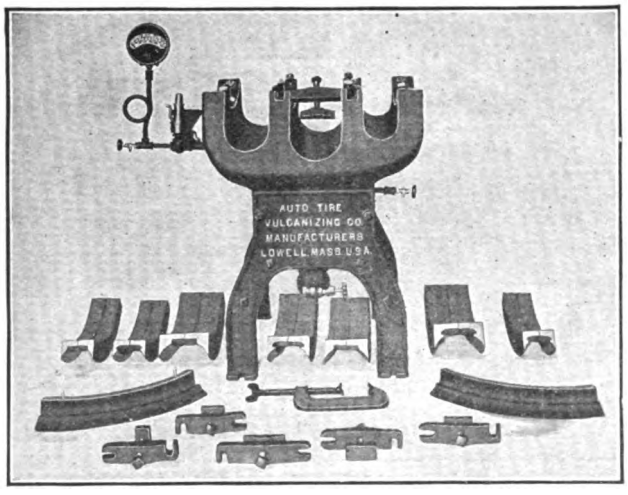
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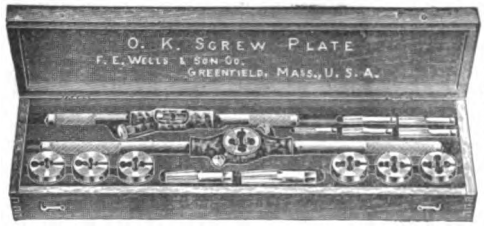
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A JOURNAL OF PRACTICAL MOTORING

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VOL. XIX, No. 1. NEW YORK, MARCH, 1915. PRICE { 10c PER COPY / $1.00 PER YEAR

AUTOMOBILE LUBRICATION.

More About Testing—High Viscosity and Its Relation to Friction.

BY SYDNEY F. WALKER, M. E.

While on the subject of testing, it may be as well to refer to testing machines that are on the market. Practically all of them are based upon the imitation, as closely as can be arranged, of the conditions ruling between the surfaces that are to be lubricated. It is the reproduction of the exact conditions ruling in practice that is always so difficult in the testing laboratory, and that is one reason why laboratory tests are so often received with suspicion. It is so very difficult to get all the factors into the equation. In one form of testing machine, two surfaces are kept running over each other. It is merely a variation in detail, for one surface to be stationary and the other moving; or for both to be moving. A given oil is fed to the lower surface, or at any rate caused to pass between the surfaces, at a given rate. With some tests, a given quantity of oil is fed to the space between the two surfaces, and the indications are watched. Arrangements are usually made, enabling heat to be applied. Up to the temperature of superheated steam, say 600°F. or 650°F., there is no difficulty about this; and so far as is known at present, those would be higher temperatures than the lubricants would be exposed to. It has been estimated by one engineer who has given very great attention to the subject, that the temperature of the film of

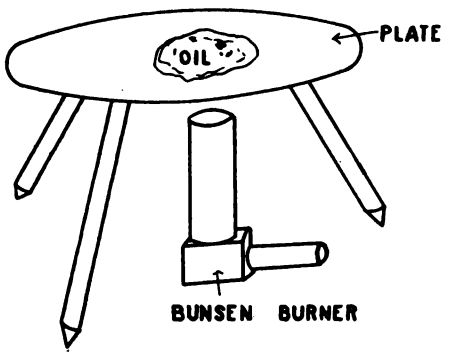


Fig. 14—Diagrammatic sketch of suggested method of testing a lubricant by heat. A measured quantity of the lubricant is to be allowed to fall on the upper side of the plate, and the under side is to be heated by a Bunsen burner.

oil between the piston rings and the cylinder walls, in an internal combustion engine, does not exceed 300°F.; and is usually much less than that.

In the testing machines referred to above, care is taken that the oil can flow to every part of the surfaces that are rubbing together. It is also arranged that the speed at which the surfaces rub together, can be varied within wide limits, say from 50 revolutions up to 3,000 revolutions per minute. Pencils working over revolving drums carrying paper, divided up into squares, in the usual way, trace out the pressure between the two surfaces in contact, and the temperature of the surfaces. When only a certain small quantity of the oil to be tested is placed between the rubbing surfaces, the temperature and friction rise very slowly at first, and then apparently, according to the makers of the machine, it rises very rapidly. They claim to be able to discover the comparative values of different oils, at

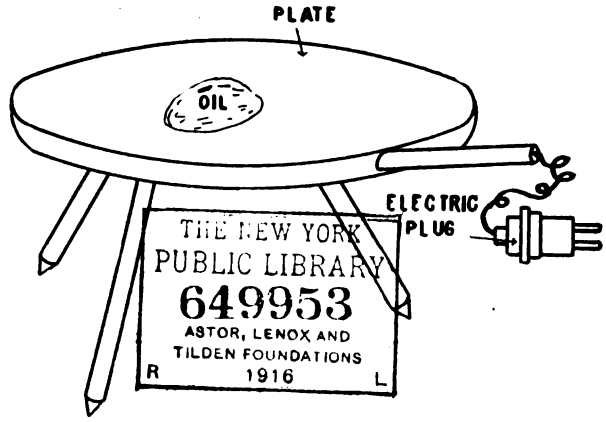


Fig. 15—Diagrammatic sketch of an electrically heated plate for testing oils. The arrangement is similar to that for heating with a Bunsen burner, but the heat is applied by an electric current flowing in a heating element, buried under the plate.

different speeds, and at different temperatures; by the time that elapses before the breakdown occurs. Fig. 16, shows a curve that illustrates this. It will be seen that in the case shown, the temperature rises very slowly, up to a critical figure represented by about 46,000 revolutions; and then it rises very suddenly. Similarly in Fig. 17, which is the record of the friction, the resistance set up to motion between the two surfaces; it will be noticed that it rises very quickly at first, before the oil has time to penetrate between the discs; then it falls to a low figure and rises very slowly, by steps, until the same critical time as in the first figure, when it rises very quickly.

The idea underlying this is, that a given lubricant has a certain staying power, so to speak; that a given quantity tested in this particular machine will break down after say 46,000 revolutions, and the surfaces in contact, if allowed to continue to rub over each other, would very soon seize. Another set of curves is shown in Figs. 18 and 19, where it will be seen that the rise was very gradual, until 27,000 revolutions had been made, when the rise in temperature became more rapid; and in the case of the frictional resistance, the sharp rise occurred at about 30,000 revolutions. It will be seen that the rise in the pressure is very sudden after the critical time.

These tests are after all only comparative; and as in so many other cases, it is only by long experience of different oils, passed through the machine, under exactly the same conditions, the oils being

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followed to their actual work in engines, that really accurate information can be obtained. What the present writer wishes to bring out is that in every repair shop, and in every manufactory, it should be quite possible to rig up apparatus of a simple character, to which oils offered for lubrication might be submitted; and from which a good general knowledge of what the oil is likely to do under working conditions would be obtained. Of course each oil should be followed; and a record kept of the tests made upon it. To a man who is constantly working with the oils, passing them continuously through his hands, the record will be very efficiently kept in his own head. He will be able to tell very quickly, when he exposes a small quantity upon the heated plate, whether it is worth while taking further tests.

It should not be a difficult matter again to rig up a pair of discs revolving one upon the other to which a measured quantity of oil could be supplied, the system being set in motion say by a small electric motor, and either the time taken before heat appears or the motor set to come to rest after spinning the apparatus for a certain time. Fig. 20 is a rough diagram of the suggested arrangement. As is well known, automatically controlled electrical apparatus are very common indeed, particularly in America. Some of the apparatus that have been worked out in America, are almost human in the way in which they operate, and the writer's idea is that it would be quite simple to arrange for the motor to make a certain number of revolutions, and then to stop.

Viscosity.

The term "viscosity" is very difficult to define. It is perhaps best described as the opposite to fluidity. The more viscous a fluid is, the less freely does it flow. Pure water for instance flows freely, and at

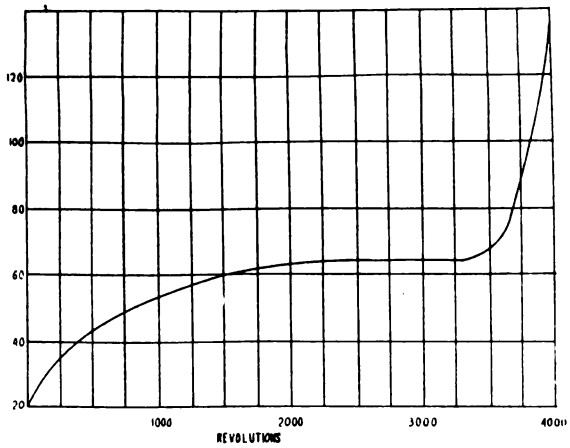


Fig. 16—Curve showing increase of temperature between two surfaces in a testing machine, after different total numbers of revolutions. The curve illustrates the breakdown of the lubricant.

the other end of the scale—pitch—though it is looked upon as a solid, does flow when exposed to pressure, though at a very slow rate. Between these two extremes are a very wide range of fluids.

The viscosity has an important bearing upon the efficiency of a lubricant. High viscosity means a certain likeness to treacle, a tendency to hang about the bearings, and the surfaces to be lubricated; and a highly viscous lubricant will set up friction by itself. For heavy slow running machinery, solid fats, which are of course very viscous, are employed; but it is not the fat in the solid state which performs the office of lubricant, it is only when the heat that has been liberated in the bearing, or between the surfaces to be lubricated, has caused a certain quantity of the solid fat to be formed into a liquid that it performs its office. The surfaces requiring lubrication in a motor car, with the exception of some of the gear wheels, move over each other at high speeds, and therefore a highly viscous fluid would be quite out of place. On the other hand, a certain amount of viscosity is of great value in the lubrication of the cylinder.

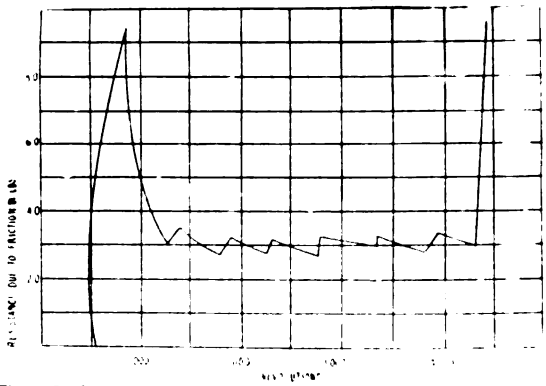


Fig. 17—Curve showing the variation in frictional resistance between two surfaces in a testing machine, after varying total numbers of revolutions. As will be seen, the frictional resistance rises very much at first, then falls to a certain figure at which it is nearly constant, till a certain number of revolutions have taken place, when it rises very rapidly. This also marks the breakdown of the lubricant.

Vertically placed cylinders, as all motor cars are now fitted with, are not subject to the same amount of wear as horizontally fixed cylinders. One great trouble with horizontal cylinders is the weight of the piston bearing upon the lower half of the cylinder wall, gradually wears it away, and wears its own piston rings away. There is nothing like this in the vertical cylinder, but there is always the possibility of some inequality, either in the machining, or more likely in the material, of which the cylinder, or the piston rings are composed. A little extra hardness, or a little extra softness, either in some part of the cylinder walls or in some part of one or more of the piston rings, will give rise to wear at those points; and the wear will unfortunately tend to increase. Where this occurs, a comparatively thick, viscous lubricant is of great service in filling up the gap.

It follows of course that if wear occurs, either in the piston rings, or in the cylinder walls, there will be a leakage of the hot gases past the piston, with the result that the efficiency of the engine will be reduced, the quantity of gasoline used per mile will be increased, and the lubricant in the crank chamber will be subject to the deleterious effect produced by the hot gases. Even the leakage past the piston of a small quantity of the hot gases into the crank chamber, occurring as it does say 2,000 times a minute, will have a seriously deteriorating effect upon the liquid lubricant in the crank chamber. The crank chamber itself will necessarily be hotter than it otherwise would be, the hot gases will act chemically upon the lubricant, carbon will probably be deposited, and there will be other troubles. It has been shown therefore by practical experience, that too thin an oil in the crank chamber, and for lubri-

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cating the piston is not good, and too thick, too viscous a lubricant would also be out of place. It is the happy means apparently which gives the best results, and this can only be found by experience. But when once an oil has been found, whose viscosity answers with a particular engine, under practically all conditions of service; it is not difficult to test the viscosity of other oils that are submitted for purchase.

How the Viscosity is Tested.

It should be mentioned, before describing the apparatus employed, that viscosity varies very much with the temperature. As the temperature rises, the viscosity lowers, and with higher and higher temperatures, the viscosity is lowered more and more rapidly. In testing the viscosity of any oil, therefore, it is important that the conditions of temperature should be the same. The method of testing is by measuring the rate at which the oil under test flows, and this is accomplished by filling a vessel of known volume, maintaining the temperature of the oil in the vessel at a given standard figure, and allowing the oil to flow out through a small hole in the bottom of the vessel, the hole also being of standard size. The standard quantity is usually 50 cubic centimeters (say 7¾ cubic inches), and rape oil, maintained at a temperature of 60° F., is the standard, with which other oils are compared. The 50 cubic centimeters of rape oil flows out through the Redwood viscometer, which is shown diagrammatically in Fig. 21, in 535 seconds. Oils that are more fluid than rape, which are less viscous, flow out in a smaller time, while more viscous oils take longer. The writer suggests that if a viscometer is employed to test oils, they should not only be tested at the standard temperature of

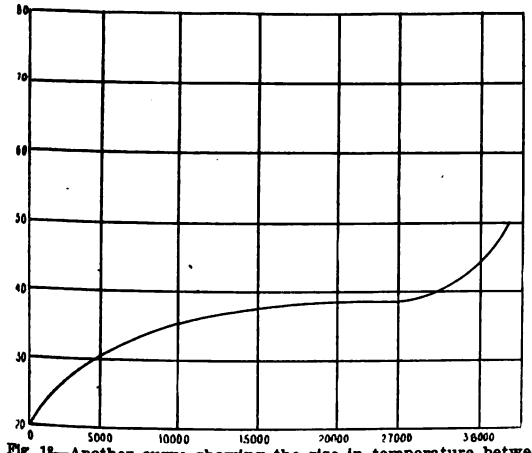


Fig. 18—Another curve showing the rise in temperature between two metal surfaces in a testing machine.

60°, but at increasing temperatures up to say 300° F. at least. This of course demands special apparatus, and special means of heating the vessel, and of maintaining it at the given temperatures during the whole of the test. He suggests this, because it has been found that the viscosity of different oils varies as their temperature is raised. With some oils the viscosity falls very much more rapidly than with the others. The important point to know is, of course, how the oil will behave, when at the temperature to which it will be exposed.

In the Redwood, and practically all viscometers, there is a vessel that will contain the measured quantity, 50 cubic centimeters, of the oil to be tested, when the oil is at a certain level in the vessel. The oil vessel is carried inside another vessel through which hot water, or any other liquid can be caused to flow, so that the temperature of the oil whose viscosity is to be measured, can be maintained constant during the whole of the test. In the bottom of the vessel containing the oil, is the small hole, closed till the test commences by some simple valve

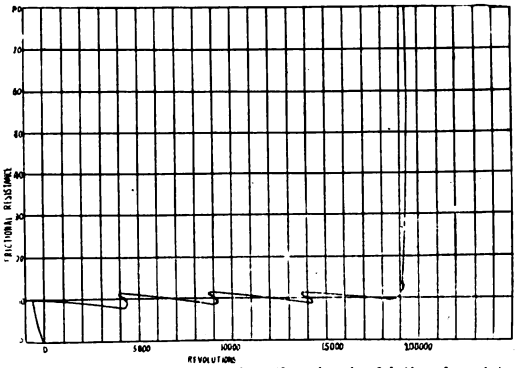


Fig. 19—Another curve showing the rise in frictional resistance between two metal surfaces in a testing machine.

that can be opened from outside, such as a ball attached to a thin rod. Underneath the viscometer a flask is usually placed, holding exactly the same quantity of the oil as the oil vessel. Arrangements are made for thermometers to be inserted in the oil vessel, and in the heating baths. The oil to be tested is heated to 60° F. before placing it in the viscometer.

A rough and ready method of testing the viscosity of oils is, by allowing a single drop of the oil to fall upon an inclined plane, and measuring the time required for it to run down over a certain measured distance. Of course there are a number of what mathematicians call independent variables in this matter; and in order that the test should be of any value, care must be taken to eliminate them as far as possible. The board employed for instance should always be the same, and it should be in exactly the same condition; and at exactly the same inclination. Further, for the test at ordinary temperatures, care should be taken that the temperature of the oil itself, and of the atmosphere in the neighborhood of the test board, and of the board itself should be the same. A comparatively viscous oil for instance, if tested on a hot day in summer, in nearly every part of America, would give a very different result, from the same oil, tested at the same place, say in the depth of winter. Again a very different result would be obtained from the same oil, at the same temperatures, with the board having rather a sharp inclination with the horizontal, than with one having a very slight inclination. Further, if the board is rough or dirty, it is quite evident that the drop of oil would not be able to run down it at the same rate as if it was smooth. Further, if means had been taken to reduce the temperature of the oil in the bottle, or the can, from which the test drop is being taken, to say 60° F. or 70° F.; if the board is exposed to the sun's rays, even in winter, or if it is in a warm part of the works, the drop of oil will lose a considerable portion of its viscosity. And perhaps more difficult than all is the measurement of the drop itself. The day has gone by when doc-

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tors and chemists used to send out medicine, with instructions that so many drops were to be taken, say on a piece of sugar at certain times. Even now, however, a good many patent medicines are sold, in which the instructions for taking are in that form. In the days when drugs of that kind were measured in drops, chemists, at any rate, and assistants, acquired a considerable amount of skill in measuring the drop.

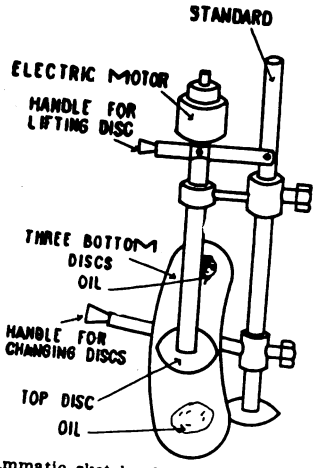


Fig. 20—Diagrammatic sketch of a suggested electrically driven oil testing apparatus. There are two discs, one above the other, the top one moving over the bottom one. The top one is driven by the electric motor shown.

A little examination of the question will show that the size of the drop will depend upon a good many things; upon the form of the lip of the bottle, upon the bottle itself, upon the inclination at which it is held, upon the quantity of oil in the bottle, and so on. But again, for rough and ready tests, it is not very difficult to reduce a large number of these difficulties to very low terms. It would not be difficult for instance to have a small bottle made with a special form of lip and holding a certain definite quantity, and to provide a sort of cradle, in which the bottle would be held, with means to tip it at a certain definite angle. The cradle and bottle might be fixed over the board.

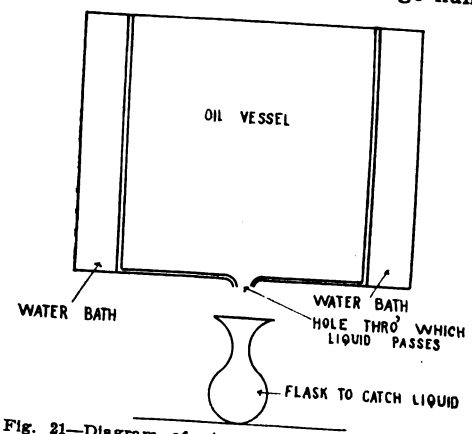


Fig. 21—Diagram of viscometer, Redwood pattern.

Given a board whose surface is always of a certain smoothness, whose surface is always perfectly clean, always at the same angle, always at a certain given temperature or nearly so, any man who is constantly testing oils would be able to form a very good idea of the viscosity of different samples of oil passing through his hands, by filling the test bottle, allowing a drop to fall from it on to the board, and watching the time it took to run down. With the writer's own experience in making tests with different apparatus, his view would be, that after a little time a man who was continually making these tests would know almost as soon as the drop of oil had fallen whether it was of the viscosity required or not.

(To be continued.)

THE REPAIR SHOP.

The Question of Replaced Parts or Making the Old One Answer.

BY JAMES F. HOBART, M. E.

Which shall the garage man do, repair the old broken part or send for a new one from the factory? Which is the best for the car owner, the garage man and for all concerned? There even is an ethical side of the question which should be considered. But the question is a most difficult one and cannot be answered the same for all cars, for all times, and for all shops.

When a man has an accident and smashes up his car within a short distance of the factory where the car was made, it would be worse than foolish for the repair man to make all the parts which are broken. But were the car to be used up in the mountains of Montana, thousands of miles from its shop in the East, with freight amounting to 50 per cent. of the cost price at factory, then it is time to consider the making of parts instead of sending to the factory for them.

To come right down to bare treads, it is the duty of each and every repair man to decide impartially what parts he will make, and which he will order from the factory. It is now a growing tendency, along populous routes, for certain garages to cater to certain makes of cars. To concentrate, so to speak, all their energy and all their enterprise, upon one or two makes of cars; to carry in stock as many parts of that car as possible, and to make and maintain tools and jigs for making parts of those cars to the exclusion of others. In remote locations of course this cannot be done, and in such places "repairs" are the rule, while "renewals" become the exceptions.

The garage man must therefore decide for himself as to whether he will—make or order. But let him, once for all, do so with due regard to honesty and fairness. Let him not decide to repair because he can make more money thereby, to the despair of the car owner. Let the garage man decide in all fairness to the car owner, and discuss the matter with him, stating prices and time for obtaining new parts.

Of course when time is limited then repairs go and the owner expects to pay a little more for the repairs in view of the time saved thereby. But here is where shop ethics come in. It is the duty of the repair man who desires to make new parts, to make and maintain the required jigs; tools, attachments and fixtures whereby parts may be manufactured at a reasonable cost, considerably below what it would cost to "make" a single part in a shop not fitted for such work.

To put the matter in another shape, the repair

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man should put a certain portion of time and material into make up jigs for turning out repair parts. Instead of charging the customer, as many repair shops do, with "time and material" for the jigs, tools and fixtures, the repair man should charge up a certain portion of the cost thereof to "tools and jigs" and thus add to the shop equipment in a manner fair to himself and to his customer.

No sane repair man would think of charging the cost of an acetylene welding apparatus to the first customer who brought in a water jacket to be repaired, but wouldn't you think of charging the entire cost of a jig for machining a new cylinder, should you make up such a jig, even with the hope of machining many more cylinders upon the same jig? It would be human nature to do so, but it is not justice to you or to your customer. Too much of that kind of work is done, but it is not honest or ethical. Put a portion of tool and jig cost at least into the shop equipment column, and in a short time you will be so equipped with tools and jigs that you can make "repairs" as cheap or even cheaper than you can obtain "renewals" from the home factory or the nearest distributing center.

You can't afford to make engine parts in a garage unless you are willing to invest considerable money in jigs and fixtures, as noted in a preceding paragraph. And furthermore, you can't put all these necessary things in a small shop; therefore, if you decide to go into making repairs then you must branch out, put in a large shop equipment and take means to get business enough to pay for so doing.

A Manufacturing Business.

The making of automobile repair parts is going to run you right into a small manufacturing business—that's just what it will amount to. To be sure, you can't turn out a crankshaft quite as cheaply or as quickly as in lots of 100 or 500, but you should have the tools and jigs all ready if you set out to do that kind of work on crankshafts no matter in what sized lots they come along.

And as matters go on, you will find yourself up against several vital and interesting problems which must be worked out if you stay in business. You will find that your shop has an "overhead" and that overhead won't be a loft or an attic, either. It will be a steady outgo for tools and jigs, and for interest on the amount invested, also for insurance, rent, taxes and depreciation. In short, you will find your shop so covered with fixed charges which go on all the time, whether you do any business or not, that you are obliged to get out and hustle for business in order to live to hustle.

And it is this sort of thing which will drive you into specializing in the repairs for one or two makes of car. You find that you cannot afford to carry castings and unmachined parts for all cars, but that you can do so for one or two cars, and make a nice profit, if you can only get business enough on those few makes of car. And right here you become a "repair specialist" and have a nice business started, when along comes another chap and opens a shop right besides yours and starts the automobile repair business also. But don't get discouraged at this. Go right ahead with your specialties and let the newcomer take the rest of the work which comes along. If he is wise, he will soon do as you did and settle down to the repair of one or two makes of car other than those you attend to.

If you both attend to business, you will find that you are doing even better than before the newcomer came along, and he is doing well also. And right here is a fine chance for you to increase your income and do a still greater business than before. It is in this way: Buy out your neighbor, or go into partnership with him. There are two sets of overhead expenses which can be lessened a bit by having the two shops under one management. In the buying of material, the cost of so doing, as far as clerical expense is concerned, may be cut in half, and in the obtaining of new business the cost may be lessened by one-half also for the men who obtain business, for you can handle the four makes of car as well as the two makes which each shop now caters to.

And in the matter of shop tools and equipment —there is a good deal which must be common to both places, which can be dispensed with when both are under one management. And some of the workmen will be able to do similar work for both shops without being too busy with either, thus making a good saving in that direction. In fact, the consolidation of the two shops yields to their owners most of the benefits, though on a somewhat smaller scale, as those derived from the merging of two manufacturing businesses into a single management —a young "trust" in fact. Now I am not by any means advocating the forming of a repair trust in automobiles, but I am merely pointing out the benefits to be derived from going into the repair business in a businesslike way.

You want to go into the automobile repair business as though you were going to make a business of it. In fact, go to the work so you can manufacture repairs. You don't want to fool yourself that you can put up a 10x16 foot shack with a portable forge and a drilling machine and then set up as a first class automobile repair shop. With such an outfit you can make repairs, but you can't manufacture them, and that is where the profit comes from in the automobile repair business—from manufacturing repairs—not from "making" them.

Bear this in mind when you start the automobile repair shop and plan things right through so you can do the business profitably when you get it. And when you are fixed to manufacture repairs, and have the know-how to do so, there is not the least doubt but what you will get the business—if you go after it.

Small Shop Profitable—Sometimes.

Many a small shop has proved profitable; many another small shop has failed and it went under so quickly that nobody even heard the splash. I know of a very large and successful repair garage which was started with no tools other than a breast drill, and the other small tools usually found in a machinist's tool box. The man who started this shop had the know-how and was willing to work and work hard. He did, and now he has a fine shop, manufactures repairs and has also manufactured several good automobiles. No, he didn't "make" them—they were "manufactured" in the truest sense of the word. He could turn out other cars to advantage if the shop had time, but it is so busy with profitable repairs that the owner does not care to go into car manufacturing to any extent save as a means for filling any gaps which may come along during dull times.

This shop is not a small one by any means. It got over that several years ago, and now covers

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considerable territory, and even has a little foundry. One of those affairs built into a steel cylinder, placed horizontally, and fed with gas. After the metal has melted, either iron or brass, you turn the melter sidewise on its trunnions and pour out the molten metal almost the same as you would from a big foundry ladle with geared hand wheel attached. You can operate one of these melters with artificial, natural or "producer" gas, the latter kind being easily made from coal and from the cheapest kind of coal at that.

With a producer, you can make gas to run a cupola, also for operating your own and your neighbor's gas engine. You can also profitably attach another gas engine to the producer and make electric light for your own and neighbors' shops, residences and stores. In fact, you can soon work up a nice little business in that direction in connection with your "manufacturing garage."

Furthermore, when you get the home shop well started on repairs for a couple of good standard machines, then try the matter of starting small shops in adjacent places a few miles away. You can start very small places and supply them with parts made in your central shop, which is only a short distance away by automobile or by parcels post and telephone. Work up a half dozen places in that way, and you can have your specialty repairs started toward each or any of those subsidiary shops before the damaged automobile has fairly been taken down for repair.

Try this scheme, you man who is "looking for a good thing," and I don't believe you will find a better one if you look, and keep looking from January 1st to December 31st. But remember one thing: You can't make money by starting a repair garage, manufacturing your own repairs, and then expect the business to run itself and make money for you. It will require the hardest kind of continual work to pull off a stunt of this kind, and it will require a lot of experience and know-how as well. But if you have the latter, the former will come along every day of the year and you can have a nice business for the work of building it up.

Rosin Radiator Repairs.

On page 35 of the January issue there is a little paragraph to the effect that leaks in pipes or tanks may be temporarily repaired by pouring melted rosin over the crack, reinforcing the rosin if necessary with a bit of leather placed in, under or over the rosin, as required by conditions. I have used this method for a long time, and have worked out several modifications of it which seem to improve the original proposition very much. As gasoline soon cuts its way through rosin, it is better to fill the crack with common yellow laundry soap before applying the rosin. A slight thickness of soap may also be spread over the crack, and allowed to extend a short distance to either side. This will prevent the gasoline from eating its way through the rosin, which may be quickly and nicely put in place by means of an ordinary soldering copper, using the rosin same as you would solder. In fact, "soldering" the crack, over the soap, with rosin.

But there is always danger that rosin will break open as the car receives strains due to traveling, and should the rosin crack open, it will fail to prevent leakage. To get rid of this trouble, I mix a quantity of oil with the rosin. Almost any mineral oil will answer, except coal oil, which will do the trick, but which is not as good as lard or lubricating oils.

Melt the rosin in a can or in a ladle, and stir in about one-half its volume of oil. Stir the mixture well and place one side to cool. You had better keep it in a dish which can be covered to exclude dust. If you make this mixture about as soft as beeswax, it can be "soldered" upon a crack, and will be found so tough and elastic that it will yield to motion of the car without cracking in the least.

If you make the mixture thinner, you will have what is known in paper mills as "lagging wax" and is used for fastening strips of felt or canvas upon pulley faces when it is necessary to increase the pulley diameter very slightly in order that the web of paper may be drawn through the paper machine at exactly the right velocity.

Lagging wax also forms a fine dressing for damaged fingers. Just daub a bit on a rag, wind it around the finger and the bandage will stay in place until "the cows come home" and the wax proves very soothing and healing to most flesh. Thin this stuff still more with oil, and you have a pretty good substitute for sticky fly paper. You won't catch many flies with it this time of the year, but in summer, thinned lagging wax, spread upon pieces of board, has done duty many a year before "tanglefoot" fly paper became a household necessity. Try lagging wax. It's great. It's fine also for chucking a small piece on the face plate of a lathe.

MAKING SMALL BEARINGS.

How it is Done by Means of Crucible, Lathe and Drill Press.

From J. N. Bagley, Nebraska.—Scarcely a day goes by but we need in the shop a piece of brass or bronze for making some machine bearing. To carry

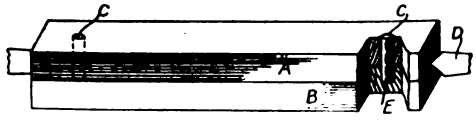


Fig. 1.

a stock of bronze involves quite a little capital, although many times a cheaper bearing material will answer the purpose. Every shop having a turning lathe and drill press is equipped for making small bearings and many times a bearing that is worn can thus be replaced with a new one as quickly as the old one can be repaired and with far better results. Of course, this home-made bearing metal is not supposed to be as good as the special non-grain on the market, but it is a good metal for ordinary work, such as lawn-mowers, corn shellers, threshing machines and similar machines. For automobile bearings, such as spring toggles, steering knuckles, etc., it will answer very well. Such parts as the wrist-pin bushing and other parts requiring great speed and strain, should be made of the very best bearing bronze.

One should always save the old bronze boxings taken from machinery and not sell to junk peddlers, as the price one gets for it is not the value of a single repair job one can get by turning down an old bearing. This old metal can be melted and molded into round stock which can be made into almost any shape desired with the aid of an inex-

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pensive mold and an ordinary forge fire. The fire should be made deep and well lighted after which the crucible should be heated slowly until the metal begins to melt when piece by piece may be added until the required amount is melted. There are a number of different crucibles on the market. Some are of black lead, others of graphite, and some are of sand. They are not expensive, and one could have a half dozen different sizes and use only the size that would come nearest answering the requirements. When buying the crucible it is a good plan to get a lid for each, as by covering, much heat is



Fig. 2.

held in which otherwise would radiate out at the top, especially if the crucible is a trifle large. Then next in order will be a pair of tongs to fit each of the crucibles, for it is a little awkward to handle them without tongs made to fit, and besides when the metal is ready to pour, it should be done at once instead of looking about for something to handle the crucible with. The metal should be poured at once and not in a small stringy stream, as it will cool sufficiently to stop flowing before it has flowed over the entire mold. The gate above the mold should be large enough to force the metal into all the parts of the mold.

Next in order will be to know the size of the stock to make the finished bearing. Now with a couple of pieces of white pine fastened together with dowel pins, as shown at C, in Fig. 1, we will proceed to make the pattern. The blocks, A B, should be enough longer than the stock is wanted to allow for an impression in the mold to carry the core, as it is better to core the stock than to make it solid, as it takes a little less time to machine it. The dowel pins should not extend entirely through the second piece as shown at E, and should be arranged so that in case the top half of the pattern be lifted off, it could be replaced with the ends the

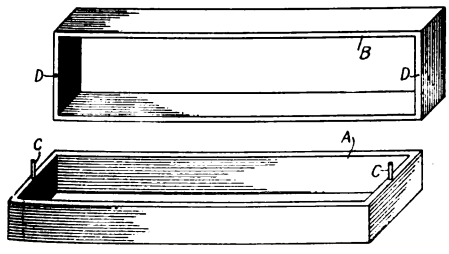


Fig. 3.

same as before. The pins should be made fast in half A, and slightly looser in B, so that when the part A is removed the pins will remain in it. Now by placing the entire piece in the lathe and the outer end supported by the tail stock center, as at D, we are ready to turn it to the required size.

In Fig. 2 we have the finished patterns so far as the turning is concerned. The parts A and B are held still by the pins C. The projection at either end D, is left the size we want the hole cored through the stock. Of course this can be arranged to meet requirements while making the pattern.

Now that we have the pattern turned, we will give it a coat of hot beeswax, so that the mold material will not stick to it when we are making the mold. These are best handled not too long; say, anywhere from 6 to 10 inches works very well, and in case the bar cast is quite large it makes quite a little metal to melt in a forge, although if a well-banked fire is made it will be no trouble. Now in making the core or the pattern for the core, it should be at each end exactly the same as the ends of the pattern so that in supporting it in the mold it will fit exactly where the pattern comes out. In case the core is to be quite a little larger in the stock, the core could be made larger except the ends D, and this would save a little time in making an extra pattern for a piece of stock with a larger hole, and yet at the same time have the same outside diameter.

Next in order will be a box for a flask. This can be made of thin lumber and should be roomy, especially if sand be used for molding, or plaster of paris. I would recommend the latter as many casts can be made without destroying the mold unless some accident befalls it. The writer has made as high as fifty casts of a single piece and yet had a very good mold. We will need in this case two separate boxes, as we will call them, with neither top nor bottom, as shown at A, B, in Fig. 3, and into each end of

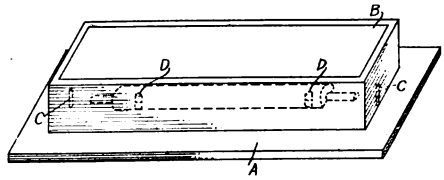


Fig. 4.

the "drag" or bottom half, place pins C, to allow the cope or top to be replaced exactly each time.

These parts should be well fastened at the corners to prevent them racking when handled. It is not a bad idea to place a few screws from the outside of the cope and drag, allowing them to stick through to hold the material that the mold is made of, especially if it be plaster of paris, as in constant use it wlil slip out of the frame, and when it does not have protection at the corners, it will chip away very easily.

We are now ready to make the mold. In the first place it will be necessary to obtain a board, A, Fig. 4, to lay the half of the pattern on while making the lower half of the mold. Now make small holes at D, in the board for the pins in the pattern to set in while making the half mold. Then when placing the half of the flask over the pattern on the board we find there are a couple of pins in it that hold it up and it is necessary to make holes to allow it to rest flat on the board as at C. Now we have the pattern securely fastened by the pins on the board A, the half of the flask B resting squarely on the board. Mix up a quantity of plaster of paris which will fill the space and is as thick, will push well into shape. It should not be thin and watery but should have plenty of body. Fill the box, being careful to force it well into all the cracks and corners and around the pattern. This will complete all that can be done until it sets and dries, save stroking of the surface which should be done as soon as finished, and at this time it would be well to take a sharp instrument and mark on the top the size and such other information as will be useful later on.

After leaving it in this manner for a day, if pos-

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sible, turn it over and remove the board from the pegs and we have it as shown in Fig. 5. The lower half of the pattern is in the "cope." Over this place the remaining half of the pattern and we are ready for the other half of the mold, except that some powder should be used to prevent the parts sticking together and I have found that powdered graphite does very well and can be found in almost every shop. Sprinkle this or rather dust it over the sur-

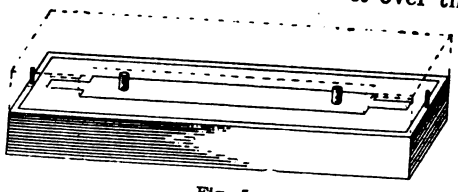


Fig. 5.

face of the already finished part before filling, after which a second batch of mortar can be mixed and the flask filled. Set away to dry and harden. It should be thoroughly dry before attempting to mold in it. As soon as it is dry, a gate with a sort of a funnel entrance should be made about center way of the top half of the flask. And over the top, it is a good plan to drill a few very fine holes to allow of the air passing out as the molten metal passes in. The object of having the funnel shaped entrance for the metal is to allow of the metal to be dumped rather than poured and to give weight to force the metal well into all the little crevices of the mold.

We will suppose all is dry and in readiness for the first cast. The next thing in order will be to place the core in position as shown at A, Fig. 6. As

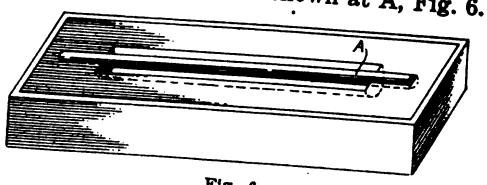


Fig. 6.

soon as the core is in place we are ready to place the top of the flask in position and clamp down or lay heavy weights at either end to prevent it raising or allowing the metal to crawl out around the edges. When the cast is made and cooled the "cope" may be removed carefully and the cast stock lifted from the "drag" or bottom half. Now remove the core with a chisel or by punching it to pieces with some instrument and the stock is ready to use.

These cores can be made of the same material as the mold or they can be bought from a foundry and broken to the proper length. In Fig. 7 we have a drawing of a finished cast of stock as it will appear after it has been removed from the mold and the core knocked out. In Fig. 8 we show home-made core box. A hole is made through the two blocks which are pinned together as shown at D. The top half A, can be lifted from the bottom half B, as soon as the core is dry. The hole in the core box C, will be the size of the finished core when it is removed from the box.

In case some special size or shape is wanted it can be made up at odd times and the time will not be lost. This need not be confined to the casting of brass alone as it works equally well for casting babbitt stock for duplicating die cast boxes for connecting rods of many automobiles as well as for the boxings of gasoline engines.

If one cares to make small brass castings oth than those just mentioned it would be well to ord from some foundry a bushel or so of good moldin sand and have it on hand. Many times a small bras casting can be made which would take weeks to g from the factory. Likewise, a small casting of iro or an engine or a cream separator can be duplicate in brass and the customer continues using the ma chine, where if he had to wait for one to arrive fron the factory it would take many days and might mea many dollars to him.

I remember how quite well pleased a customer was when he came to a shop with a small broken casting and he could not get repair for it, as he had purchased the machine from a small mail order concern that had gone out of business. He was anxious for me to fix it up in some manner. I told him if he would spend his money at home next time I would try and help him out of his trouble, although I would be unable to get it for some little time. He was satisfied with any sort of a promise as the machine had cost him quite a sum. When he had gone I set about to solder the broken parts for a pattern and in course of a couple of hours I had the

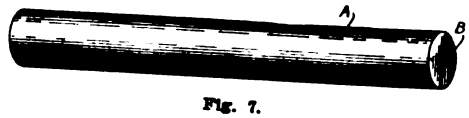


Fig. 7.

part cast in brass. I machined and polished it up and it looked even better than the piece he had brought to me. He came in the next morning and when the piece was delivered and I told him the bill would be two dollars he gave me an extra one, which indicated he was pleased with the job. Since that time I have made him many castings of brass for his neighbors.

One day he wanted me to make a casting for a hay bailer. "Now, Mark," I said, "you are imposing on good nature and if I have to do anything like that you can go back to the mail order house." He laughed but told me he guessed my suggestion was a little strong. The large casting we welded with the welding machine and again he was surprised at

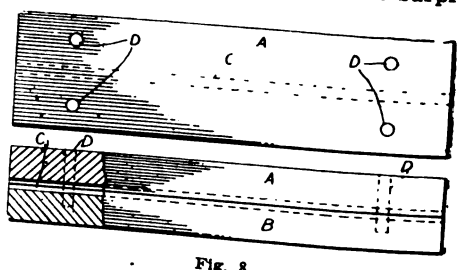


Fig. 8.

the welding of cast iron. As he paid the bill he said, "I 'low as how you fellers can fix most anything; thought I had you stumped this mornin'."

Inflation Dangers.

Over-inflation causes injurious vibration of the whole car. Under-inflation hastens breakdown, but gives easy riding. Heavy cars wear the treads down rapidly, light cars the sides. Drive wheels wear the tires one-fifth faster than front tires. There is no certain mileage in any tire. It's the driver's care that counts.

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BATTERY CHARGING.

Another Rectifying Device for an Alternating Current Electrical Supply.

Simple forms of rectifying devices have already been published in this magazine and we have had scores of letters either approving or criticizing them. Plainly and conclusively, it will pay no one to either purchase or make a recharger for his own use only, and unless the garage or repair shop workman, has plenty of time and constructive ability on his hands, he would better purchase a rectifier than attempt to build one. However, here is a description of a simple rectifying device taken from the Autocar of England, which is given for what it

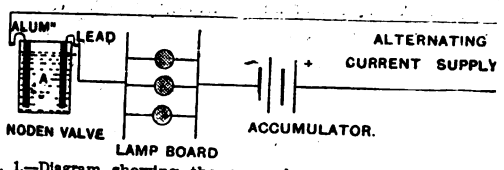


Fig. 1.—Diagram showing the general arrangement for accumulator charging from an alternating current by means of the Noden valve.

is worth. It may be added that we know absolutely nothing about it except as stated:

"Accumulators or batteries in spite of their somewhat robust outward appearance, are, as a matter of fact, delicate pieces of apparatus at the best of times. Given fair treatment and careful handling the user will be more or less repaid by faithful service, but neglect a battery, permit some cells to be overcharged, and others undercharged, exceed the maximum capacity on frequent occasions, allow sulphating and short circuits to develop, and very soon it will be found advisable to replace that particular battery by a new one.

"A battery cannot be regarded as a mechanical device; it stores energy in a chemical form, and chemical actions are necessary to effect this storage, or, on the other hand, to release the energy as the energy of a current. The adding of a little water from time to time, in the same manner that oil is usually added to the engine, will not suffice to retain a battery in good working order and condition. Each separate cell requires individual attention, and if it be found to be suffering from any of the numerous battery complaints a period of treatment on a charging board is essential.

"For battery charging a direct current is required, and to obtain this, when the only available supply is an alternating one, it is necessary to rely upon some form of rectifying device to produce the required transformation. Many such devices, notably the electro-magnetic and the mercury-vapor rectifiers, are on the market, but owing to their rather complex character and somewhat high cost motorists have been slow to adopt them. There is, however, a pressing demand for some such device, and the following notes, dealing with the construction and operation of a form of rectifier known as the Noden valve, may be of interest.

The Noden Valve.

"The Noden valve is extremely simple in construction, and a serviceable model can be quickly made at a trifling cost. The necessary materials comprise an active pole consisting of a rod or plate of pure aluminum and a further plate of lead, iron, or carbon to form the inactive pole. The dimensions of the poles are of no particular importance, and for small cell charging an aluminum plate 10 in. x 1 in. x ⅛ in., and a lead plate 10 in. x 2 in. x ⅛ in., will be found to give excellent results. The liquid required is a saturated solution of bicarbonate of soda or similar alkali, which, together with the metal rods, may be conveniently retained in a glass or stone jar some 5 in. or 6 in. in diameter, and the valve will then be ready for use.

"If a valve constructed in the above manner be connected in series with an accumulator, or other source of direct current supply, it will be found that a steady current will flow when the positive pole of the accumulator is connected to the lead plate of the valve; but that, on the other hand, if the positive be connected to the aluminum plate, the current will rapidly fall to practically a zero value.

"This very remarkable property of the rectifier is partly due to the collection on the aluminum plate of the gas formed during the passage of the current, but mainly to the fact that the gases attack the plate, combining with it to a certain extent and forming upon its surface a non-conducting layer of aluminum hydroxide.

"If an alternating current be now substituted for the direct one previously employed, the same actions will take place.

"Currents will be permitted to flow in one direction only, namely, from the lead plate to the aluminum one, all currents in the opposite direction being checked, the result being the passage of a pulsating direct current through the circuit.

"The rectifier behaves in exactly the same manner as a non-return valve, opening to permit the flow of current in one direction, but closing as soon as the current tends to flow in the opposite direction round the circuit, one half of each alternation being suppressed and the other passing through the cell or cells on charge.

Use of the Noden Valve in Practice.

"In practice the valve should always be used in series with a lamp bank, similar to the ones em-

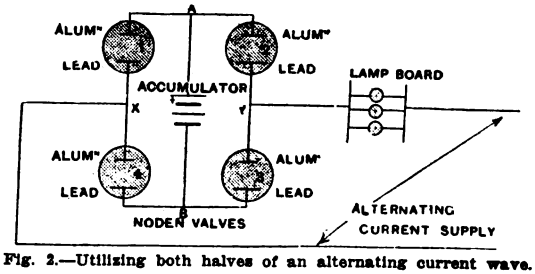


Fig. 2.—Utilizing both halves of an alternating current wave.

ployed in ordinary direct-current charging sets, for the current may then be conveniently varied to suit the charging requirements of the different batteries in use.

"Fig. 1 shows the general arrangement for accumulator charging from an alternating current supply, the necessary rectification being produced by the valve A. It is important to note that the negative pole of the accumulator must be connected to the lead plate of the valve in order that the charging current may always flow in the correct direction, the current, as previously pointed out, being a pulsating but direct one. In Fig. 2 four valves are shown connected up for charging purposes. Such an ar-

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rangement is a more efficient one than that shown in Fig. 1, for now both halves of the alternating current wave may be made use of.

"Thus, assume for the moment that X is the point at which the current first enters the circuit. Such current will be limited in direction by the action of the valves, which will only open to permit of a flow taking place from a lead plate to an aluminum one. The current will, therefore, flow through valve 1 to A, and, being checked by valve 2, will pass through the accumulators to B, and continue from this point through valve 3 to Y and back to the mains.

"Again, when Y is the point of entry of the current, the circuit will be maintained through valve 2 to A. At this point valve 1 will check the flow, which must then be continued through the accumulators to B, and thence through valve 4 to X and back to the mains.

"The charging current is thus maintained in the same direction throughout, and it will be clear that both halves of the alternating wave are made use of. In conclusion, it may be mentioned that, in order to prevent the solution from creeping, it is as well to cover the top of the jars, as well as the plate to which the metals are fastened, with hot paraffin wax, and, further, occasionally to renew the solution."

THE MAGNETO.

From a Paper Read Before the Coventry, England, Engineering Society.

By Arthur P. Young, A. M. I. E. E.—The impetus given to the gasoline motor and allied industries some years ago by the advent of the high tension

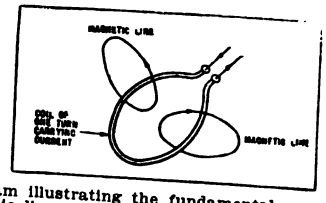


Fig. 1.—Diagram illustrating the fundamental conception of magnetic lines linked with a conducting circuit.

magneto is apparent to all those who have watched the extraordinary developments that have taken place in the last decade. Prior to the outbreak of hostilities, this country obtained almost the whole of its magneto supplies from Stuttgart, in Germany —due seemingly to a short-sighted policy on the part of British motor manufacturers in not encouraging a home industry—and one immediate effect of the war was, therefore, to cause electrical appliance manufacturers to turn their attention seriously to this development.

The new industry that has thus come into being is of national importance, and it is gratifying to be able to record that several electrical firms of this country have undertaken the development and manufacture of magnetos, so that in the very near future the English-made magneto should entirely displace the imported article. Prominent amongst those who are engaged in this work is the B. T. H. Co. of Rugby, a firm of electrical engineers having admittedly a world-wide reputation. Some two years ago they interested themselves in this problem and during the intervening period much important research work has been carried out in their laboratories. The result of these investigations is reflected in the design of the sixteen different types of magnetos which have been developed at their Coventry works with the object of ultimately producing quantities sufficient to meet the demands of the British market. By permission, I am able to make use of some of the experimental data which the company have obtained.

My object in writing the paper, of which the following is a summary, was to throw some new light

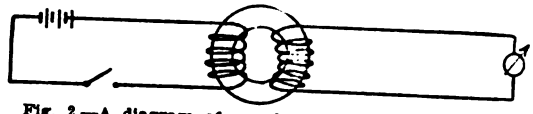


Fig. 2.—A diagram of an elementary induction coil.

on the action of the magneto—which, after all, is purely an electrical machine—and I have endeavored to treat the subject in the following lines in such a way that those whose knowledge of electrical matters is rudimentary will have little difficulty in understanding my meaning.

The Induction Coil.

If we study closely the steady development that has culminated in the present high-tension magneto, we shall find that it had its conception over eighty years ago, when Michael Faraday, an Englishman, made known to the world his epoch-making discovery of electro-magnetic induction in the autumn of 1831. This is not only the basic principle underlying the construction of the magneto, but also the solid foundation upon which the great electrical industry has been built up.

Farraday gave to posterity a sound mechanical method of producing an electric current in a circuit. Briefly, if the number of magnetic lines (called the flux) linked with a circuit—as depicted in Fig. 1—be changed, a voltage is induced in the circuit which is directly proportional to the rate at which the change occurs. With a closed circuit, a current will flow around it as a result of the induced voltage.

Following on Farraday's discovery, it was relatively easy to construct an "induction coil," which

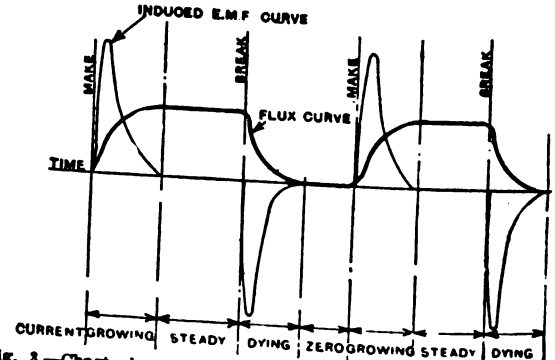


Fig. 3.—Chart showing the relation between the induced E.M.F. and the flux curves when the primary circuit is closed and opened.

was perfected by the Frenchman Ruhmkorff some sixty years ago. Fig. 2 represents diagrammatically such a device, and, if the battery be deleted, we get the connections of the magneto reduced to their simplest possible form. The curves given in Fig. 3 show what happens in the secondary when the primary circuit is closed ("make") and opened ("break") and they express graphically the formula given above.

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To cause an electric spark to jump across the air space of ½ inch between needle points, a pressure of about 13,000 volts has to be applied.

In an induction coil or magneto, therefore, the induced voltage has to be exceedingly large, which can only be done by:

(a) Having a very large number of secondary turns (S).

(b) Making the flux (N) linked with these turns as large as possible.

(c) Using a contact breaker in the primary of such a design that at "break" this flux is made to die away as rapidly as possible.

These results are achieved in the induction coil, and also in the magneto. As will appear later, the magneto is simply an induction coil which is able

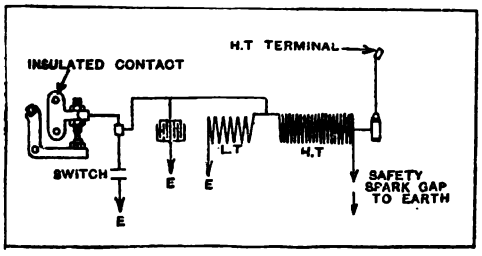


Fig. 4.—A diagram of the connections of a B.T.H. magneto.

to operate without a battery, by virtue of the fact that it rotates in a magnetic field of varying strength, and thereby has induced in the primary winding the requisite current.

The Action of the Magneto.

Considered purely as an electrical machine, the magneto consists of three essential parts:

(a) A magnetic system comprising a permanent magnet, or a combination of permanent magnets, to the poles of which cast iron pole pieces are secured.

(b) An armature made up of a partly laminated iron core, and provided with a primary and a secondary winding. This rotates in the space between the pole faces.

(c) A contact breaker, which is rigidly secured to the armature shaft so that it rotates with it. The function of this part is to short circuit for a certain period, and then suddenly open circuit, the primary winding, when the armature is in predetermined positions.

A simple connection diagram for a B. T. H. Co. magneto is given in Fig. 4.

The flux change in the armature core corresponding to a movement of the armature through nearly one-half a revolution is shown diagrammatically in Fig. 5 by means of four figures. Taking the positions in the order given, namely, 1, 2, 3, 4, the variation of flux through the armature core is of the following order: 4, 6, 4, 0.

The point to be noted is that when the armature moves to the position 4, the flux linked with the windings is suddenly withdrawn and made to bridge the pole tips. This position I shall call the "dead center," and, as the flux change is so rapid, the induced voltage in both primary and secondary must attain a maximum at this instant. As there are two "dead centers" in each revolution, the induced voltage is alternately positive and negative, the maximum point occurring after each half revolution.

Fig. 6 shows the voltage wave obtained experimentally on a B. T. H. Co.'s type "M" machine at a speed of 1,000 r. p. m. The flux wave has been calculated from it, and shows that the maximum flux through the armature core is as high as 31,000 lines. In each magnet this corresponds to a flux density of 5,250 lines per sq. cm., which speaks well for the high quality of the magnets used in this particular machine.

The maximum voltage attained in the primary at 1,000 r. p. m. is 27.2. In the secondary at this speed the voltage would be 27.2 multiplied by about 50. This voltage is therefore 1,360 volts. At a speed of 2,000 r. p. m. it is very nearly 2,500 volts. It must be remembered that this figure gives the voltage due to relation only. Superimposed upon this we have to consider a much larger voltage which occurs at the instant when the primary circuit is opened by the contact breaker. That is, we have to take into account the induction coil effect.

Magneto Operating with Primary Short Circuited Continually.—The induction coil effect depends upon the value of the primary current at "break." For the machine under consideration, the value can be determined from the three short circuit current curves given in Fig. 7, and which have been calculated from the voltage wave. A careful test, however, made at 2,000 r. p. m. checked the curve for this speed, thus showing that the method of calculation employed is reliable.

Magneto Operating Normally.—As the speed increases the maximum value of the current wave is displaced more and more beyond the "dead center."

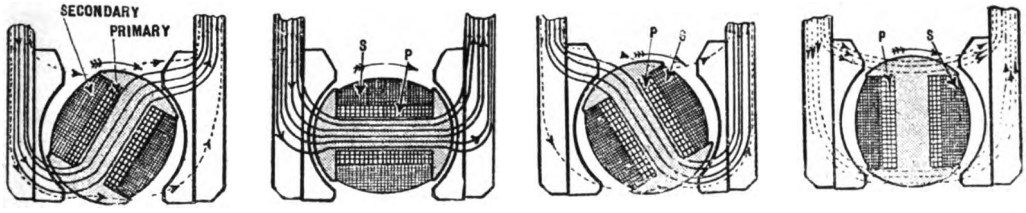


Fig. 5.—Diagram showing the flux changes in a magneto armature due to rotation. In position 4 the armature is in position of dead center.

That is, the lag increases, reaching 50 degrees at 2,000 r. p. m. It is important to note, also, that the actual maximum current does not change appreciably over the range of speed chosen. After a considerable amount of research work, the parts are now being produced in this country, and very careful tests which the B. T. H. Co. have made show that as regards insulating properties, durability, and power to withstand extreme variations in temperature, they are quite equal to the German material.

Magnets.—Before the outbreak of the war practically all the permanent magnets used in this coun-

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try for a variety of purposes were obtained from Germany, and English users generally were only too prone to believe that a satisfactory permanent magnet could only be produced in that country. During the past few months, however, there has been sufficient evidence to show that such an idea was entirely false. To produce satisfactory permanent magnets great care only is necessary in the treatment of the steel, particularly during the hardening processes. There is an abundance of literature dealing with the subject, and it is interesting to note that, whereas for the past years the industry has been entirely in the hands of the Germans, the classical treatise dealings with the whole subject of permanent magnets is of French origin, and was prepared some years ago by Madam Curie, who, as is perhaps well known, collaborated with her husband in the research work which resulted in the discovery of radium.

The B. T. H. Company have recently carried out very extensive tests on permanent magnets designed for magneto work and manufactured by English suppliers, and there seems little doubt but that the permanent magnet industry in this country will increase at a very rapid rate and maintain its position by displacing the German-made article, even after the war is ended.

It is, of course, understood that under normal working conditions the primary is not continually short-circuited, but is alternately short-circuited and open-circuited by the contact breaker. I have adhered to the simpler way of looking at the problem, however, because in a great many cases the value of the primary current at "break" as determined from the short circuit current curves is substantially correct. In other words, if the ratio be large, then the short circuit current curve for the period of time in which we are interested agrees very closely with the actual primary current wave. In the case of magnetos designed to give one break per revolution, and even for those giving two breaks per revolution, and provided with flat segments on the timing lever, this method can be safely applied up to speeds of 1,000 r. p. m. At higher speeds the actual "break" current is somewhat greater than that given by the short circuit current curve.

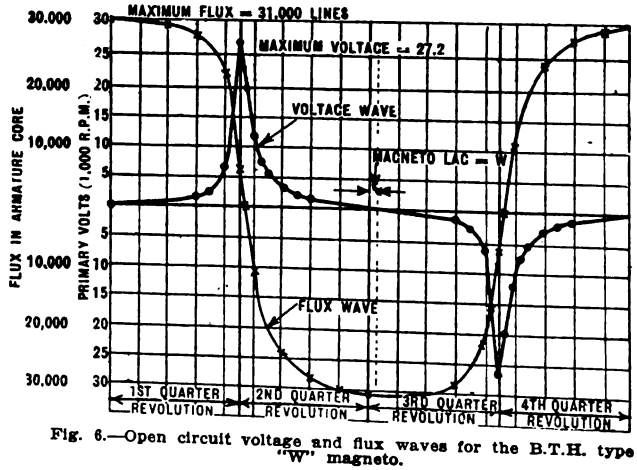


Fig. 6.—Open circuit voltage and flux waves for the B.T.H. type "W" magneto.

For magnetos giving two breaks per revolution and having relatively long segments (as in the case of the Bosch type Z4, for example), the ratio is very small, and this method of treatment cannot be applied. It would be necessary in such cases actually to calculate the primary current waves which, however, could be done by following out the method of analysis employed to determine the short circuit current curves already referred to.

Sparking Voltage.—The spark results, of course, from the voltage suddenly induced in the "secondary" at "break." The voltage between the plug electrodes at the instant before the spark occurs (called the "sparking voltage") is very much greater than the total voltage induced in the secondary, as

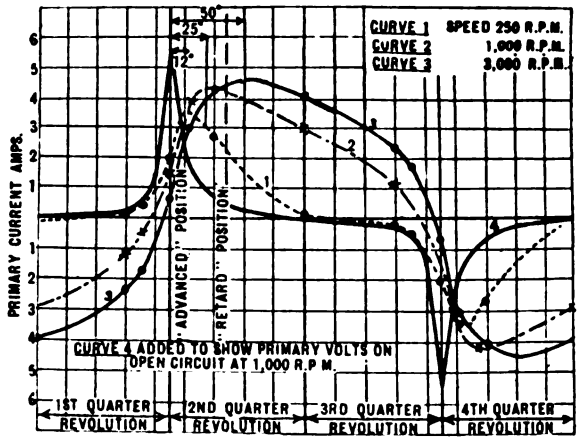


Fig. 7.—Short circuit primary current waves for B.T.H. type "W" magneto.

determined by the method indicated under sections (2) and (3), owing to a rise which results from the sudden application of a large voltage to a circuit possessing self-induction and capacity. This effect is one that is well known to electrical engineers.

Tests made on the B. T. H. Co.'s type "W" machine, already referred to, show that the sparking voltage is approximately 10,000 even at very low speeds. That is, a spark can be obtained in air between needle points 10 mm. apart. This figure is quite equal to that obtained with a standard type ZF4 Bosch machine suitable for the same class of service. As an approximate rule the sparking voltage can be assumed to be proportional to the primary current at break.

An Up-to-Date Garage.

The St. Albans Foundry and Implement Company, of St. Albans, Vt., have completely rebuilt and enlarged their garage at 43 Lake street. The garage occupies a portion of the company's main building which is of fireproof construction, the first story being built of solid brick and the second story of metal lath and cement on a wood frame. The entire interior of the garage department is of steel and all floors of cement, except those in the ladies' waiting room and the stock and show room. These rooms have hardwood floors. The large storage room it is estimated will accommodate sixty or more cars, the entrance being eleven feet wide. The main repository, repair department, stock and show room and ladies' waiting and rest room are all located on the ground floor. Entrance to each may be made from the street as well as from the main storage room or repository. The automobile repair department is in the rear of the main storage room.

Heat to all these rooms is furnished by the large steam boiler formerly used as a power boiler for operating the company's entire plant, which is now run by electricity.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1554 Starting Queries.

From a Reader, West Virginia.—1—I would like to know if you can start an auto with a Splitdorf, low-tension magneto, without batteries. I have a low-tension Splitdorf magneto and coil and switch marked "bat. off mag." Car will only start on bat. 2—I see in your January number writings by James F. Hobart, M. E., that he would not have a magneto if he could not use it in starting. Would he please tell me how to use the above in starting? 3—In case you have a good hot spark at plugs, and motor will not start, what could be the cause of not starting? I primed the engine but it still refused to start. 4—Can you tell me where I can get a good correspondence course in electricity?

Reply.—1—You cannot start your motor with a Splitdorf low-tension ignition magneto for the reasons that it does not generate direct, but alternating current, the former only being suitable for charging storage batteries, and that it would be impossible to run an alternating current magneto as a motor with direct current supplied by a storage battery. To make an electric starter three things are essential: first, some means for generating electric current; second, some means for storing this electric energy, for when the motor is still, current can not be taken from the generator, hence the storage battery, and third, a motor supplied from the stored electric energy to run the electric motor until the engine will take up its regular cycle. 2—Mr. Hobart simply expressed his views. There are plenty of others well informed in automobile matters who would not use magnetos for ignition, preferring so-called single-spark battery ignition system, the current being generated to charge storage batteries. There is another class who would not have a car that did not have dual, duplex or double ignition, both engine timed magnetos and batteries. There are some engines that are so structurally designed that it is well nigh impossible to start with a magneto. Mr. Hobart might well have added that he would not own a motor that he could not start on magneto. The ignition system he described is by no means a modern one. 3—Dozens of causes, but among the most common, providing the engine is properly timed, both in valve operation and ignition, the following: Very cold weather; hard-to-vaporize gasoline; weak exhaust valve springs; air leaks past inlet valve springs; too much gasoline; impaired compression, etc., etc., ad infinitum. 4—We make it an inflexible rule never to advise or indicate any preference, accordingly we must decline to make specific reply. If you will indicate the branch of the electric study you desire to take up we might select a list of books for you to purchase that will give you an elementary information which you would probably follow up in some definite line, such as electric ignition, electric lighting, electric propulsion, etc. For one to absorb the entire gamut of electricity by correspondence seems to us an impossibility, when an electrical course in a university would take several years, and then would school one in the principles and theory only.

1555 Piston Ring Clearance

From William H. Beers, New York.—I intend to put Wasson rings on my car this spring and should like to know the proper end clearance to give them. The car is a Flanders 20, 1912 model, with new cylinders last year. Would it be best to replace all the rings with Wasson or not?

Reply.—Wasson piston rings should have about .010 inch end clearance at the smallest diameter of the cylinder bore. Two thicknesses of ordinary newspaper makes a good measuring medium. We believe you should renew all rings while the engine is apart. You will probably find that the cylinders are slightly worn, for all they have been used but a single season.

1556 Rewinding Coils.

From A. G. Luyster, New Jersey.—I have under my care several gasoline engines. Every once in a while one of the spark coils breaks down. Is there any way that I could rewind an old one to have on hand for an emergency? Some few months ago a coil on my two cylinder opposed engine had a breakdown. This is not a vibrating coil and it has been running for three years straight. Will you kindly explain the cause of a breakdown and how to remedy it in an old coil?

Reply.—There is no way that you could rewind a broken down coil, for in the secondary wiring there is usually several thousand feet, or a mile or two of fine wire. It is cheaper to buy new coils than to attempt to repair defective ones. The cause of broken down coils is usually either a short circuit in the primary or secondary wiring, a punctured or perforated condenser, a broken primary wire, poor contact at the binding post, etc. If the coil is of the vibrating type, there may be vibrator troubles as well. If your coil lasted you three years it seems to us it has done pretty well. When you get a new one do not see how far you can make the spark jump with it and it may last you longer. We think we are safe in saying that 90 per cent. of all defective spark coils are ruined by the abuse above mentioned.

1557 Wants Increased Power.

From Dr. Ellsmer L. Piper, Pennsylvania.—I have been told of two ways in which the power of a Ford engine may be increased and wish to know if any damage might be done to the magneto or the engine. 1—One Ford driver has had ⅛ inch "milled" or "planed off" the cylinder head and by reducing the size of the explosion chamber, claims a decided increase in the power of the engine. 2—

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Another Ford driver allows the vibrator, i. e., does not shunt them down in the regular equipment to act with a K. W. master vibrator and claims an increase. I am inclined to be skeptical on both points, but desire to submit the same to your Trouble Department, and will thank you for a reply in your next issue.

Reply.—1—A few years ago the Ford Motor Co. increased the clearance in order to slightly decrease the compression which in actual practice had proven too high. While you might get slightly more power there are other conditions to be considered, especially of pre-ignition, knocks, etc. You can take it from us as gospel truth that the present clearance in Ford motors is much nearer what it should be than what some experimenter thinks it should be. 2—In order to be charitable we say that we think your informant has been able to delude himself into the belief that he gets more power. We are even more skeptical, if this were possible, than you. Manufacturers of master vibrators should be best informed as to the proper way to connect their product in a vibrating ignition system.

1558 **Lubricating Trouble.**

From Lawrence W. White, Massachusetts.—1—I have a 1908 Lancia, 4 cylinder, 4 speed runabout, motor 3½x4, built in Italy, which I have owned for about a year. I find oil consumption very heavy, about 300 miles per gallon. I use Mobiloil B all the year and think I should get more mileage. The oil system is entirely force feed. What should I normally get? On gasoline I average 19 miles per gallon, which I consider good. 2—From the exhaust end of the muffler I removed a heavy carbon deposit and for experiment touched a match to it and found it burned quickly. Do I not run the risk of the entire muffler catching on fire? The muffler has no pipe at its outlet, but exhausts about the middle of the under part of the car. 3—The tires are clincher demountable (Machelin) and are metric sizes. I find the nearest actual size in American sizes is 32x4, and it takes two strong men to put on a new shoe. Why can I not use a 33 or 34 by 4 on these rims? 4—By lengthening the intake valve push rods, can I not secure a bigger charge of mixture and increase the power considerably? As it is, the engine is too small, and the car is geared too high for American roads, although on English and French roads, which are uniformly smooth and with gentle grades, this car is speedy and economical. 5—Do you recommend a heavy oil for transmission or a non-fluid oil? In warm weather the gear oil appears to get too thin, and in cold weather the non-fluid seems to solidify and one runs the risk of getting no lubricant on the shaft bearings. If you will answer my several questions, I shall be greatly indebted to you and wish to thank you in advance.

Reply.—1—If after seven or eight years' use you are able to run 300 miles on one gallon of oil we think you are doing pretty well. Nineteen miles on a gallon of gasoline is nothing unusual. 2—Yes, there is some danger of the accumulations of carbon and unburned oil taking fire in the muffler. It should not do any great harm though. Until you have new pistons and rings fitted to re-ground cylinders you cannot expect to reduce oil consumption which now clogs your muffler. 3—Absolutely nothing to prevent your using oversize tires, but you should not use larger than 33 inch diameter. 4—No. 5—It depends entirely upon the design and construction of the transmission. One should not use a grease or non-fluid oil of the same consistency in winter as in summer. Use as thin an oil or grease as you can without its leaking out.

1559 **Rusting Rims.**

From James Harazim, North Dakota.—I want to ask a favor of you. I would like to know what to do for G. D. rims to keep them from rusting on the face of them. The castings will rust and get vulcanized to the rims so they are hard to get off. I polish them every time I take them off with sandpaper, but as soon as they get damp or wet they rust again.

Reply.—Probably painting them with black asphaltum varnish P. B. insulating paint, shellac or some waterproof varnish will do the trick, or you can use graphite. Sandpapering them only presents a fresh surface to rust quickly.

1560 **Gas Saving.**

From H. A. Van Kuren, Pennsylvania.—1—I am experimenting on a gas saver on my Ford car, similar to the same advertised in your publication. In the first place, do you know them to be much of any value? 2—I am connecting common ¼ inch brass tubing in the manifolds above the carburetor (Holly), giving it one wind around the exhaust pipe, extending it on up the steering column port-way with air valve on end. Will it be better to have hot air or cold to enter and why? 3—With such an arrangement will hot or cold be permitted to enter the intake, and why? I have tried this device temporarily and the speed increases possibly 15 per cent. The motor running idle was not tried on the road. The air must be gauged in proportion with the speed.

Reply.—1—Any device which will more perfectly proportion the gasoline and air should result in economy in fuel, and providing the engine is run all the time with fixed throttle opening, as is possible in a boat engine, manual control of an auxiliary air supply gives more power. This is the only reply we care to make to this query, except that such a device if absolutely positive, automatic in its action, and that would reduce the vacuum in the inlet manifold the correct amount, would be perfection. 2—We do not know that it will make much, if any, difference. If the gas in the inlet manifold is too warm, cold air would undoubtedly help it, and vice versa if the gas is too cold hot air should help it. The effect in either case would not be great, owing to the small area of a ¼ inch brass pipe, which is about one-tenth of the area through the carburetor throttle. 3—We are afraid we do not understand this question. Your statement that "the air must be gauged in proportion with speed," is a little indefinite, as this would depend upon whether the car was running free on a level road, partly throttled, or climbing a hill with throttle wide open. It would be better, perhaps, to say that the auxiliary air should be in proportion to the engine's demand for gas, less the air which leaks past the inlet valve stem bushings, another complexity, and a more serious one with gasoline growing heavier and heavier, and harder to vaporize as a result.

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1561 **It Knocks at Times.**

From S. R. Newton, North Carolina.—1—I have a Ford touring car, 1914 model, run about 7,300 miles, which has a knock which seems to be in the No. 2 or 3 cylinder. I have had the engine top off but cannot discover the trouble. It is worse at times. It will run sometimes for 15 to 20 miles without a perceptible knock, then it will begin again. I have taken the carbon all out so I know that it is not the trouble. When it is knocking it doesn't make any difference where the spark lever is—whether it is advanced or retarded. The more gas I give it the more the knock. I have an air friction carburetor on my car. The knock is the same whether going on hard pulls or on level stretches. I have never had the car entirely down. 2—How much clearance should there be between valve stems and push rods? 3—Do these cup valve stem adjusters do the necessary work?

Reply.—In the hands of an experienced motorist an engine with a removable cylinder head is extremely convenient construction. Its serious disadvantage is from the fact that as soon as some fault develops somewhere in the engine or transmission—off comes the head. Knocks most frequently occur from lost motion, usually at the lower end of the connecting rods or in the center main bearing, and it is not at all surprising that you could not locate it by removing the cylinder head. Your description of symptoms shows lost motion probably in the center crankshaft bearing. You can reach this through the side plate hole in the crankcase. You may need a new bushing there. 2—About the thickness of a visiting card. 3—They should.

1562 **Clutch Inspection.**

From A. B. Carman, Iowa.—I have a 1910 Reo with a multiple disc clutch in the center of the flywheel, with only one thrust spring. The shank on which the spring is coiled extends back over the flexible joint in the drive shaft, to a point about one-half of an inch from the adjoining cone on the front of the transmission. This cone in the front bearing in the front end of the transmission case worked loose. I desire to inspect this bearing and see if any balls have been injured. I should also like to see the flexible joint and make sure same is O. K. What I desire to know is, what to remove first. Can this clutch be removed without removing the motor? The motor has recently been overhauled and is in excellent condition. Two or three times I have felt a very sudden jerk accompanied by some noise. The first time I felt the same I thought the drive shaft was broken, it was so sharp. This jerk seems to occur at times when the motor is pulling some load, but never occurs at regular intervals. The car may run five miles without it or it may only run one. There is no growling or grating, but just the jerk, then everything goes on well for some distance. I realize that it is practically impossible for you to locate the jerk exactly, but any suggestions you can give will be thankfully received. I have repaired many cars but this Reo beats my time.

Reply.—You should be able to remove the clutch without taking out the motor. You will probably have to disassemble the transmission, however, and disconnect the universal joint in the drive shaft. When you take the transmission down you will be very likely to find the cause of the occasional "jerk," which you mention.

1563 **A Generator Installment.**

From Joshua Conner, Delaware.—I am considering installing a generator on my Ford, 1913 T car, to work in conjunction with a 6-80 ampere Exide Westchester battery. Whose would you advise?

Reply.—If you install a generator you will need an automatic switch or relay, to prevent the current from escaping through the winding of the generator when the engine is not running, and when the voltage of the current being generated is less than that of the battery. It would perhaps be good advice for you to inquire from the makers of your storage battery what system they recommend, or from the maker of the generator you decide to buy, what automatic switch they suggest you use with your 6-80 Exide Westchester storage battery. We cannot advise you in the choice of a generator.

1564 **Engine Knocks.**

From R. D. Clark, Colorado.—I have a Buick model 31 which has been run 5,800 miles and am having some trouble with my engine knocking. Can eliminate the most of this trouble by retarding the spark. I had the cylinders taken down some time ago after the car had made about three thousand miles and the carbon taken out. I wonder if you can advise if it would be better to go through this performance again or can I use a good carbon remover to good advantage?

Reply.—In relation to the knocking in your engine, although it may be due to carbon deposit, yet, as you probably are aware, there are other causes for knocking. A fuel mixture that is too rich may cause a knock, or if a carburetor float leaks or is water-logged, it will cause it. Possibly, too, you may have a loose bearing after having run your engine nearly 6,000 miles. In case you find the trouble is due to carbon, we should hardly think it would be necessary to take the engine down again, but it would answer to use some good carbon remover for this purpose.

1565 **Starting Trouble.**

From Raymond Standish, Connecticut.—I have a Reo model "R. A." 1912, 30 h. p., cylinders 4x4½ inches, firing sequence, 1-3-4-2. It is equipped with a Stromberg carburetor, and a National Magneto model B-4. Sometimes it will start on the first half turn on magneto or battery (on battery the best) and then again I cannot start it at all. The carburetor is all right, because it runs fine when once started. I take out the spark plugs and lay them on the frame and no spark will show at all. I think the wires must be broken somewhere, but have been unable to find it, although I did find one broken wire under the switch on the coil box on the dash. I repaired it and am not positive that I got it right. Under the switch on the box the wires are like the diagram. I connected them as shown in the diagram. Is it correct? On the dash under the hood the studs are marked as shown. All wires seem to be in good condition and I cannot understand where the trouble can be. Would be very grateful for any information you could give me.

Reply.—If you get no spark it certainly explains the cause of failure to start. Your trouble is probably in the breaker box. The platinum contact points may need smoothing, adjusting or possibly renewal. Next time you disconnect your wires you will proba-

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bly tie strings to them or otherwise mark them. Any one can take a watch to pieces, you know. Our advice is for you to send to the National Coil Co., Lansing, Mich., for their wiring diagram. From the diagram you submit we do not note anything wrong, except that you may have connected the plug wires incorrectly, or in improper sequence. In order for you to use battery ignition you must have the magneto properly and perfectly grounded.

1566 **Responsibility for the Damage.**

From C. G., Indiana.—A owns and operates a public garage and repair shop. B drives up in front of A's garage and asks to have his carburetor adjusted. A proceeds to make the necessary adjustments, and when speeding the engine to try the last adjustment the nuts slip off the studs of one of the connecting rods and damage the engine to the extent of about $150. Who is liable for this damage? The car did not belong to the party driving it, and he was alone in the car.

Reply.—A, who adjusted the carburetor, is not responsible for the damage, surely, assuming he did nothing else to the car. The responsibility for the damage rests entirely with whoever allowed the nuts to get loose.

1567 **Engine Inquiries.**

From A. R. Peterson, Iowa.—1—May a more powerful engine be placed in a 1914 model Krit touring car than a 22½ h. p.? 2—Which company puts out the most efficient engine? 3—What do you know about the Continental Certainty engines?

Reply.—1—Yes, if there is room for it, but we do not know if there is. 2—Every manufacturer claims his engine to be more efficient than others, and every such statement seems to be unchallenged. If we were to depart from our long fixed policy and make the statement that any one engine were any better than another we would receive deserved objections and complaints from the manufacturers of every other engine. Frankly, however, we are free to tell you that we do not know the name of the manufacturer, or of the engine, which is the most efficient, and if even we thought we did we would not dare to think out loud. 3—We know practically nothing of the engine you mention, but the Continental Motor Co., who probably manufacture this particular make, are responsible and reputable people, and are manufacturing and selling thousands of engines every year.

1568 **High Test Gasoline.**

From R. Cook, Indiana.—I drive a 1912, 55 h. p., 7 passenger Apperson car, which has a Stromberg carburetor. I have used a Standard and another gas which test 64 degrees with pretty good results, only in cold weather it was harder to start on. I changed to a gas which tests 75 degrees. The motor only needed a quarter of a turn to set it in motion, but after it runs for about 5 or 10 minutes, or in other words, until it gets warm, there are very fine bubbles which can be seen coming up from the bottom of the chamber. They get larger till it boils like water. The engine runs good till the larger bubbles come up, then it runs irregular and finally stops. As I did not want to use lower grade of gas on account of starting, I began to hunt for some device to stop the gas from bubbling, so I shut off the hot water, which goes to warm the carburetor, and placed a piece of tin (which was cut to fit) around the carburetor, up far enough and down far enough so that the hot air which the fan blows back from the engine could not come in contact with it. Now I run my motor on the standstill or on the road without any trouble with the gas.

I also drive a 1914 Ford car, which I am having a little trouble with and wish to know the reasons why. In the morning or after it stands for an hour or two, I start to crank it and have to spin it a dozen times or more before there is an explosion of any kind. It has the regular Kingston carburetor and I use a gas which tests 75 degrees. It makes no difference if it is on the magneto or battery in starting. The carburetor has been cleaned time after time, properly adjusted, tank and lines cleaned, spark plugs cleaned and points adjusted, and later replaced with new ones. The cylinder heads and pistons are free from carbon and I also cleaned the timer. After the engine gets started it runs fine. There is another trouble I have with it, once in a great while. The car goes along fine on the road and all at once the engine stops, so I get out and start it on the battery and then go on. When it stops running I turn it on the battery before the car stops and then it "takes to its heels again." Why is it?

Reply.—If you persist in using high priced and high test gasoline you must not use heated air nor hot water to assist in vaporization. You get easy starting, but there is not so much power in a gallon as there is in the heavier fuel. The trouble with your Ford T is that the gas is too rich when starting, the carburetor being designed to use a much heavier fuel. The size larger of carburetor would probably give better results for the reason that the fixed or constant air opening being larger the air would not have so high a velocity past the vaporizing nozzle. Earlier models of carburetors did not use so small openings as do present day models.

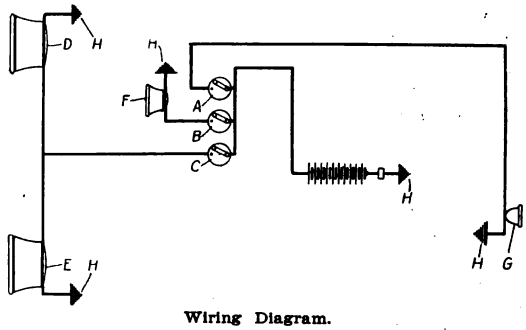
1569 **Lighting Diagram.**

From W. DeVere Blackmar, Michigan.—I drive a Ford automobile which has electric lights run from the magneto. I would like to convert my oil lamps into electric by using a storage battery. Will you please show me how to wire same so that I can use the tail light alone, or tail and dash together, or tail and side together, or all three at once. Will I have to use a one, two, three or four point switch? I would like to wire these in series as much as possible.

Reply.—Your storage battery is 6 volts and as 6-volt bulbs are to be purchased at almost any electrical supply store or garage, it will be much better to connect lamps in parallel, as in this case you can use 6-volt bulbs throughout. If you were to connect two lamps in series you would need 3-volt bulbs and if three in series the bulbs would have to be 2 volts each. If you use ground return, or the single-wire system you would ground one side of the battery to the frame of the car, using between the ground and battery a fuse block to protect the battery in case of a short circuit. The other pole of the battery could best be connected with three small single point switches, mounted in a row, as shown at A, B, C, one caring for the two oil lamps, D, E, another for the dash light, F, and the third for the tail light, G. This would

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be very much simpler to wire and would give you any combination desired. If you only wanted one oil lamp all you would need to do would be to take out the other bulb. The diagram illustrates the wiring. You will note that each separate lamp has to be grounded, as at H, and also the battery, I, itself. In order to connect by the two-wire system the ground wire from the battery, instead of being grounded to the frame, would have to be extended



Wiring Diagram.

through or to the binding posts of all the lamps from which binding posts ground wires now lead, and no ground connections should be made from either battery or lamps.

1570 **Motor Vehicle Law.**

From F. M. Groth, New York.—Is there any clause in the New York State Motor Vehicle law saying that after a car is five years old the owner will have to pay only half the usual fee for it?

Reply.—There is no clause of this kind as far as we know.

1571 **A Missing Cylinder.**

From Paul Kuhnhausen, Washington.—I have a Buick, model 21, 1911 car, 35 horsepower, that is giving me some trouble. At times it will run fine for a while and then it will commence to skip on the second cylinder, and the plug will be covered with oily soot, while the remaining three will be clean. The compression seems to be good; also the wiring is in good condition. Do you think this trouble could be in the magneto? The magneto is a Splitdorf. I noticed in several of your late issues that some are having the same trouble with their model 10 Buick. I noticed in your January issue, on pages 57 and 58, Mr. Wm. Sisson's answer says to cut a little groove through the oil dip of the said cylinder, but this does not seem the proper remedy to me, as the machine ran fine when new. Now if you can help me out of my trouble, I will be very thankful.

Reply.—When an engine misses intermittently, as in your case, always in the same cylinder, the fault should not be laid at the door of the magneto for the reason that the same circuit breaker, same coil, same condenser and same distributor furnish the same strength of spark, up to the secondary cables connecting with the spark plugs, to both No. 2 and No. 3 cylinders. If therefore missing occurs in No. 2 cylinder as a result of faulty magneto it should also cause missing in No. 3 cylinder. There is, however, a slight possibility that it takes a stronger spark to ignite charges of gas in the No. 2 than in any of the other cylinders, but in every such case the trouble usually is structural, resulting in imperfect carburetion or lubrication. If structural it may be due to poorly fitting piston or rings, scored cylinder, leaks past the inlet valve stem, broken or weakened inlet or exhaust valve stems, sticking valves in this cylinder, defective plug insulation, leak of current from oil soaked secondary cable, etc. Scored cylinders and poorly fitting piston and rings are the most probable causes, which will allow oil to be drawn past them into the explosion chamber from which it will be splashed onto the plugs, short-circuiting them, and thus preventing sparks at the electrode. On the other hand, defective insulation of the plug wire or plug itself would cause an accumulation of oil on the plug as a result of the explosions not burning the small amount of oil that always works into any gas engine cylinder. Leak of air past the inlet valve stem would have a tendency to make the gas too lean, while weak or broken valve springs might prevent the valves from seating properly, allow burned gas to be drawn into the cylinder or drive out a portion of the properly proportioned explosive mixture. If cylinder is scored the only remedy is to have the Nos. 1 and 2 cylinders reground and new rings and pistons fitted, which should cost you for this work alone about $20. If piston and rings only need renewing the cost should be very much less.

1572 **Cause of a Thump.**

From Lawrence W. White, Massachusetts.—I have a 1909 four-cylinder Lancia, semi-racing car, with which I am having trouble. Owing to loose main bearings and end play on the crankshaft and lack of power, I have just had the entire motor taken down by one of the two best repairmen in Boston, who specializes on overhauling foreign cars, and who does thorough, honest work, from all accounts. He renewed every worn part, refitted all main bearings on the crankshaft that were loose, straightened the crankshaft itself, fitted new camshaft bearings, fitted new piston rings, cleaned out the carbon and ground the valves, and when the motor was assembled and started, I never heard a more silent even-running engine. So much for the condition of the motor.

I have driven about 200 miles since it was overhauled, and the last hundred miles I can feel a distinct thump through the clutch pedal, foot throttle and steering post, whenever the throttle is opened to pick up on a grade and when a load is thrown on the engine. The whole footboard and framework of the car seems to reflect this "knock." It cannot be heard but is quite perceptible to the driver, though passengers have not noticed it. It is a case of feeling and not hearing. Evidently something is loose somewhere and I don't want to pull the whole motor down again if I can avoid it. The repairman thinks that when he adjusted the crankshaft bearings that the alignment between the clutch and transmission may have been changed. Would this cause such a pound? The clutch is housed in the flywheel. This knock is not very severe, but on opening up appears right away. It is not a carbon knock, nor a wrist pin knock, but like a loose main bearing knock, without the noise part of it. When the bearings were renewed, the repairman ran them in under power for a day before assembling. Lubrication has al-

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ways been good, being force feed. My old car hasn't much power and perhaps I should never attempt to force it, though I am used to a four speed transmission and believe I am easy on a car. Can you throw any light on the case, judging by other cases?

Reply.—There is little doubt in our mind that the thump is a cause of imperfect alignment of the engine crankshaft and transmission, although new transmission bearing bushings may be needed. We consider it just as necessary to assure perfect alignment as to renew bearing bushings, particularly when using cone clutches.

1573 **Length of Sparks.**

From E. E. Edwards, Iowa.—Could I bother the Automobile Dealer and Repairer to ask you for an answer in the March number to the following? We have a 4-cylinder Buick, Model S, and use a timer, a 4-unit non-vibrating coil with master vibrator on end in the same box (a Splitdorf), and get current from a 6-80 storage battery. Now in testing this spring, I find that when I have a cylinder firing I get a good spark at the gap; also that when I short the top of the plug I get a spark ¼ inch or over in length, but I also get a small spark from the other three plugs when shorting them with a hammer from the top of the plug to the top of the cylinder. I have no insulating rubber sleeves on the bottom of the coil on the four secondary tunnels. Would there be enough leakage across to make a faint spark in all plugs? Any suggestions that will aid us will be appreciated.

Reply.—If you will refer to back files of the Automobile Dealer and Repairer you will find that several times we have cautioned owners and operators of motor cars against the all too frequent practice of trying to find how long a spark they can get from their magnetos and coils. You are apparently no exception to the general rule, and if you have not ruined your coils you soon will if you persist in your destructive practice. You should never attempt to run the motor or try the spark unless all the plug wires are attached to the plugs. The plugs do not necessarily have to be in the threaded plug holes, for they can lie on the cylinder tops on their sides, when the spark can be observed, as it ought to be without danger of ruining the coils. You should remember that the secondary current, the electricity which jumps across the spark plug electrodes, may be 500 times the voltage of the ordinary 16 candlepower incandescent electric light, and more than 100 times the voltage used in arc light illumination. It has to have this very high voltage in order to jump a short air gap. If the gap is too long, following the law of least resistance it will go somewhere else quite naturally, and in your case the plug wires being close together it jumps to them and completes the circuit through the other plug gaps. If the other plug wires were sufficiently far apart so the high tension current could not get to them, it would probably jump to the primary winding of the coil and thus burn out the secondary insulation, ruining the coil. The insulating rubber sleeves are not absolutely necessary.

Two Interesting Points.

From J. W. Miller, Lebanon, Kentucky.—I notice No. 1528 is having trouble with oiled spark plugs. This can be easily remedied by tapping out the spark plug holes enough so that the spark plugs will screw one-fourth of an inch further into the firing chamber. I have had the same trouble and know that this is a sure preventive. Of course the plugs must first have the oil cleaned off of them.

If No. 1537, or anyone else with the same trouble—grease working out through brake drums—will drill a one-fourth inch hole in the underside of the axle housing, about six inches from the rear wheel, they will find that the grease will drop out of this hole along the road instead of working out all over the brakes and tires.

How He Avoids Trouble.

From T. J. Preston, Washington.—I have a model T Ford touring car, 1912. I have run it two years, 8,000 miles. I had a master vibrator put on and like it very much and a Prest-o-lite or gas tank. There is just one thing more I want and that is a hand starter, then the Ford will be good enough for me. It is a sure go 365 days in the year. The great trouble with lots of car owners or drivers is that they won't let the adjustment alone. I have not adjusted my carburetor since I got my car, but I keep all wire connections clean and tight. Also the vibrator platinum points clean and smooth. I had 4 dry batteries put in to start on, and they work fine. I had them put in at the same time that I had the master vibrator put on.

Valve Grinding.

From Wm. A. Amend, Tennessee.—I had my valve seats destroyed by an incompetent repairman and had a continued worry about leaky valves for a long time. The only way that I could overcome this matter was to purchase a set of Tungsten valves, ⅛ larger and reseated the valve seat with a reseater. The valves alone cost me $22. Grind the valves until a white rim extends clear around the valve and seat, then make pencil marks on the valve every ¼ in. Put the valve back accurate but a little piece out. If all the lines are not erased clean then clean the valve and seat well and grind with coal oil. Then lubricate all parts. Use a brace and bit by going forward several times and then reverse. Continue this until the pencil marks erase clean and even. This will make a polished seat, although of course not as good as a ground seat, but it is the best that can be had. The other way of using a valve grinding compound will cut wherever the metal is the softest, whether it be the valve or the valve seat and the longer one grinds the worse will be the seat and the only remedy is a reseater and a valve dresser for the valve.

A Boost for Piston Rings.

From F. H. Ahl, Maryland.—I drive a Cartercar for pleasure, equipped with the American piston rings and my car runs beautifully. My cylinders are like a burnished piece of silver. I do not know what the smoke nuisance is with my car. I have been driving my car for the last two years equipped with the American piston rings. My car is a model S, 1912, weight 3,500 pounds.

For the Leaking Grease.

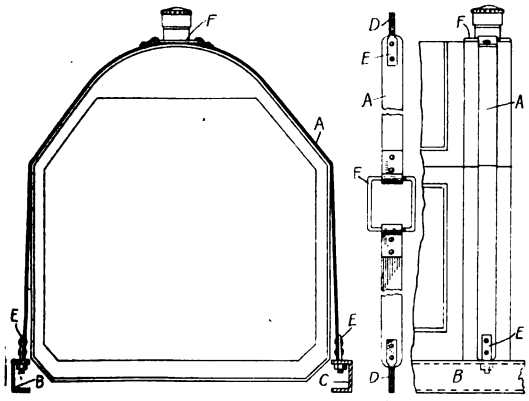
From J. H. O., Iowa.—If the Ford owners who have trouble with grease working out of the rear axle will take the wheel off on the side that is caus-

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ing the trouble, remove the cage of roller bearings, then take some strips of cloth two or three inches wide, wrap around the axle, and at the same time keep pushing it in with a small iron rod till the housing is about two-thirds full, not solid, but just what will go in easy, they will find it will remove this trouble. Woolen or old underwear make the best packing. My car was packed in this way two years ago and has caused no trouble since.

Radiator Fastening.

From F. A. Dooley, Nebraska.—I will make a suggestion to Mr. C. Avery of Florida. A very neat looking and the best rigging I know of to tie a radiator, such as he describes, down, is made as follows:



Sketch of the Radiator Fastening.

Take a strip of heavy galvanized iron, A, long enough to reach from one side of the car frame, B, up over the top of the radiator down to the other side, C. Cut a hole in the iron to fit over the filler tube. Take two ⅜ inch bolts, D. Cut heads off, flatten out for about 2½ inches, as at E, and rivet one to the lock end of the rigging. Run these bolts through the holes in the frame and screw up the burrs. He must solder the studs back on the bottom of the radiator but must throw the burrs away. If there isn't room on each side of the filler cap to allow enough of the band remaining after cutting the hole, take a ¼ inch iron rod, F, and make an oval or square to fit over the filler tube and rivet the side bands into this, like drawing.

Remedy for Oily Spark Plugs.

From Merle M. Zentz, Nebraska.—In your February issue, under the Trouble Department, No. 1528, in regard to oily spark plugs in a Buick model 17, 1910, I will say that I have had the same trouble in nearly all the older models of Buicks. Personally I have the best success in overcoming this trouble by lowering the oil level in the crank case. I usually do this by simply cutting the dippers off on the lower end of the connecting rods so that they dip into the oil 3/16 or sometimes only ⅛ inch, depending on the seriousness of the trouble. A crank case may be easily measured, both top and bottom by laying a straight edge across and then measuring down to the oil level and also to the end of the dippers. I like this method much better than to cut notches out in the case as I have seen some do, for it is much more easily remedied than is the other in case a mistake is made. Try this once and you will keep up the practice.

Improved Running.

From John Tye, Minnesota.—I own a Ford, model S roadster, 1908. It is still in good running order, I having run it nearly 12,000 miles the last two seasons. I am overhauling it at the present time and expect to run it for another season at least. The only trouble of any consequence that I had with it was the timer. The popping in the carburetor was caused by the nut which fastens the wire being too large, which explodes No. 3 cylinder, and when I advanced the spark it would touch the frames of the engine and cause a short circuit. I filed off a part of the nut and have had no trouble since. I have a magneto attached to my car which runs it fine and saves me on my battery bill. When I first got my car I ran it on batteries altogether and after they had run a while it would miss and did not run very good. Since putting in the magneto and master vibrator it works fine.

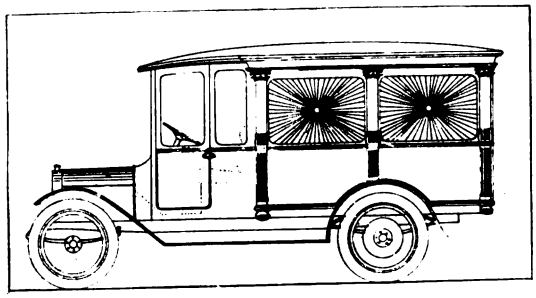
Tank Rattle and Plug Leaks.

From M. C. Underhill, New York.—Referring to inquiry No. 1542 by Chas. O. Farrar, Massachusetts, who is troubled with a rattle in his gas tank, the noise is probably caused by one of the baffle plates, which has become loose and is bouncing around inside.

Also tell C. G. Bierbauer, Minnesota, No. 1528, to see that his spark plugs are tight. I also have a model 17 Buick and have been troubled in this way and find that any leak around the spark plugs, or if the valves are not timed correctly, will allow the oil to work into the combustion chamber.

Hearse Bodies for Buick Cars.

In relation to hearse bodies for automobile chassis, it may be stated that the Walker Carriage Co., of Merrimac, Mass., supplies them for Buick and Cadillac cars, but not for the Ford car, as they do



not consider this chassis strong enough for the service. The illustration shows a hearse body fitted to a Buick model C 4 chassis.

That Loose Motor.

From P. G. Liederbach, Minnesota.—I believe the reply to No. 1549 in the February issue is a very reasonable one, although I think the studs were crystalized instead of the flanges of the cylinders. A car that has seen five years service has had a great deal of strain on these studs and although these studs were designed to be of proper size they have lost a great per cent. of their original tensile strength. Sometimes one or two studs will work loose. Should this happen on one side there would be only one stud

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on that side holding. This could very easily break and with the slack in the other two the block could rock, a condition that the weakened studs could not stand. Although the studs on the other side of the block might be quite tight, the result would be that the flanges of the cylinders would break off very easily by reason of the side strain. I would advise this reader to put in all new studs a thin paper gasket between the cylinders and crankcase, and when putting the cylinders on use washers under the nuts and tighten mighty tight. There is not the ghost of a chance of a crankcase explosion doing this damage, as any explosion in there could not affect the cylinders in the least. The pressure would come against the piston all right, but these are tied to the crankshaft by the connecting rods and the explosion could not reach the cylinders except at the walls and this pressure would be exerted transversely and therefore would not affect the studs.

Battery Ignition Favored.

From P. G. Liederbach, Minnesota.—Much is said these days by magneto makers against battery ignition. They cannot be blamed for this, as that is the means of their livelihood and they feel as though others are encroaching on their business and they must put up a defense.

In the same way the gas light companies are fighting for their business against the electric light companies, claiming their light is the best. The question raised by Dr. Cunningham is that magneto ignition is better than storage battery ignition. I think not. Those who have used battery ignition for several years have no cause for complaint. The rats' nests of wires are on every car that is electrically lighted and started, whether it has a magneto or not. On some cars these wires are ingeniously concealed; on others they are open. They are there just the same. The more they are concealed the harder it is to locate and repair trouble.

To make starting easy, you want a good, fat spark. This you get in battery ignition. If there is any one time that you get a good spark out of a battery that is better than another time it is when the car has been standing with the engine still, and this is just the time a good spark is needed, because the engine is cooled off. We can't crank very fast by hand, neither does a self-starter crank very fast. The gas mixture is, as a rule, not good, by reason of leaks, etc., so we want a fair spark. Do we get this in a magneto? No; if we crank fast we get a fair spark. Dr. Cunningham says the faster the car goes the more intense the spark. If this condition were reversed it would be much better for starting. This is the principal argument against the magneto, because the fat spark comes after the car gets under way.

Nearly all cars now have electric lights and where electric lights are wanted when the engine is still, a storage battery is needed, so the very fact that you have a magneto is not going to save your storage battery expenses. This battery you have to have anyway and the little current you use for ignition, compared with what is used for lighting and starting, is so small that you can hardly figure it at all. I have seen cars where the battery was so low that a hydrometer would not float and still would not miss a shot. If your car has a high tension magneto and this should fail some stormy night when you were a long way from home, what could be done in the dark? There is no other source of ignition. With the battery system, if your battery should fail, switch over on the dry cells and "beat it" home and look for your trouble as you get there.

And then to say that all a magneto needs is an occasional drop of oil, etc. This is putting it very mildly indeed. I have just sent a Splitdorf magneto that has seen three seasons service to the Splitdorf service station at Minneapolis to be put in shape, and the bill was the small sum of $25, and it has had attention from time to time right along. This word "service" surely is catchy and looks harmless, but I think a word could be used in place of it that would be more appropriate, then people would be more careful.

That Jackson Car.

From Joseph Fahey, Connecticut.—I notice in your February issue under the Trouble Department a complaint from Mr. B. H. Prior, Oregon. As I am an owner of an M/35 Jackson I think that I can help him out of his trouble. The engine in this machine is the N. M. & M. Co., and I notice that Mr. Prior has the same trouble that I have had and found that it was all in the carburetor. The Model L Schebler will not fit between the crankcase and engine frame if you leave the old carburetor flange on. This wants to be left off altogether and fit the carburetor properly to the intake manifold. In doing this the holes will not line up properly, so take a rat-tail file and make the holes in the manifold about 1/16 longer and you will have a perfect fit. Then you will have to change the control, as all the new carburetors are built the same way. I had two brackets made to fit over a piece of round steel, 3/8 inch, so that they were adjustable. I made two small brackets to fit the steel on each side of the frame, and run it across the back of the fan bracket.

I also notice that Mr. Prior has tried a 1 inch carburetor. The proper size to fit this car is the 1¼ inch. I have been using the Model L Schebler for about six months in all kinds of weather and it has given perfect satisfaction in every respect, and I am able to throttle the engine down so that it will just turn over. I trust that this information will benefit Mr. Prior.

Motor Indigestion.

From E. S. E., Ohio.—Just a word, please, in response to No. 1533, W. F. K., Indiana, under "Mixture Too Rich" heading. I experienced the same trouble three years ago, and only by very careful study and some experiments, I located the difficulty. Firstly, I would say that the mixture was too rich twice! In the first place it was too rich in quality and secondly it was too rich in quantity. Furthermore, the entire alimentary of his car needs a decidedly violent physic. If the good brother will by carburetor adjustment cut off about 15 to 20 per cent. of his gasoline he will observe quite a difference. Then again, if he will add about a quart of common kerosene oil to his next tankful of gasoline he will observe a greater difference, and yet again, if the next time he runs his motor, while it is still hot, take out number one and number three spark plugs and by aid of a common syringe, squirt about a tablespoonful of kerosene oil over the top of his valves and piston heads and then let it stand

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still over night before starting his motor, he will discover, by holding a white handkerchief about six inches away from the end of the exhaust pipe, that he has effectually cleansed the machine and both he and his motor will feel a whole lot more like working. To use a term common among the medical fraternity his motor is afflicted with "Pylonic and Intestinal Indigestion," and if it was a human it would be auto-intoxication or self-poisoning. Too much food is decidedly bad for anything. If we eat more than we can easily digest, it will ferment. And a gas engine is a mighty close approach to the human being in this particular respect, besides, such troubles usually have a tendency to disturb the continuity of one's religious intent.

Spark Plug Gaps.

From J. Bonebrake, Indiana.—Some owners of automobiles are frequently buying new spark plugs. They come to me to fix their old ones. I have run a Ford car nearly seven years but do not even think of spark plug trouble. I set the gap of my plugs just wide enough to take a thin dime and make each gap absolutely the same. If any one has a better remedy than this for spark plug trouble I would like to know it.

An Easy Constructed Turntable.

This turntable will be found not only useful in a garage, but simple in its construction. In Fig. 1, the top of table A, is made by crossing 6 inch planks, as

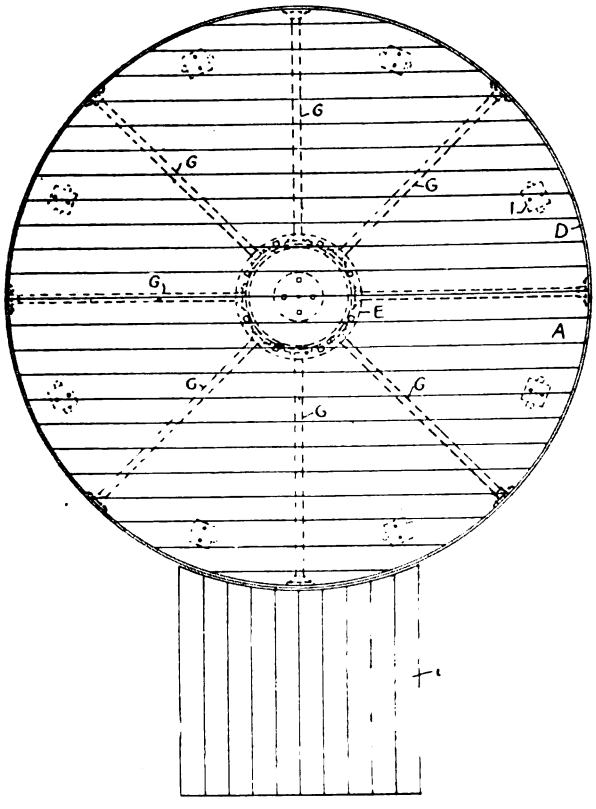


Fig. 1.

better shown in Fig. 2, at B and C. On the edges is an iron hoop D, to preserve the edges of the timber. At E we have an angle iron hoop, as well as at F. At G is a 1¼ inch pipe, with ordinary floor rail sockets H, which in turn are bolted to hoops E and F, and act as a brace for the top of the table. We have at I, ordinary truck rollers which ride in an L shape iron runner. K is the pivot on which the turntable revolves. This turntable is built up above the floor to do away with the expense of the con-

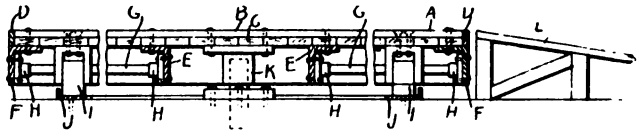


Fig. 2.

struction of a pit to receive the turntable, and therefore it is necessary for a runboard, shown at L, in Fig. 1 and Fig. 2.

TIRE EXPENSE.

Care and Attention Necessary to Their Proper Wear and Service.

From D. H. B., New York.—The question of tire expense has always been a serious one for the motorist. But when tires receive the care and attention which they should have, tire expense will cease to be an impediment to the enjoyment of motoring. Many drivers have little or no regard for the life of their tires, trusting mostly to luck to carry them through.

Often the life of a tire is shortened by being applied to the wheel so that it is out of alignment. This tends to wear the tread unevenly and soon disables the tire. A little care in applying, to see that the tire is even all around the rim, will save many dollars for the owner. I have personally seen a man using a common hammer in removing a tire, and he was pounding the sides of the tire with all his strength. Of course, he succeeded in getting the tire off—but at what cost? Certainly he bruised the rubber and fabric and laid an excellent foundation for a quick blowout. A little patience and the proper tools would have been more efficient and left several hundred miles of added service in the tire.

Furthermore, many persons carry their extra tires without any covering or protection whatever, exposing the rubber to the deteriorating elements of light, heat, dust, water and the sun's rays, and when they have need for this tire it has become partially baked and the real rubber-life far spent. Another point to consider is the care of tires when the car is to remain idle for a considerable period. It is a conceded fact that if tires are permitted to sustain the dead weight of a car for a long time, they will become sufficiently flattened at the points of contact with the floor to pound the tread loose when they are put into service again. Then, too, it frequently happens that the garage floor is damp, and if tires remain on a damp floor the fabric will absorb the dampness and become greatly weakened. This is one of the many causes which starts the process of tread separation. The remedy is simple—jack the car up each time it is brought into the garage.

A man has the right to expect "service" from a tire, provided he purchases a high-grade one, but he must be willing to take reasonable care of his tire if he would receive "extra service." The use of chains will materially shorten a tire's life, and they should be employed only when absolutely necessary and removed immediately they are no longer needed. But how many put chains on for a rainy day and

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permit them to remain for a week, even though the roads have long since become dry?

In using chains the cross-members should always have plenty of play to distribute the wear on the tire.

Some people claim to have been fortunate in the use of "second" tires. While some "seconds" wear well, from my experience I believe that in the end they are more expensive than "firsts." This may be a matter of opinion, but I have seen a tire which cost $27 and which after a few hundred miles of service was utterly ruined by a six-inch blowout along the bead, and the owner had absolutely no redress. This is only one case. I could cite many more.

It is no doubt a fact that more tires are ruined through under-inflation than from all other causes combined. If one would keep his tires inflated to a pressure of eighteen or twenty pounds to every inch of cross-section of the tire, he would be quite free from blowouts. Even during the hot weather this pressure should be maintained, as it has been conclusively proven that the extra pressure caused by friction is so small, it need not be considered. But care must be taken to see that the tubes are of the best quality, for in reality the tube is the "heart" of the tire. Red tubes seem to give the best satisfaction and will withstand the heat exceptionally well.

Tires well inflated add to the efficiency of the car, for it takes less power to operate the car when the tires are hard. Tires properly inflated also have much less tendency toward sidewise distortion, when there is a severe strain on the tire bead.

As an illustration of a case where proper inflation was entirely disregarded, a man stated to me that his tires (3½ inch) couldn't very well blowout, as he only kept thirty-five pounds pressure in them. He was defeating the very object which he sought to overcome—for he had just half enough in his tires.

To-day tire construction receives as much scientific consideration as the car itself, and with proper care and intelligent use there is no reason why tires should continue to be a source of great expense to the car owner.

NOW A WAR ZONE.

Notes of an Automobile Trip in a Land Now Devastated by Conflict.

From Felix J. Koch, Ohio.—When Europe settles down to its normal self once more, go try for yourself and be convinced. If you can find a more delightful bit of touring than that from Banjaluka to Rjeka—"Jacje" it is pronounced—in the Balkans, over as good a road, among as quaint a people and in a land where government hotels are as cheap and as good, we'll take off our hats to you, proceed thence, and say thank you, at end.

To begin with, when Austria-Hungary built those roads down in Bosnia she was being put on her mettle. Austria-Hungary was given permission by the Powers to occupy Bosnia, after the upset of the '70s, and realizing that what would start as a temporary occupation would mean actual acquisition as soon as the folk down there acquiesced, she proceeded to give Bosnia the world's model government, until Uncle Sam tried to imitate on the Isthmus of Panama. So you have roads winding through the mountains and crossing the streams and scaling the heights by easy stages. Well, when we say that we even let Roosa drive the machine on those hills, you can guess how good the roads must be.

Then again, Austria knew that to advertise you must get people to come down and see, so she opened hotels of her own, established rates and tariffs and to-day you can get more for a shilling or a quarter in Bosnia than two dollars and fifty cents will give you in a New York hotel. That, though, is just incidental to the actual tale of the touring.

To save time we had the machine shipped from Fiume, where we landed, to Banjaluka, where we really struck Bosnia. Thence we entered what is to-day the real war zone, the last real news from there being that Montenegrin troops were swarming over the land. We stopped at night at Bajaluka and we'll never forget the charm of it. Then next morning we went on to explore, first the environs of the city, then out that road which leads, not straight as an arrow, but by mildest ascent and gradient, through those wonderful Balkan canyons to the other town. Every foot of the way had its interest.



Well Loaded.

Roosa had just paid the hotel bill and he was radiant. "Think of it, $1.20 each for that room for three nights; that big room and everything a man might desire."

Roosa paid for the gasoline at the garage, careless of what it cost; the saving on what he expected to spend for hotels would more than equalize. In a merry mood, therefore, we started out.

The way led past the little shops of the Moslem inhabitants—the Turks—people call them, though they are no longer Turkish subjects and haven't been since Austria made her occupation some half-dozen years or so since. The shops are of one story. At front there is a great open window, down from whose upper sash the prize wares suspend. At the store front is a counter, and around the sides shelves hold wares, visible to all from the street side. And so we jogged along slowly and we stopped to buy what we would. That is the charm of motoring in bazaar-lands; you buy from your auto and pile in the machine and go on as you choose.

People walk in the street itself, in most of these countries, and strange folk very often they were. Once it would be a Serb priest in a long black robe, black fez, long black beard, crossing squarely, and Roosa would snapshot him as he went. Again it was Turkish women, dressed in black gowns, their

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heads swathed in windings of white linen. You never so much as address a Moslem woman in the Balkans, so Roosa got those pictures on the sly. Meanwhile we noted how those swathings about the heads of the damsels were folded so that a slat, or eave, permitted them to look on the walk as they went.

As we reached the outskirts we took on speed,



Watching Us Pass.

naturally. When a Turkish hodja, or priest, in splendid white turban and gown, crossed ahead, Roosa hardly dared toot the horn and order him out. It pays to respect Islam when traveling in Bosnia. Other men, we found, on this roadway wear the turban throughout, preferring it to the fez, as being warmer for use in the uplands. Only the hadjis, or pilgrims, who had been to Mecca might have beards, per the faith, and so we commented on these all but smooth-shaven men as we passed. Most men had a moustache, but not all of them.



The Coffee House.

Only certain classes, we soon learned, might wear green turbans here.

The speed that we traveled at means nothing. We'd hardly come out of low, after stalling abruptly, before Roosa stopped short once more for a snapshot on the way. The women sauntering townward, in their clog shoes, detained him; three Bosnian Christian peasants a-horse, each with red fez, white shirt and sleeveless coat of sheepskin.

At last we got well on our way into the mountains, their slopes well cultivated though wearing few trees. Here there was magnificent scenery; there were brooks and cascades and serpentines of roads. But more than all, there were wayfarers to attract us. Again and again we slowed up and went slowly to side while Bosnians quarreled with the donkeys they straddled, to get them to give us the way. Sometimes the peasants walked beside them and were likewise stubborn and we had to bide our time to get by. In due course we passed through a settlement, old two-story frame huts, with verandas along their second floor and a bazaar in the corner room of the first story. Turks were in charge of all and they hardly gave us a look as we passed. On beyond splendid plums were ripe at the roadside, or hung from branches protruding over the walls to the pastures, each side the pike. As we nibbled stolen sweets there, we traveled onward until Turkish homes, some of great size, their second-floor windows latticed, the first floor on a level with the wall built round the yard and so invisible to us, came to



A Devotee of Islam.

hand. Along the right, a creek ran all the way at a good rate, rippling around the feet of the mountains, but well curbed off the road.

Now and then some Jewish trader would be encountered, his cart laden; shrewd at his bargains and so disliked, yet patronized, for he did sell things cheap to all. Then more homes, plaster-coated, wider on second story than first, put in appearance. From these we rounded to a cemetery at the foot of the slopes. Turbans grace the headstones of the men in the Moslem graveyards. The stones for women are plain; often there is no stone and there is no casket at all. On our right and left the Balkan mountains grew higher. Stupendous peaks and crags began hemming us in. Forty years ago who went through here did so at his peril; to-day it was so safe we might have stopped for a "blow out," and a thousand inquisitive peasants gathered round to look on, yet not one untoward incident would occur.

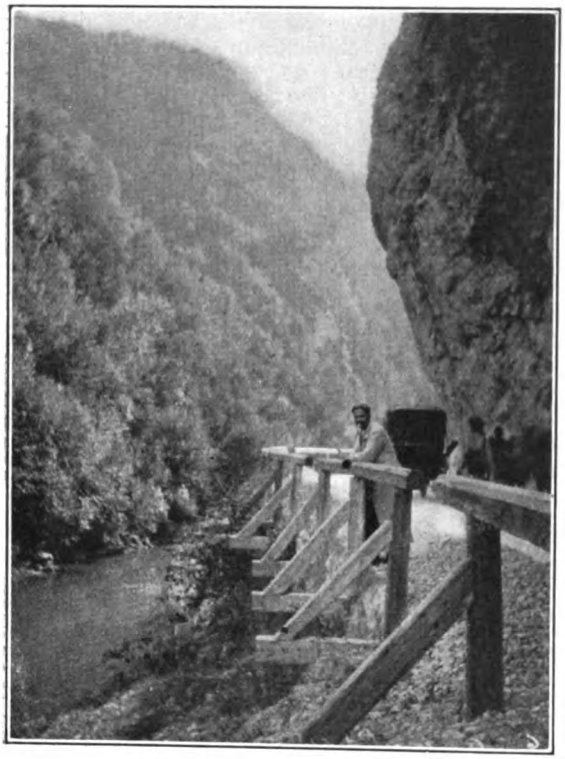
Corn fields, plum orchards, yielding the prune for the "slivowitz." Then mountain forests, dense, impenetrable right side and left. At their feet our brook, now a very blue river, with cascades and riffles to make it sing and then roar. Sometimes goats in numbers, or cows, would be seen on the foothills. Again, donkeys, with panniers laden with pears, would rest next some telephone post at the roadside.

We had exhausted the film we had handy and

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Roosa wanted to get at our trunk back behind. Nestling at the roadside was an inn. Its white plaster-house walls bespeaking a clean hospitality within.

If you have ever traveled the Orient you know how irresistible the inns are. You stop for Turkish coffee at each of them, and you halt as much to chat with the old, turbaned Moslem who has the place in charge. Roosa stalled—I vow he did it on purpose—then, before we could question, he had shut off the gas. By that time, bearded Islam was out upon us. He had the usual tray, with its two tiny, round saucers of white porcelain, with pattern in red and blue. Into these saucers—bowletts perhaps are better—(they had no handles and so were not cups)



Some Scenery.

went the strong Turkish coffee, which one drinks without milk always. As we halted the Turk poured more coffee from his small, brass, sharp-mouthed canister into two more cups, the sugar already in. As the mass melted and sweetened, we drank of the other. Then he brought ice-cold water to wash down the grains, for in Turkey the coffee is ground fine as powder and you really drink grounds, thus, and all. Furthermore, the water settled the bits of caffine on the palate and you get an after-taste that lingers till the next stop.

Naturally, Roosa must have a second order of coffee; it is but two cents a cup, so who would object. Our host invited us to the summer-house across the road. We could only enter, however, when a Moslem woman, already there, had retired. Then Roosa posed him for pictures and posed native guests in the meal room. We lost half an hour at least in the place.

Only then did we launch anew for Rjeka. A long ride, a fascinating one, still, in prospect. But what matter, whether we got in at dusk, or at sunset, or by moonlight, who cared? We were out to see things, to enjoy the wonderful touring. We could never rely on memory or note-books to bring it back. Long after our tour we could enjoy those pictures. So we pardoned Roosa the delays he had occasioned again and again.

To-day, in fact, every time we look over the collection we get a fresh hankering to tour downtown there once more. Things may be a bit primitive; you may miss some things you are accustomed to, but in our opinion this nook of the Balkans, is the motorist's happy hunting-ground of the world.

THAT NEW GASOLINE.

Much Is Promised But It Does Not Disturb the Standard Oil Company.

Secretary of the Interior Lane has announced the discovery by the United States Bureau of Mines of two chemical processes, one of which, it is claimed, will be of much importance to the oil industry, greatly increasing the supply of gasoline, while the other may make the United States independent of the rest of the world in regard to important materials necessary for the dye industry and the manufacture of high explosives used in warfare and in engineering operations.

The first of these processes it is claimed will enable the independent refiners in this country to increase their output of gasoline from petroleum 200 per cent. or more. With an estimated production on the part of the independent refiners of 12,000,000 barrels of gasoline in a year, this will mean an output from the independents alone of 36,000,000 barrels, greater than the total production to-day from all sources.

The second process includes the manufacture from crude petroleum of what is known chemically as toluol and benzol, both of which have heretofore been obtained from coal tar. As Germany has specialized far beyond other countries in by-products from coal, the United States and the rest of the world have been dominated by that country as regards those products of toluol and benzol which are the important bases for the production of dye stuffs and high explosives, and especially smokeless powder.

The discoverer of these two processes, after many years of research, is Dr. Walter F. Rittman, chemical engineer of the Bureau of Mines, the work having been done at Columbia University, New York, the facilities of the laboratory there having been turned over to the Federal Government by President Nicholas Murray Butler.

Application has been made by Dr. Rittman, on behalf of the Federal Government, to patent these processes in order to prevent any monopoly in their use, the patents to be dedicated to the whole American people.

"These processes," said Secretary Lane to-day, "are fraught with the utmost importance to the people of this country. For some time the Standard Oil Company, through the great amount of money at its command, through its employment of expert chemists and through its extensive organization, has had a big advantage over the independents in the production of gasoline, this company having a patented process that obtains for it as much as three times the amount of gasoline from a given

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quantity of petroleum as the independents now obtain. There are two or three other large corporations that have an efficient process for the manufacture of gasoline, but the independents as a whole have never been able even to approach the results obtained by the Standard Oil Company. Now the Federal Government, through the efforts of Dr. Rittman, proposes to make free for the use of all of the people of this country who wish it, a process that is confidently expected to increase their yields of gasoline from crude petroleum fully 200 per cent. and perhaps more, such results having repeatedly been obtained in the laboratory. It is claimed by Dr. Rittman that his process is safer, simpler and is more economical in time than processes now in use and these are economic factors of great importance. With a steadily increasing demand for gasoline for automobiles, motor boats and engines, this fortunate discovery comes at the proper time. It is but two years ago that the automobile industry, fearful that the supply of gasoline might not be adequate for its rapidly expanding business, offered through the International Association of Recognized Automobile Clubs, a prize of $100,000 for a substitute for gasoline that would cost less than gasoline. Happily the urgency of this situation has passed and at the present time there is a plentiful supply of motor fuel to meet the immediate demand. This new process adds to the hope, that in spite of the wonderful growth in the use of gasoline, there may not be any shortage in the future. It indicates an increased production of gasoline from the present production of petroleum—an output of 50,000,000 barrels instead of 25,000,000, as under the present methods. It will render free for use to all, the results of that efficient and intelligent research which has heretofore been only at the command of the wealthy. I am led to believe that it will not only be of inestimable value to the refiners commanding but limited capital as well as those of wealth, but also to the hundreds of thousands of users of gasoline. When it is realized that the gasoline industry each year in this country yields products amounting in value to between $100,000,000 and $150,000,000, the importance of this discovery is seen."

In relation to this matter, a Standard Oil official has stated that their company has not taken the announcement of the new fuel seriously, although it is admitted that nothing is known of Dr. Rittman's discoveries. The company took the attitude that if the patents were given to the public it would be able to use them as well as anyone else.

The Standard Oil Company also pointed out that benzol and toluol can be produced from very few crude oils and that millions of pounds of coal tar products are yearly burned under coke ovens, and that these products could be utilized in producing benzol and toluol if it were not cheaper to buy them from Germany. No allowance, however, was made for the fact that Dr. Rittman's new method might make the cost of manufacture so low that it would be cheaper to make these products than to import them from Europe.

The slightest escape of current will quickly run down a dry cell. Moisture in the paper covers, occasional touching of metal to the zinc binding post, incomplete opening of the switch, and too much testing with an electric meter, are all prolific sources of no current.

A Work Bench for the Garage.

This work bench is constructed entirely of angle iron, and also has a metal top made of sheet iron, A, as shown in Fig. 2. On one end, as shown at B, Fig. 1, is four drawers to keep tools, etc., in, and will be found very useful in a bench of this kind.

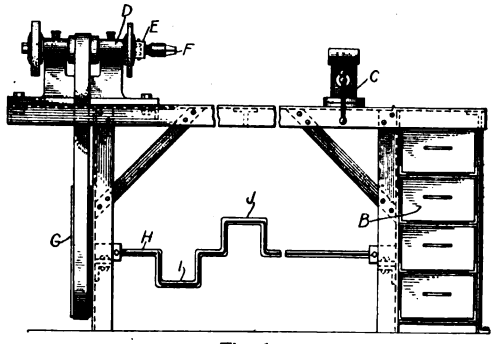


Fig. 1.

There is also a vise, C, to hold the work in as this is useful in many cases of repairing. At D, is an ordinary emery stand which can be used as a speed lathe by boring a hole in the nut, E, and fastened to it is a chuck, F. This can be used for filing pins and for

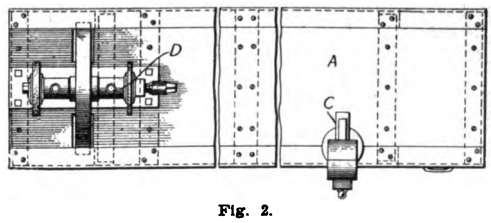


Fig. 2.

a number of small jobs that have to be done on a regular speed lathe. You can also use a circular brush in the chuck for cleaning bearings, etc. The emery stand is operated by a large belt pulley, G. The pulley, G, is mounted on a shaft, H, which is

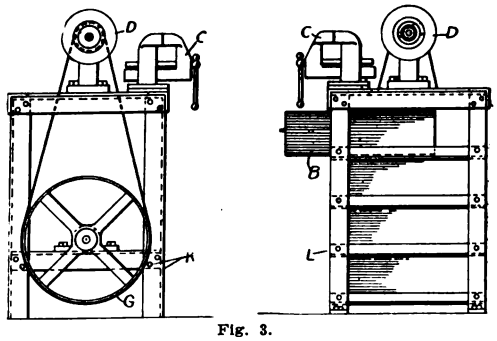


Fig. 3.

shaped as shown in Fig. 1, with foot pedals I and J. In Fig. 3, at E, is an end view of the bench showing pulley, G, and construction of the bench. At L, Fig. 3, is also an end view showing the drawers and construction of the bench. This work bench is 8 feet long and 2 feet wide by 2 feet 6 inches high.

There are three principal points of lubrication in the Ford car that should receive special care. The crank case supply, the universal joint and the differential gears.

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EIGHT CYLINDERS DISCUSSED.

Indiana Engineers Differ in Their Opinions as to Their Merits.

Eight cylinder motors were discussed at length in the regular meeting of the Indiana Section of the Society of Automobile Engineers last month, in Indianapolis. The speaker of the evening was J. O. Heinze, chief engineer of the Northway Motor & Mfg. Co., of Detroit. The central theme of his discourse was that "the nearer we approximate the turbine in smoothness of action the closer we are to the ultimate or ideal condition." He reviewed the problems of the eight, reciting its difficult manufacturing points rather than elucidating its most desirable points. The particular advantages of the eight which he pointed out were its unparalleled smoothness of operation which made the wear and tear on the parts less than on a motor of fewer cylinders. Its ability to accelerate better and to require less gear changing were cited as further advantages. Among the problems that arose in its design were proper lubrication without overdoing it, forked versus single connecting rods, accessibility, ease of repairing, adjustment of bearings, manufacturing cost, camshafts and valve timing, carburetion and efficiency.

The discussion that followed the paper was opened by W. G. Wall, chief engineer of the National Motor Vehicle Co. He pointed out that the eight of the same displacement as that of a four or a six-cylinder motor had much more rubbing surface in the pistons. He said that the eight had 40 per cent. more than a four and 17 per cent. more than a six of the same displacement. He built and gave up the eight-cylinder motor in 1909 because of expense of manufacturing such a design. He also pointed out that vertical vibrations in the chassis were not so objectionable as the sidewise ones of the eight.

Howard Marmon, chief engineer of the Nordyke & Marmon Co., gave an opinon that the eight was a psychological proposition rather than an engineering one and that what the public thought of it a year from now would be the criterion of its success. He pointed out that one could not tell the difference in vibration between well-built four, six or eight-cylinder motors to-day under ordinary running speeds. It was only down around three or four miles an hour that you could distinguish the difference between them, so he affirmed.

Elmer Apperson wanted to know how one takes up the wear in the forked connecting rods. Heinze explained that the angular motion of the outside rod was only 12 degrees in their motor and the wear was much like that on a wrist or piston pin. Paul Grimes, of the Wheeler & Schebler Co., said that George Schebler built a twelve-cylinder automobile motor in 1908 and drove it for three years. He then put it in a motor boat and is now building another.

George Weidely, former chief engineer of the Premier Motor Mfg. Co., pointed out that the six and the eight had about the same smoothness of torque and that the former was much more economical than the latter. Heinze had said in the discussion previously that smoothness, long life of motor parts, and little gear changing were more desirable than economy. Weidely suggested that if the public were not interested in economy, why were the results of economy trials on the speedway and elsewhere so interesting to them? O'Neil, of the Stromberg company said that his company had an eight-cylinder motor and had been making extensive tests with a view to adapting Stromberg carburetors for eight-cylinder motors.

A remark had been made by some one that valves placed at an angle would give trouble. Sargent, of the Lyons-Atlas, refuted this at once. He said that he had used valves as large as 16 inches in diameter at an angle without trouble. He added that if they tended to give trouble they used a flat seat instead of 45 degree one.

John Guy Monihan, of the Mutual Motors Co., gave a note on the psychology of the proposition. "Is one's social status going to be measured by the number of cylinders?" he asked. "We have only a few drays with the one and two-cylinders to-day," he jocundly remarked, "so now will the city man have to settle the difference with an eight or a twelve?"

George Dickson, of the National Motor Vehicle Co., when called upon said that so far they had not had any public call for an eight. Chas. S. Crawford, chief engineer of the Cole Motor Car Co., cited the fact that the number of inquiries depended upon whether you were prepared to furnish an eight or not and that from his point of view there was a decided demand for eights. Chester S. Ricker remarked that even horizontal valves such as had been used on the Lanchester cars in England for fifteen years did not give any great amount of trouble on account of their position. Heinze, when asked the relative efficiency of the four and eight-cylinder motors of the same displacement said that no absolutely accurate tests had been made by him yet, but that in one case some rough tests with two similar chassis having about the same weight and equipped one with a four-cylinder motor and the other with an eight made twelve and ten and a half miles per gallon respectively.

The question of ignition arose and Heinze said only Atwater Kent and Delco battery ignition systems were used at the present time, but he expected to see magnetos made that would work on an eight-cylinder motor.

Light at Night.

The only light that is useful in automobile driving at night is that which is thrown on the roadway. This effect may be obtained by painting the lower segment of the conical reflector and letting the rays that strike the upper part and are directed downward do all the lighting.

A simple method of avoiding the objectionable glare is to direct the light downward by bending the lamp supports so that the principal rays will strike the roadway about fifty feet ahead of the car.

It is a mistake to increase the power of an engine beyond the amount for which it was designed, no matter what means may be used. By so doing there is placed upon the working parts of both engine and chassis an excessive strain that may injure the whole car.

The contact points of the coils on the Ford car are of more than usual endurance yet they will pit after long use and require smoothing with a fine file to restore even running of the motor.

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Coming Events.

Springfield, Mass., March 22 to 27.—Automobile Show, the Auditorium; managers, Graham & Hobbs.

Mason City, Ia., March 25 to 27.—Automobile Show, the Armory; manager, Mason City Automobile Dealers' Association.

Oklahoma City, Okla., April 20 to 22.—Road race; manager, South Western Automobile Racing Association.

Boston, Mass., May 18 and 19.—Annual meeting of the American Automobile Association.

Indianapolis, Ind., May 29.—International sweepstakes; manager, Indianapolis Motor Speedway.

Galesburg, Ill., June 16.—200-mile race; manager, Galesburg District Fair.

Chicago, Ill., June 19.—500-mile race; manager, Chicago Motor Speedway.

Sioux City, Ia., June 25.—300-mile race; manager, Sioux City Speedway Association.

Sioux City, Ia., July 3.—300-mile race; manager, Sioux City Speedway Association.

Tacoma, Wash., July 4.—Speedway races; manager, Tacoma Speedway Association.

Visalia, Cal., July 4.—Road race; manager, Tulare County Automobile Association.

Omaha, Neb., July 5.—Speedway races; manager, Omaha Motor Speedway.

Burlington, Ia., July 9.—100-mile track race; manager, Tri-State Fair Association.

Denver, Colo., July 31.—Road race; manager, Chas. L. Newcomb, Jr.

Janesville, Wis., August 14.—Track meet; manager, Janesville Park Association.

Elgin, Ill., August 20 and 21.—Elgin road races; manager, Chicago Automobile Club.

A Simple Ratchet Wrench.

A ratchet wrench has been demonstrated as being the best and quickest way to tighten and loosen nuts.

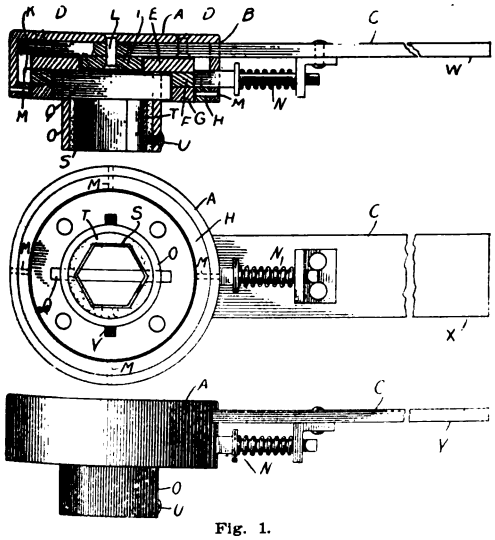


Fig. 1.

This design is simple and can receive nuts from ¾ inch to ⅜ inch or more. The construction consists of a 2½ inch pipe cap A, Fig. 1, with an opening cut at B, to permit the handle C to enter into and is held in position by rivets D. Then take five washers E, F, G, H, I, and drill holes J, in the washers E, G, F, as shown in Fig. 2. Rivet the washers together as one. F is the ratchet washer and is notched with a chisel as at K, Fig. 1, and Fig. 2. Washer I, is held in place by the rivet L, and is used as a center for washers E, G, and F, as well as the guide washer F, which is held in place by pins M. The catch N, is to engage in the notches K, to turn E, G, and F, by

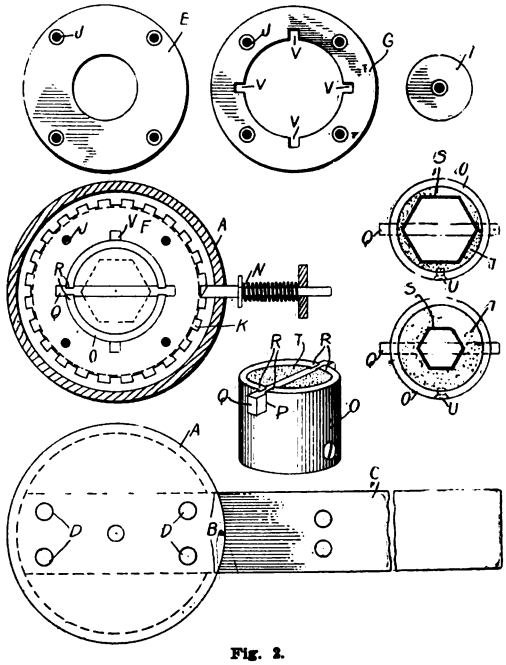


Fig. 2.

pulling forward on the handle C. Now take a 1¼ inch pipe O, and cut off as many pieces as needed for the size nuts and cut two notches P, Fig. 2, to receive a bar Q, and turn the edges over as at R, to hold the bar tight. Then take a piece of thin metal S, and form it, as shown in Fig. 2, on the different size nuts, and place it in the pipe. When this is accomplished pour melted babbitt or lead around it as at T, which is held in place by the screw U. Washers G and F have a recess to receive bar A. This ratchet wrench can reverse by reversing the catch N. In Fig. 1, at W, is a sectional view. X is the bottom view. Y is a side view and Fig. 2 shows detail parts.

Vulcanizing a Patch.

Several vulcanizations, one over the other, will make a better wearing patch, allowing plenty of time between them. Common gasoline now contains some grease, and a higher grade should be used for cleaning the rubber. The casing should be left on the demountable rim and fully pumped up when vulcanized.

To secure uniformity of solution the water and acid should be well mixed before pouring it into the battery cells. In mixing, the water should be placed in a porcelain or enamel ware dish and the acid added slowly, stirring continuously with a clean wood paddle. Mixing causes the mixture to become quite warm, and the solution should not be placed in the cells until it has cooled down.

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

Member of the Audit Bureau of Circulations.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, MARCH, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

ANOTHER WARNING.

Swindling subscription agents have found it profitable to solicit subscriptions for the Automobile Dealer and Repairer and doubtless many other publications throughout the country, putting the money collected in their pockets and never reporting anything to the publishers. There are several of these rascals now working around in different parts of the country. Sometimes, we have been informed, they have receipts printed to imitate the receipts of the various publishers so as to more easily deceive those they approach for a subscription.

Prospective subscribers are warned to pay no money to any man who cannot show an authorization signed by the president of this company and written on the letter head of this office. Regular subscribers, of course, send their subscriptions direct to us always as we allow no commission on renewals of subscriptions. If any reader is approached by one of these swindlers we hope he will kindly give us a description of the man, that is, as to his height, weight, age, color of eyes, whether light complexion or dark, color of hair, whether clean shaven or wearing beard of any kind and how dressed. We want to get on the track of these swindlers and put them where they belong.

THE DECEIVING EYE.

Car drivers should be aware—and many of them are aware—that there is none of the five senses so deceptive as the eye. For illustration, the eye often conveys the feeling that the automobile is going up-grade when it is really going down-grade, or down-grade when it is really going up-grade. One may be ascending a very steep hill indeed when seemingly there is but a slight rise, or he may be ascending a seemingly slight rise and wonder why his engine labors so strenuously in negotiating it.

We know of no reason for this anomalous situation or deception unless it be the grades of the surrounding country. For instance, it is possible that if there chances to be a steeper grade adjoining the road, the grade which the car is making may seem less by comparison. At all events, we know of no other reason to account for it, but if any reader has a different hypothesis we should be glad to know what it is.

But the eye is often otherwise deceptive in instances which are not so easily accounted for. Possibly some of our readers may have sat on the grand stand at a baseball game—assuming that they enjoy this pastime—when right beside them is an individual who claims that the base runner is "out at first," or other base, as the case may be. Yet to him the runner seems clearly not out. Now each is equally honest and sincere in expressing what his own eyes tell him, and it would be hardly fair to assume that prejudice accounts for the difference of opinion or feeling. It is largely due to deceiving vision.

Or one may be seated in a railway coach while passing a small body of water in a hilly country. Of course the water must be absolutely level, but does it often seem so? Or in the case of a running stream, does it not frequently seem as if the current were running up-hill, so to speak?

Interested readers may be able to throw some light upon this subject of deceptive vision, which is most important in relation to automobile driving.

SECOND-HAND CARS.

Occasionally letters are received asking advice as to the purchase of second-hand cars. Buying a second-hand car is like buying anything else that is second-hand. If it is absolutely what the intending purchaser wants, and he is sure of the amount and kind of usage it has had, he is likely to get a good bargain.

But the conditions surrounding all second-hand articles are not as favorable as new ones. If a man is looking for a new car he can easily find anything that is on the market, and he thus has a wide range for choice. He can get the kind, the model of the kind, or a choice of several kinds. He can also inspect them at his leisure, which he can likewise do in the case of a second-hand car unless it is sold at auction, when of course he is probably obliged to examine quickly and bid quickly. Quite likely the second-hand car is not absolutely what the intending purchaser would choose, but the chances are that he must take that one or no other. It is thus often a question of how much one is willing to sacrifice in personal choice for the privilege of a lower price.

Second-hand cars are not usually quite up-to-date, whether they are offered at private sale or at auction. This fact must be admitted unless it be assumed that the automobile art is not progressive, which would not be strictly correct. There is not yet and will not be for years to come, anything like the standardization of automobiles. There are too many different viewpoints, too many problems of engineering, too much to be learned concerning use

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and stress. If manufacturers do not learn something concerning construction or material from year to year, then they lack business ability and will soon fall behind the procession. It is true, the improvement may be slight, but in detail it ought to be something every year and for a good many years to come.

In the case of a vehicle that must carry its own power of propulsion, and that is driven with the speed of a railway train, there are problems of engineering and of construction that possibly may not have their match in any other piece of machinery made.

NEITHER PRACTICAL NOR ETHICAL.

Not content with robbing the railroads by its refusal to increase their compensation after the Parcel Post system was introduced, the Government later issued an order extending the service to packages of large size and increased weight, thereby depriving the railroads of carrying freight at a legitimate rate.

The Parcel Post was heralded as a great money-making proposition, and it ought to be, in view of the fact that all parcels are carried far less than cost, yet it appears that the Post Office Department is running behind and there is a suspicion that the Parcel Post is responsible for it.

Postmaster-General Hitchcock before his retirement, and when the Parcel Post was first inaugurated, introduced a system of special stamps with the laudable purpose of determining the exact cost of carrying packages. As the rates fixed were mere guesswork, the Government did not know whether it could afford to carry packages at present rates or not. It was therefore good business to try and find out about it.

The present Postmaster-General, unwisely it is believed, abolished the special stamps, and of course the department is now all at sea as to the real cost of the Parcel Post to this department. There is no possible way, under existing conditions, to solve the problem of such rates.

If a private corporation were conducted with a similar disregard, not only of business principles, but of justice as it concerns payment to the railroads for a stated service, it would either soon land in bankruptcy or achieve an unenviable reputation for business ethics.

A PECULIAR MANDATE.

An instance of somewhat fine distinction has recently come up in Peoria, Ill. It appears that the Ford Motor Company has compelled a garage owner of that city to change the name of his firm from Ford Repair Shop to some other name less suggestive of official Ford connection. The garage owner selected the name "The Repair Shop for Ford Cars"—but it is still doubtful whether this slight change will be found satisfactory from the point of view of the Ford Motor Company.

The accredited representatives of the Ford Company in Peoria contend that the use of the name Ford has caused them annoyance and loss of customers, and has led the public to believe that there are two Ford establishments in Peoria. Replacement parts and accessories carried by the Ford agents are said to have suffered in a cut-price war, and repairs have been carried out in a manner not agreeable to the Ford agent.

What kind of a new principle in law is this, anyway? Surely, any one whoever has a right to repair Ford cars, whether he is the agent for them or not, and having that right, he undoubtedly has the right to say that he does it, and either publicly or privately, as he prefers.

It will be interesting to learn what kind of a court of justice "compelled" the Ford repair man to change his sign as stated above.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The accounts of accidents received this month, as clipped from the newspapers, are largely what may be termed winter month accidents. That is, many of them were due to slippery roads and streets. In most cases of this sort they are not serious, for when the roads are known to be slippery most drivers naturally proceed with additional care, so if an accident does occur it is not liable to be as destructive as if the car were going at high speed. Some of the following are of the more unusual sort and it is hoped they will be a warning to careless drivers. Lack of space only makes the list a short one.

One Dead and Three Injured.—In Perry, Mo., a party of young people, who were riding in an automobile, overturned on a straight and fairly good road. The car was rapidly going down a slight grade and it must have hit a rut in the road or some obstruction. It swerved and immediately overturned. One young woman was killed and three others suffered broken bones and bad bruises.

Due to a Dog.—Near St. Louis, Mo., in attempting to avoid striking a dog that crossed in front of a car, it struck a curb and three of the occupants were pinned beneath it when it overturned. One was killed and three were seriously hurt. The valuable touring car was completely wrecked.

Plunges into a Gulch.—Two men were killed and two injured near Tacoma, Wash., when the automobile in which they were riding plunged 40 feet into a gulch below. There was a turn just before the bridge was reached and the driver attempted to make it without slacking his speed. The occupants were all thrown clear of the car as it began its fatal leap. It is stated that the driver had the appearance of being intoxicated, but he claims this is untrue. He asserts that his car was not traveling more than four miles an hour, while others claim it was going four times that speed.

Plunges into a Car.—Going at a lively speed from New York to Philadelphia, a man with his wife, son and chauffeur plunged into a crowd of high school girls near Trenton, N. J., and some of them were seriously injured. There was carelessness somewhere and judging from reports the chauffeur was to blame. When a body of high school girls, or any other girls, get to talking they are not likely to notice what is going on before them.

Dozing at the Wheel.—Near Taft, Fla., a young man left his father's home at a late hour to carry several of his friends to their homes. He then

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started to go on to Orlando where he was engaged in the motor livery business. His ride had been a long one and he may have been dozing while driving. In some manner he grasped the clutch and gave the wheel a quick turn, thinking he had reached an abrupt curve to which the machine was approaching. The car completely turned over pinning the young man beneath. It is likely that his death was instantaneous.

Gasoline and a Match.—A young man in Peru, Ind., lighted a match to find a leak in a gasoline tank shortly after dark. The result was that an hour later he was in the hospital with his entire body covered with burns. His chances for recovery are said to be poor. It appears that the gasoline tank sprang a leak and after some examination to locate this leak, a quantity of gasoline was poured into the tank to ascertain if it had been properly mended. The fumes of the gas came in contact with the flame of a lighted match and the explosion started a fire in the garage, which called out the fire department. The young man was seared from head to foot and his recovery is doubtful.

Just a Frightened Mule.—This is probably the only thing to which a serious accident is attributed in Bedford, Ind. A party in an automobile passed a man in a wagon drawn by a mule, and although the driver of the car succeeded in passing, the mule suddenly plunged ahead and seemed to be about to run into the car. The machine was overturned beside the road and the passengers were thrown out. One of the passengers had a broken neck and the others were seriously injured.

Will Need False Teeth.—Near Moundsville, W. Va., a young woman was thrown from an automobile, over the side of a bridge into a creek thirty feet below. The driver of the car was racing with another machine and not knowing the road did not slow down in time to make a sharp turn. He struck the side of the bridge and the young lady was thrown from the seat over the wall into the stream below. It was considered a miracle that she was not killed. As it was she had a good many teeth knocked out and was badly bruised.

A Drunken Driver.—A former teacher of Logansport, Ind., was run down and killed by a drunken saloonkeeper. The young man was not at all to blame and the accident is merely another illustration of the fact that whiskey is a dangerous thing to mix with automobile driving.

Tracks Obscured by Box Cars.—Two girls were instantly killed and one woman is dying as the result of a crossing accident in Jewel, Ind. The view of the tracks was hidden by a row of box cars and the front wheels of the automobile were almost on the track when the driver saw the train. He turned the car aside but the rear wheels caught in a cattle guard and the car was overturned, the rear end being thrown in front of the locomotive.

Struck an Ice Spot.—At Pittsburgh, Pa., one person was killed and three injured when a car slid across the road on an ice spot. The driver in an effort to keep the machine from being precipitated over an embankment, ran the engine faster and the car turned around twice and with the weight of the occupants on the downward side of the hill, turned turtle, killing one and injuring three as stated.

Steering Gear Broke.—One person was killed and two injured in Yonkers, N. Y., when the steering apparatus broke and the machine swerved off the macadam road into the mud and turned over, pinning the occupants beneath.

Crushed Between Automobile and Wall.—A driver of a sixteen-ton automobile, at Kenosha, Wis., failed to see a man behind his car and in backing it the man was crushed between the car and a wall and died instantly.

Slipped Down Embankment.—At Atlanta, Kan., one woman was killed and two badly hurt when the wheels of the car in which they were riding slipped and went over an embankment. The driver had turned out to allow another car to pass and drove too near the edge of the road.

Failed to Take a Curve in Time.—One woman and three children were severely injured near Orange, Texas, when the driver of the car in which they were riding did not take the curve as soon as he should, causing the car to overturn and go into the ditch. The car was completely wrecked.

Rear End Collision.—At Alliance, O., one man was severely injured and remained unconscious for nine hours, when a touring car going at a high rate of speed, overtook the runabout that he was driving and crashed into his car from the rear. He was thrown from the car and landed on his head. The touring car proceeded to strike a telegraph pole, climb a terrace and plunge into a front window of a residence, demolishing the glass. The driver of the touring car stuck to the wheel and escaped injuries.

Steering Gear Broke.—Near Leipsic, Ohio, a man was driving in an automobile when the steering gear broke and the car ran into a ditch. The occupant was quickly killed and the accident occurred but a short distance from where he was born 59 years earlier.

The Life Saving Tire.—A young woman of Caldwell, N. J., was driving past a mill pond when her attention was attracted by the cries of a young man who had broken through the ice while skating. The young woman in the automobile tied a piece of rope to a spare tire which she carried and threw the tire to the man. He got it under his shoulders but the young woman was not strong enough to pull him out. She then saved the man by fastening the end of the rope to the automobile and jumping into the machine, switched on the power and had the man safely on the shore rather quicker than he relished.

A Frozen Radiator Explodes.—A young man in Ottawa, Ill., is suffering from a badly cut and scalded face, which he sustained when the radiator on his car exploded. It was noticed that steam was escaping from the radiator and that the engine seemed to be over-heating. On getting out to investigate, the radiator exploded. A piece of metal struck the driver in the head inflicting a severe cut and his face was badly scalded by steam and hot water. It is supposed that the accident was due to the freezing of water in the bottom of the radiator which stopped the circulation.

An Old, Old Story.—Near Porterville, Cal., a man was crushed to death when an automobile which he was driving turned turtle. Three other occupants of the car were injured. The car is reported to have been traveling at a slow rate of speed when the accident happened. A jammed steering gear is be-

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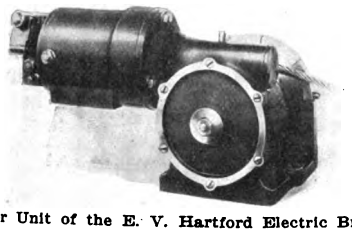
lieved to be the cause of it. The car was going down a gentle grade, when suddenly it lurched near a high embankment. It finally struck the embankment and was thrown one side and overturned. All the passengers but the one who was killed jumped from the car. He remained at the wheel and was crushed beneath the car when it overturned.

AN ELECTRICAL BRAKE.

Said to Give Complete Control of the Car and to Be Entirely Satisfactory.

Every motorist knows how inefficient his brakes become when once the lining is worn through. It becomes almost impossible to slow down without locking the wheels. This sudden locking of the wheels could be overcome by the presence of oil between the brake drum and band, and allow gradual slowing down, but the presence of the oil would make it almost impossible to bring the vehicle to a dead stop owing to the fact that sufficient pressure could not be applied by either foot or hand levers.

Thousands of dollars have been spent in designing automobile axle housings and parts to prevent the grease and oil necessary for the life of the axle



Motor Unit of the E. V. Hartford Electric Brake.

from coming into contact with the brake drums and shoes.

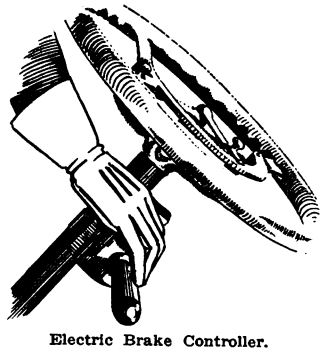
The Hartford electric brake completely reverses this order of things; the brakes are oiled with the result that a film of oil between the parts coming in contact must necessarily be squeezed out by the pressure of the brake so that the car is gradually slowed down automatically, and as the pressure overcomes the resistance of the oil, the brake becomes proportionately more effective. This eliminates any possibility of the harsh braking effect noticeable in the use of the ordinary type of brake mechanism which is so destructive to the tires. It is possible with the Hartford electric brake to drive an automobile at a speed of 50 miles per hour up to within about 35 feet of a right angle turn and easily make the turn at fifteen miles an hour.

Another result of this gradual but quick and effective operation of the Hartford brake can be seen in its relation to skidding on wet pavements. The car is slowed down gradually before the wheels are locked, so that the momentum is reduced to such a degree that there is practically none left when the wheels are stopped, whereas, with the brakes now in use the wheels are suddenly locked and the momentum of the car produces the skid.

The Hartford electric brake solves the brake problem not only on the automobile, but on every moving vehicle that uses electricity as motive power or has a generator or storage system.

The complete system is compact and light, weighing only about thirty-five pounds, consisting of a small type of the Hartford electric reversible motor, with a worm and worm wheel attached to a drum; to this drum is attached a steel cable, the other end of which is fastened to the brake equalizer arm.

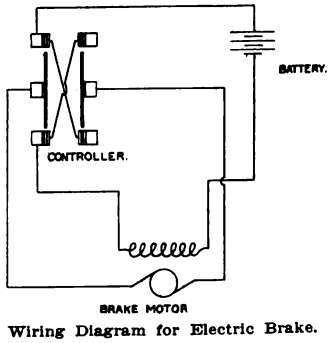
The most important and novel part of the Hartford brake is the patented controller which is entirely new, so far as the control of electric motive



Electric Brake Controller.

power is concerned. It is small and compact and placed within easy reach of the driver's hand as shown in the illustration. By this new device any desired nicety and fineness in braking effect is obtainable by purely electrical means. By actual demonstration a car of 60 horsepower weighing over 4,000 pounds can be controlled by the mere pressure of one finger on the operating lever. The operation of the brake is in fact so extremely simple that five minutes' practice will make any one proficient in its use.

With this type of switch a two-point control is given. The first point supplies enough braking power for service purposes and the second for an emergency stop. Pushing the switch back to its original position immediately disengages the brake. The whole system is very simple and can be summed up in a few words by saying that the usual manual labor connected with brake operation is displaced by the wonderful energy of the Hartford reversible motor. This motor is high-speed, series wound. The current can be applied by either a six, twelve or twenty-four volt storage battery, for automobile



Wiring Diagram for Electric Brake.

or kindred usages, but heavier voltage can be used with equal success, the motor being wound for these voltages.

This motor has on the end of its armature shaft a worm which, through a reduction of 100 to 1 drives a gear. This gear in turn operates a drum by an internal gear through a reduction of 4 to 1. This gives a total reduction of 400 to 1. On the

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drum is wound a steel brake-pulling cable which directly transmits the pull of the motor to the braking mechanism.

When running idle the motor is capable of 10,000 revolutions per minute, and when under load it can apply 1,000 pounds pull at about the same speed as would be the case with a quick application of the hand emergency brake. After 1,000 pounds pull is exerted on the cable a slipping clutch prevents any further pull and a ratchet prevents the brake from slipping off. Because of the powerful pull on the brake cable the brakes run in oil. The ampere draw in putting a 1,000 pound pull on the cable is 40 for 2/5 second, and the weight of this equipment for an automobile is about 35 pounds. The net weight would be less than this because the emergency brake lever and much of the linkage would be removed. The Hartford electric brake replaces the emergency set and is used constantly in service, this leaves the foot brake as originally installed for operation if wanted.

The death roll in motor-car accidents is increasing at a terrible rate, and any preventive such as a brake that will act almost instantaneously without requiring the driver to remove his hands from the steering wheel, that will be certain in its operation and that will be inexpensive to apply, and above all that will more positively insure the safety of the occupants of a motor car, is a positive advance in the art and undoubtedly has a wide field.

One great feature of this brake is that it can very easily be attached to any car now in use provided it is equipped with storage batteries.

Several Practical Suggestions.

From F. B. I., North Dakota.—If No. 1524, B. H. Prior, can get a Marvel carburetor to fit his car, I think he will have no more trouble from that source. If C. H. L., No. 1544, will also put a Marvel carburetor and an Atwater-Kent ignition system in, I think he will have a nice running car, and it will also start easy. I do not believe it pays to retread tires, the way they make them nowadays. We find it does not pay to even repair breaks unless the tire is practically new. The "dope" for repairing his radiator can be bought at most any supply store.

As to No. 1525, Gus Schleyer, he will need about a 15 candlepower bulb in each headlight to get a good light. A tungsten bulb takes about a watt and a quarter to a candlepower. A 10 watt lamp should give 8 candlepower. My theory is that the mixture in your car is too thin in starting. When the car is cold, jack up one hind wheel, open the carburetor adjustment about a quarter turn, and if you have priming plugs, prime the cylinders with a mixture of half gasoline and half ether. When warmed up adjust the carburetor.

The best book I have found on autos, and I have a good many, is "Care and Repair of Automobiles," by Clough, published by the Horseless Age, New York. This book will only set No. 1531, F. L. A., back a dollar and he will be well satisfied.

I do not believe No. 1547, E. C. W., can run his horn on a Bosch magneto for there are very few horns that will run on an alternating current.

Re No. 1548, Brizee: If you have not replaced the original timer and roller that came on your car, that is probably where your trouble lies, or possibly the vibrators are sticking.

A master vibrator will improve the running of a Ford that seemingly runs perfect, but rather than buy a master vibrator and put it on, I would get an Atwater-Kent system, then you get away from all vibrator trouble. I have put this system on several real old cars—a 1909 model 10 Buick, one of the first model "N" Fords and several others. The owner of the Buick said his car never ran better and the others "crack right along" as even as a clock. You can tell a car with this ignition as far as you can hear it by its even, sharp explosions. I am not putting them on with a "money back" guarantee. I do not want to give free advertising, but I am so enthusiastic about it, I cannot help but recommend it. Perfect ignition will cure a lot of motor ills.

If I could afford a six as No. 1542 can, I would spend $10 more and put on a Stewart vacuum system for gasoline feed, and get away from a lot of the trouble of a pressure tank.

Carment, No. 1532, is not the only one who has had an accident on account of the Ford steering gear. We use the "Little Steersman" which helps a great deal. It would seem as though the Ford company would remedy this trouble.

Oily Spark Plugs.

From E. M. Douglass, Missouri.—For the benefit of A. G. Bierbauer, Minnesota, No. 1528, February number, I will tell how I helped my Buick, 16, 1910. I had the very same trouble with oily spark plugs. They got so bad sometimes I would have to clean them in going 10 or 15 miles. The first thing I did was to use as long a plug as I could get and see that the point on the shell of the plug was down at the bottom when in place in the cylinder and the end must stand up past the point in porcelain, so that the oil cannot stand on the points and cause it to missfire. The next thing I did was to drill six 32-inch holes in each piston in the upper oil groove, slanting the holes down on the inside. I did this drilling on the front pair of pistons as I was not bothered in the others. This drilling seemed to help me some and in December I gave the car a complete overhauling and drilled four more holes in each piston, making ten holes in each one. I have not run the car much since overhauling it but I can run with the crankcase full of oil now where I could not do it before. I also lowered the oil in the crankcase just so the end of the cranks will barely tip the oil while standing level. This is very easy to do. Take off the bottom half of the crankcase and turn the crankshaft so two of the cranks are straight down. Lay a straightedge of any kind on the bottom of the crankcase and measure down to the lowest point of the crank, then put your straightedge on the top of the bottom half of the crankcase and measure down to where the oil overflows in the case, and if it is not the same as it was on the crankshaft measure cut the grooves down until it measures the same and your oil will not stand so high and the cranks dip so deep. Also be careful that the cotter pins in the ends of the crank boxings bolts are bent close around the nuts and not left full length straight out or they will help to throw more oil. I also put on two new rings on each piston a year before drilling these holes, but I could not see that they helped the oil business any until they wore down to fit the cylinder. Pistons or cylinders are not scored at all and I have good compression in all cylinders. I

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have very little trouble with my car, except I would get too much oil.

I also had a knock in the engine last summer that was hard to locate. Would notice it only when pulling real hard or running slow. I examined the cranks and took up all slack to perfect fit. The wrist pins were not loose enough to cause a knock, but I found it at last. It was a crack about six inches long just back of the magneto, on top of the hanger arm. When pulling hard the explosion in the cylinders would open this crack just a little and when it went back it would cause the knock. I had it welded and I do not hear any knock at all now. If any of the boys have a knock you cannot find, look for a crack in the crankcase somewhere and have it welded and see if the knock does not disappear. I hope this may help someone as it has helped me.

Wants Metz Car Information.

From A. W. Graham, New Jersey.—I have recently acquired a Metz 1911, 2 cylinder opposed, air-cooled machine, but on account of illness have only just started to overhaul it. I should be very much obliged to you if you could insert in your paper a short notice asking for experience with this particular model. I especially desire to know the kind of oil used and drops per minute (it has 4 sight feeds, two to cylinders and two to crankcase over connecting rods, the oil being forced by small centrifugal pump). Also the carburetor suited to this type of engine. (I had Model E Schebler, ¾ inch when I got it, but I think model 4 would be better.) Also whether the brakes are sufficient to stop it and hold it in the middle of a steep grade, and if not, if they have been able to countershaft or other brake which will do so. Also any information as to enclosing chains, lengthening frame or carrying passengers on rear seat. I have written the Metz Company for instruction book of this model, but they seem to be all out of them (although they sold them for three years) and they are apparently unwilling to give very full information of this machine. Its size, power, etc., suits me and the building I have to keep it in far better than the later and larger models. If you can give me any information by mail in regard to oiling, carburetor, brakes or running slow with magneto (which is Bosch model D. U. 2 fixed spark) should consider it a favor.

Those Missing Two Cylinders.

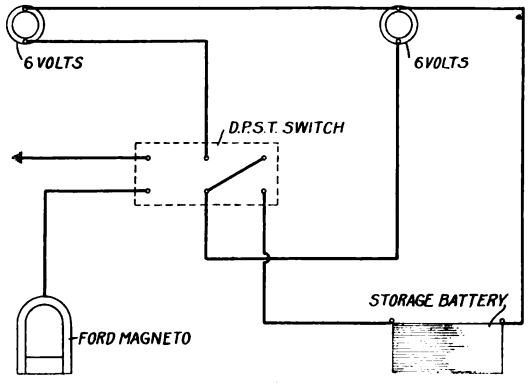
From Forrest Wilson, Arkansas.—In regard to No. 1534 in which Will & Co. state that they have an engine missing on two cylinders and are unable to locate the trouble, I wish to say that I am satisfied that they will find the trouble is bad connections between the intake manifold and cylinder ports on the missing cylinders. These cylinders are drawing fresh air through these points and are therefore getting very little or no gasoline. I find this to be the trouble a great many times when a motor will not run slowly or fire properly except when running at high speed or pulling hard.

Slopping Gasoline.

From A. Larson, New York.—I am just now reading the February number and will give one explanation to query No. 1542, "Snapping and Rattling." Some tanks are equipped with baffle plates to prevent gasoline from slopping. It is probably this that has come loose and naturally will cause a lot of rattle, as it slops back and forth in the tank; more so if the tank is nearly empty. I had that trouble once myself in a car with gravity feed, but after I located the trouble I took a pair of long pliers and got hold of the plate and twisting the same around, rolled it up so I could pull it out through the filler cap. I am of the opinion that this is Mr. Farrar's trouble.

Wiring for Electric Lights.

From G. H. Bolus, Ohio.—I have been impressed by the number of up-to-date cars which have had trouble in their starting system. It is usually the same trouble in all cases and is so easy to remedy. I refer to the acid from the storage battery slopping over and eventually forming a conducting path for the current, thus grounding and sometimes "shorting" the battery. An insulated battery box would entirely eliminate this trouble. It has been



Wiring Diagram.

a year now since I got a larger car (Buick 30) and sold my Ford. I never knew what real comfort in an automobile was until I got my Buick. I have worked out a system for a Ford whereby the electric lights could be used either on the 12 volt magneto or a 6 volt storage battery at will. The wiring scheme is as shown and may interest some of your readers. It is simply a series—parallel proposition.

Tire Reliners and Radiator Cement.

From Edward D. Mix, New York.—I will make a few suggestions for the benefit of No. 1544 in the February issue. Question No. 2—Had three different shoes retread, different makes. They all blew out long before I had gotten my money's worth. Retreads cost about as much (a little more) as a new shoe. No more for me! I now have "Innershoe" reliners that I will use until the shoe falls apart. I can use it then in another. No. 4—After using different makes, at the same price, I find "Se-ment-ol" the best radiator cement. It won't last forever though, maybe a month or so. I hope the above will be worth consideration.

Too much poor mineral lubricating oil will interfere with current delivery to the battery. A generator should not be tested with a six-volt battery current. It may burn out. The ordinary "monkey-wrench" mechanic should not attempt to repair a magneto or generator.

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A Spark Plug Fact.

From N. G. Near, New York.—Simply because a spark plug sparks nicely outside of the engine in the open atmosphere is not absolute proof that the plug will spark well when in service. This is a point that the great majority of automobile folks do not know and have never thought about. On giving the matter a little thought, however, you can clearly understand why there should be and is a difference in spark. Sometimes a plug will not spark at all in the cylinder, whereas it sparks nicely on the outside. Outside, the atmosphere is cool, clean and under atmospheric pressure only—14.7 pounds per square inch. Inside, the spark is timed to occur just when compression is about at its maximum. The gas in the cylinder is not pure atmosphere but is a combination of burned mixture, pure air and gasoline vapor. Besides, the compressed gas is hot although not yet burning. It is quite evident, therefore, that conditions are vastly different. In a vacuum a spark jumps very readily. In the open air greater voltage is required to force the spark across the same gap. Under pressure, and at the same temperature, the voltage necessary must be still greater. However, in the cylinder, the hotness of the gas partly overcomes the pressure drawback, for a hot gas is a better transmitter than a cold one. It is well known, for instance, that a favorite place for lightning to strike is down a hot chimney. This may be due partially to the rarity of the gas, which in turn is due to the high temperature.

A Word for Repair Men.

From A. W. Manering, Illinois.—I have been driving a model T Ford car for two years and have had very little trouble, and we have some very bad roads in Southern Illinois. I was very much amused at letter No. 1521 in the January issue. The writer certainly needs to do some hard study on gasoline engines. Would suggest that he get a copy of Dyke's Automobile Encyclopedia advertised in your journal. I agree with Mr. J. M. Barber. If doctors received pay for results only they would have to change occupations. Most owners, especially of the wealthy class, don't realize how hard the work and how greasy and dirty the repair work really is. They also expect their work to be done "right now," never thinking the trouble has to first be located which sometimes is a task where there is a wire broken inside the insulation or some slight knock develops in the motor. I hope to see the time when repairmen are paid for what the work is really worth.

That Master Vibrator Rattle.

From George W. Tappan, Connecticut.—In your issue under the inquiry No. 1505, concerning master vibrator noise like two coal scuttles rattling, I think if the inquirer will put a new middle shell in his muffler he will eliminate the rattle.

Care of the Battery.

F. E. Watts, chief engineer of the Hupp Motor Car Company, is authority for the statement that 90 per cent. of battery and ignition trouble experienced by motorists during the winter is due to carelessness and negligence on the part of owners. This is due to the fact that battery education has been sadly neglected by motorists. Most people look upon the storage battery as a "mystery box," and believe the less attention it is given the better. This is absolutely the wrong attitude. If there is one thing that requires a man's attention in the winter, it is the storage battery. The battery is the very life of a car. It is the source from which the engine derives its life. If the carburetor, as has been said so often, is the lungs of a motor, then the battery is the heart. Consequently, it should be given constant care and attention by the owner.

Tire Pointers.

In order that rubber cement shall penetrate and hold well on the fabric of a casing it must be thin and perfectly free from oil. Several successive coats, allowing each one to get thoroughly dry before applying the next, will give best results in repairing cuts and tears that extend down through the tread to the fabric.

A very serviceable blow-out patch that will take you safely home may be made out of tire tape. Clean the fabric around the blowout with gasoline, and apply strips of tape, first lengthways and then crossways, until the hole is well covered. Then cover the tape with a thickness of cloth to keep the inner tube from sticking, and the patch is complete.

When rubber cement has stood exposed to the air for even a short time it becomes too thick to give best results. But great care should be used in thinning it as the common gasoline contains some oil and is not suitable. High test gasoline or bisulphide of carbon should be used as a thinner.

The tube should be rolled flat with soft cloth between the layers, a strip of cotton flannel rolled up with the tube is good. The roll should then be placed in a thick cloth bag with the stem protruding, and the mouth of the bag be tied around the stem. It is a good plan to put talcum powder in the bag.

It is generally supposed that the greater portion of the weight of a car is carried on the rear wheels. This is only true when there is a full load in the back seat. Usually the front wheels carry one-eighth more weight than the rear.

A canvas bag filled with sand having a suitable diameter makes a good substitute for an air bag in repairing casings.

For the Gasoline Leak.

From Fred Pedersen, M. E., New York.—Seeing the inquiry of A. M., Indiana, in the December issue, I would like to offer a suggestion. I have remedied the same trouble by drawing the crankshaft timing gear up against the crankcase with the starting crank jaw and putting a thin washer between the jaw and the timing gear. If the Woodruff key which holds the gear on the shaft interferes, remove the gear and shorten either with a hacksaw or file. Care should be taken in drawing the gear against the crankcase, as it is very easy to get too thick a washer between the starter jaw and the gear, which might result in some rather expensive repairs. You will lock the crankshaft to the crankcase if too thick. I hope A. M. will understand and benefit by my suggestion.

Owing to the fact that the float in the carburetor is violently agitated when the car is traveling over rough roads, the gasoline level is practically raised, and more gasoline is fed to the engine than is needed.

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NEW 8 CYLINDER DESIGN.

The Ferro Is the Latest Type of V Shaped Internal Combustion Motor.

Among eight cylinder motors which recent development have brought to light there is one which stands out as of exceeding interest, because it is not of foreign type or in any sense a copy or adaptation. It is of truly American design, being originated by the Brush Engineering Association, of Detroit, and built by The Ferro Machine & Foundry Company, of Cleveland. The ordinary Eight "V" adopts the "L" head type of cylinder, two of these "L" head blocks at 90 degrees to each other being attached to a common crank case. The Ferro Eight "V" is an entirely different type. The motor is designed with overhead valves with detachable heads. This plan permits an Eight "V" which is even more accessible in a car than the ordinary vertical motor, either four or six. The exhaust manifold places itself low down and out of the way on the outside of the "V". The valve tappet adjustment is in the top of the cylinder head. A single riser combines the intake manifold and the water outlet manifold. This places the carburetor in a very advantageous position between the tops of the two cylinder blocks. This manifolding simplifies the carburetion problem. From the carburetor to the valve there is a continuous downward flow. This absolutely eliminates any possibility of gasoline pocketing or "loading" in the manifold. As the water outlet manifold surrounds the intake manifold, the necessary pre-heating for the proper handling of the low grade fuel to-day available, occurs at the earliest possible moment; that is, as soon as the cooling water becomes heated this heat is taken immediately to the place where it is most necessary. Such a manifolding arrangement means obviously good carburetion and a prompt and powerful response to all changes in throttle opening. The entire "V" is now left clean for the installation of the ignition outfit, and of the starting and lighting equipment.

The heads of the motor, which contain valves and valve seats with no cages, are easily detached. No expert knowledge and no special tools are required to remove these heads, clean out all carbon, grind in valves and replace them. This is a simple operation, but it absolutely assures perfectly seated valves and perfectly clean combustion chambers. The grinding in of the valves may be done on a bench, or wherever it may be most advantageous, in order that a workman may inspect his valve seats while the grinding operation is being carried on, and he absolutely sure that he has done a perfectly satisfactory job.

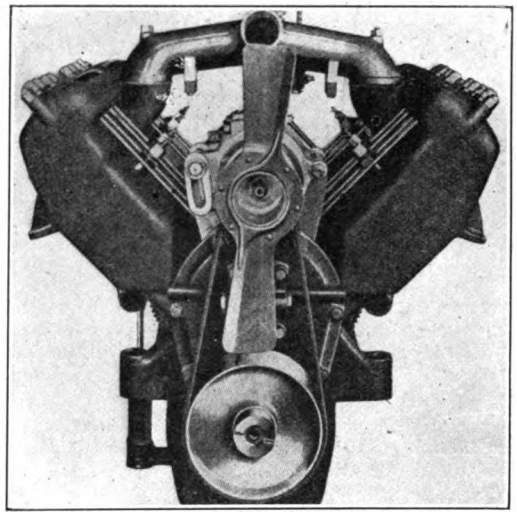
This design also permits, when the head is detached, the withdrawal of any piston or connecting rod assembly through the top of the cylinder bore. The use of overhead valves in detachable heads with the intake and exhaust passages cored in the head simplifies the cylinder casting. This simplification permits both cylinder blocks and the upper half of the crank case being cast in one piece.

Engineers and technical men have known that the only practical way to secure real motor rigidity was by "bloc" casting. Users have discovered that while their motor was quiet when new, its use brought to the surface a good many noises due to the improper relation of working parts.

There are no studs or bolts or nuts fastening the cylinders to the crank case, which may gradually work loose. The crank shaft and cam shaft with their bearings are both tied definitely to the cylinder block.

There are certain types of motor in which the adjustment of valve tappets really requires a "rubber monkey wrench." In the "Ferro" eight cylinder "V" there are no special tools required. The adjustment is quickly made, and it is hardly necessary for the owner-user to even turn his cuffs back. While this accessibility and endurance of the motor has been the subject of careful study and investigation, it has not been secured at the expense of maintenance cost.

Naturally, due to their location, the valves are farthest away from the surplus oil which may work up around the piston. They are in a position where



The Ferro 8-Cylinder Engine.

the water jacketing of valve seats and valve stems may approach as nearly to the perfect as is humanly possible. There is a free and rapid circulation throughout the entire head. There is but one thickness of metal between the valve seat and the water which completely surrounds both valve openings. The metal which forms the stem guide is also thoroughly water jacketed. This provides that these valves operate at a lower temperature than any other type of poppet valve known. The result is a remarkable freedom from pitting, or warping, or carbon deposit.

The simplification of cylinder casting permitted by the use of the detachable head allows the manufacturer to make a "bloc" cylinder, the expense of which is very little greater than that of a cylinder pair of the old type.

The combustion chamber is cylindrical in shape, and has all surfaces fully machined. It is obvious that this definitely provides that all combustion shall be of the same capacity, which means the same compression, thus providing smooth, "sweet" motor operation.

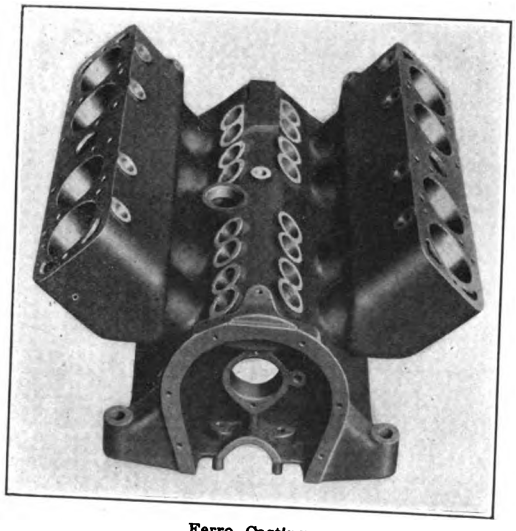
The gasoline motor is really a heat engine. All heat units which the cooling water carries away

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represents a dead loss. Only those heat units which are transmuted into movement of working parts are available for power development.

One of the first things which strikes the observer when inspecting this simple motor is the use of a pressed steel rocker arm in place of a forging for operating the valve. This construction is light, simple and permits of tappet adjustment merely by raising and lowering a stud carried in the center head cover.

The timing of the motor is remarkably simple. Instead of using eight cams on the cam shaft with, for each valve, an adapter or translation rocker with its necessary fastenings, the very obvious plan of providing a cam for each valve has been followed; that is, there are 16 cams integral with the cam shaft, each cam operating its valve in exactly the same manner as in the four cylinder vertical motor.



Ferro Casting.

It is plainly evident with this construction any repairman who is capable of timing and caring for four cylinder vertical can just as easily care for this engine, without any additional knowledge or skill. This cam arrangement presents an additional attractive feature in that any desirable four cylinder timing may be used.

The firing order provides such a distribution of loads on crank bearings that the resultant force is exerted very nearly in a vertical direction. The wear on the crank shaft bearing is, therefore, almost exactly as in a vertical motor. Taking advantage of this condition the crank shaft bearings and caps are all split on a horizontal line. If adjustment of connecting rod bearing becomes necessary, the operation is almost exactly the same as with the connecting rod bearing in a motor of the vertical type; that connecting rod which has a slight oscillating movement on the outside of the bronze bushing has merely to be adjusted in the same way as the main bearing adjustment is made.

The Ferro is a most highly developed type of internal combustion motor, both from an efficiency and maintenance standpoint. It presents to the American public for American use an eight cylinder "V" which does not require that either the user or the repairman must make a technical expert of himself.

Number Plate Color.

The State to which any car belongs may be distinguished by the colors of the number plates, which are as follows:

White on Green—Alabama, Maryland, New Hampshire, New Mexico, North Carolina.

No automobile law—Alaska, Louisiana, Texas, Wyoming.

Black on White—Georgia, Kansas, Kentucky, Missouri, Rhode Island, Vermont, Wisconsin, Arizona.

White on Red—Idaho, South Dakota.

White on Blue—Maine, Oregon, West Virginia, Indiana.

Yellow on Black—Delaware, Connecticut.

White on Black—District of Columbia, Montana, Nebraska, Pennsylvania, South Carolina.

Color not specified—Florida, Nevada, Tennessee, Utah.

Green on White—Illinois.

White on Dark Blue—Iowa, Arkansas.

Blue on White—Massachusetts, Virginia.

Red on White—Michigan.

Black on Aluminum—Minnesota, Mississippi.

White on Dark Red—New Jersey.

White on Brown—New York.

Black on Yellow—North Dakota, California, Colorado.

Maroon on White—Ohio.

No plates required—Oklahoma.

Light on Dark—Washington.

Black on Yellow—Alberta, Canada.

White on Dark Green—British Columbia.

Black on White—Manitoba, Nova Scotia.

White on Red—New Brunswick.

White on Black—Newfoundland.

Blue on Gray—Ontario, Canada.

Motor cars forbidden—Prince Edward Island.

Black on Pea Green—Quebec, Canada.

Black on Buff—Saskatchewan, Canada.

Tours Across the Continent.

From Thos. Lewark, Virginia.—In the past, automobile tours have been confined principally to the Central and Eastern States. The present year, 1915, will undoubtedly see these tours extended to the far West, because of the great exposition at San Francisco. Sufficient information is now at hand from those who have made this trans-continental trip, so that the fear and dread concerning the route are practically gone, and thousands will be seen this summer directing their tours to that wonderful, awe-inspiring section which rivals Europe in beauty and grandeur of scenery. The opportunity of the year will not be lost. With two great expositions in California as drawing cards, and the ever present lure of the West, together with "See America First," will certainly put 1915 as a record breaker in transcontinental touring.

Already the air is filled with whisperings of the trip, the information bureaus everywhere are flooded with inquiries, parties are being formed in Eastern cities, so that the greatest pleasure possible may be obtained en route. It will be the trip of a lifetime. The writer speaks from experience, having crossed the continent twice. When once you have looked upon the sublime grandeur and indescribable formations of those Cascades, Sierra Nevada and Rocky Mountains, and the wonderful

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fertile valleys, you will understand then how difficult it is to find words to convey your inward joy.

To those of your readers who are a little timid about the roads, I would say, have no fear. I used the same car both trips and had no trouble. The worst stretch of road between Richmond, Va., and San Francisco, Cal., I found between Washington, D. C., and Richmond, Va.

Temporary Gasoline Supply.

On some gasoline tanks it is frequently the case that a collar is soldered to the tank for the purpose of accommodating the thread into which the outlet tap is screwed. It happened on one occasion when the writer was on the road that this collar began to come adrift, giving rise to a leakage of the gasoline; after a few miles the collar came right away, leaving in the bottom of the tank a hole about half an inch in diameter. It should be explained that the copper pipe came up through the footboards for about a foot to reach the bottom of the tank, the end of the pipe being fitted with a cone joint. A temporary expedient was necessary to permit a continuation of the journey, and a piece of rubber tube was used, about a foot long, of a size that would make an air-tight joint on the gasoline pipe. The other end of this pipe was inserted into the nozzle of the spare two-gallon can, splashing being prevented by the insertion of a piece of cloth into the orifice. The rubber tube was arranged with the can on the footboard in such a way that a syphon action was set up, and the device acted in a very satisfactory manner until a garage was reached, where it was possible again to solder the collar on to the tank.

Goodyear Tire Reduction.

The Goodyear Tire and Rubber Company announces, effective February 1, another big reduction in Goodyear tires, the third reduction in two years, or a total reduction of 45 per cent. "Our present action," says C. W. Seiberling, vice-president, "is entirely logical, and is based on lower cost of crude rubber, the largest factory production in the world, the facilities afforded by ownership of our own fabric mill, our world-wide organization that gives us certain important advantages in purchasing crude rubber, and a desire to continue to give tire users the most for their money. In going forward on the new basis we are happy to announce several refinements in Goodyear tires, at an added cost, to insure greater service, even in the face of a price reduction." The Goodyear Tire and Rubber Company has taken over the sale of Motz cushion tires.

The Ford Oil Trouble.

From E. H. McMillan, Jr., California.—In regard to the 1911 Model T Ford troubling Mr. Myer about the oil getting up to the spark plugs too much, would advise using four leak-proof piston rings, one on each piston on the top, also would advise replacing the crankcase cover which comes on the 1911 model with later cover, part No. 3101, which has shallower oil dips.

As a rule when missing occurs in one cylinder at slow speed, and firing is right at fast speed, the fault consists of too wide a spark gap in the plug of that cylinder.

Useful Pointers.

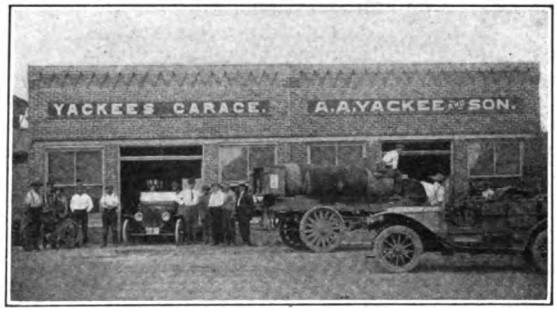
From L. W. C., Iowa.—Once while touring we punctured the gasoline tank so that it leaked a small stream. We procured a piece of common laundry soap, mixed it a little, and plastered it over the hole and drove seventy miles without losing a drop of gasoline.

A puzzling short-circuit in the electrical wiring of an Overland Model 79 was located in the self-starter switch where the copper scrapings from the contacts had collected and caused a slow leak.

In zero weather Fords usually have to be warmed up before starting. To avoid this, I bent a piece of heavy tin around the "choker" lever on the carburetor, extending it a couple inches toward the engine. I fastened a light wire to the end of this tin lever and ran it through a copper tube up the side of the steering post, where I have a clamp, giving friction enough to resist the pull of the choker-lever spring. Now I can crank my car and drive away in the coldest weather. As soon as the engine gets warm I push the wire down a little, and if it misses when throttled down, I pull it up a little.

Enterprising and Active.

From A. A. Yackee & Son, Illinois.—We enclose herewith a postal card of our garage and blacksmith shop. We have combined these two kinds of business and find that it works very well indeed.



Looks Like Plenty of Business.

For Grease Leakage.

From W. F. Ayres, Pennsylvania.—No. 1490 in December, 1914, issue. We find A. M. of Indiana is having trouble with hard grease leakage from his gear case, which is a common thing with E. M. F. 30. Three years ago a friend of mine had this same trouble and informed me he was going to have new bushings inserted and see if any improvement could be made. After spending some time, we hit upon a plan and carried it out to his satisfaction. New bushings should be made, but short enough to admit a felt washer. The grease will press against this felt and hold it into the recess which was provided by shortening the bushing. This will do the same little trick which is done in the rear axle by inserting a felt washer to protect brake drums from escaping grease.

By wiring the feed pipe against the exhaust manifold the gasoline supply may be rendered quite warm in winter, giving greater power and using less fuel.

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THE CAR OWNER'S LIABILITY.

When the Chauffeur Meets With an Accident and He Himself is Responsible for It.

It is now a well settled rule of law that in order to make the owner of an automobile liable to injured third parties for his chauffeur's negligence in operating the machine, the chauffeur must, at the time of the accident, have been engaged in the service of the owner and acting within the scope of his employment. The phrase "within the scope of his employment," or "in the course of his employment," as applied to a chauffeur in this connection does not mean "during the term of his service." All it means is "while engaged in the service of the master." Consequently, a chauffeur who is operating his master's automobile for his own use and pleasure is not acting within the scope of his employment, and the owner of the car is not liable for the servant's negligence while he is so using it. It has even been held that if the owner lends his chauffeur the use of the automobile, or gives him permission to use it for his own purposes, the owner is not liable for accidents occurring during such use caused by the negligence of the chauffeur. The chauffeur, in other words, is put in the position of any other borrower, and is alone responsible for his negligent acts. The Legislature of the State of Michigan attempted to put all question as to the owner's liability at an end by enacting a statute making the owner of an automobile absolutely liable for its negligent operation by anyone (unless the machine had been stolen), but this statute has since been declared unconstitutional by the Supreme Court of that State.—Daugherty vs. Thomas (Mich.), 140 N. W. 615.

It is, of course, usually a question of fact whether, at the moment of the accident, the chauffeur was or was not acting within the scope of his employment, and the application of the rule has given rise to a seemingly every increasing crop of litigation. It may be of interest to review the more recent decisions in which the point was involved.

The owner of an automobile in the city of New York, after having been out with the car, was, on his return, asked by his chauffeur if he would loan him the machine to go uptown on some business for himself. He said he would. The chauffeur then drove to a restaurant where he was joined by two women and a man friend. He took them uptown and was coming down Eighth Avenue when he struck a pedestrian, who sued the owner of the car. The owner was held not liable. "Beyond the scope of his employment," the court said, "the servant is as much a stranger to his master as any third person. And if the servant step aside from his master's business, for however short a time, to do an act not connected with such business, the relation of master and servant is for the time suspended and an act of the servant during such interval is not to be attributed to the master."—Cunningham vs. Castle, 127 N. Y. App. Div. 580.

This case was followed in the recent case of Davies vs. Angle-American Auto Tire Co., 145 N. Y. Supp. 341, where it was said that the question of the ignorance or consent of the master has no bearing on his liability. The jury having found that the automobile was being used by the chauffeur and his companions for pleasure purposes, it was immaterial whether or not the chauffeur had his master's consent.

The mere ownership of the machine counts for little, it is held by the Pennsylvania courts, without a development of the whole circumstances. In an action for injuries received by being run down by an automobile in which was a party of four, the evidence established that the driver was in the defendant's regular enmployment as chauffeur, that the machine was intrusted to his care and keeping, however, only for the defendant's use as he might direct. But the evidence also left it clear of all doubt that the three persons occupying the machine with the driver were there by invitation of the latter, and were entire strangers to the owner of the machine, and also that the machine was being employed by the driver on this occasion without the knowledge of the owner. While the driver had it in mind to stop in the course of the drive at a store where automobile supplies were sold, to purchase some spark plugs for future use in connection with the machine, it was clear that this purpose was simply incidental to the evening's trip, and was suggested by consideration of the driver's own convenience. The owner of the car was held not liable.—Lotz vs. Hanlon, 217 Pa. St. 339.

In another case it appeared that at five o'clock on the day of the accident the defendant's chauffeur took his automobile from the place where it was kept, drove to the defendant's store, and awaited orders. He was told to get his supper and be at a certain hotel with the automobile at a quarter before seven o'clock. After he had eaten his supper, however, instead of taking the car to the hotel, he drove a mile or two distant from his boarding place, and in an opposite direction from the hotel, for the purpose of calling on a friend. At the time of the accident he had finished his call and was on his way to the hotel. It was held that he was acting beyond the scope of his employment and his master was not liable.—Danforth vs. Fisher, 75 N. H. 111.

The following case displays still another claim of circumstances. The defendant owned an automobile, which broke down on the way from Atlantic City to Philadelphia. He left it in charge of his driver, with directions to repair it and bring it on to Philadelphia. After the driver had reached the Delaware River and while waiting for the ferry, he consented to take a third person in the machine to a place about a mile back on the road, and while making such trip, through his negligence in running too fast, he came into collision with a horse and buggy on the highway, by which the plaintiffs were injured. It was held that under such circumstances the defendant was not liable for the injury. —Patterson vs. Kates, 152 Fed. 481.

A servant of the defendant had been ordered to take a car from one garage of the defendant to its other garage, there to wash the car and put it up for the night. After he had driven the car to the garage as directed, without permission or authority from the defendant and against his express general orders, he took the car to carry another employee to his home. After driving to a restaurant for his supper he was returning to the garage when the accident happened. For the reason already stated, the defendant was held not liable for the chauffeur's negligence.—Colewell vs. Aetna Bottle & Stopper Co., 33 R. I. 531.

A case very frequently cited by the courts is that

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of Steffen vs. McManglaton, 142 Wis. 49. The chauffeur's contract with the defendant, the owner of the automobile, was to perform the usual duties of chauffeur during the day. The defendant did not undertake to furnish him his meals, and for his mid-day meal he was allowed to go to his home, about one mile distant from the defendant's residence, where the automobile was kept. He usually walked to his home for this meal. He had used the automobile for the purpose probably ten times without obtaining the permission or consent of the defendant to do so. He used the automobile on the day of the accident, and was going to his home for his dinner when it occurred. It was contended by the plaintiff that the chauffeur was using the automobile to further his defendant's interests: that he thereby reduced the time for getting his meals and thus was able to devote more time to the service of the defendant. It was, however, held that he was not acting within the scope of his employment, and the defendant was held not liable for his negligence.

The following are some cases where the owner was held liable. The owner of an automobile, while on a business trip in his machine, made his headquarters at an hotel; his automobile was kept in a garage several blocks away. On the evening of the accident for which he was sued, on arriving at the hotel, he told his chauffeur he was going out that night and directed him to go downstairs in the hotel and get oil. Instead of doing so the chauffeur drove the automobile to the garage for the oil and while on his way there the collision occurred. It was held that the question whether the chauffeur was acting within the scope of his employment was properly submitted to the jury, although in this particular instance the use of the machine was in disobedience of the master's literal instructions. The jury found for the plaintiff.—Bennett vs. Busch (N. J.), 67 Atl. 188.

The owner of an automobile had been driving the machine, and when he reached his place of business, stepped out. His employee thereupon, with his permission, attempted to turn the machine around, when a collision with the plaintiff's buggy and team occurred. It was held that the driver was not acting independently, but was serving his employer, and was within the scope of his employment.—Thomas vs. Armitage, 111 Minn. 238.

A chauffeur who had taken his master to a theatre, was told to be back there at a certain time, and loaned money from the master for a hair cut. After going the round of the barber shops to find a barber at leisure to attend to him, he was returning to the theatre when he ran into a person, who sued the master. It was held that the chauffeur in this case was acting within the scope of his employment, and his master was liable.—McKiernan vs. Lehmaier (Conn.), 81 Atl. 969.

It has been held, more than once, that the driver of an automobile who surrenders the actual driving of the car to another is acting within the scope of his employment, and the owner of the car will be held liable if an accident occur. This is particularly likely to happen in cases of demonstrating automobiles to prospective purchasers. Where the chauffeur of a car which was being thus demonstrated together with the sales agent and an employee of the prospective purchaser were driving in the car, the sales agent suggested that it might be well to let the employee run the car. The chauffeur acquiesced, because he thought this would be a good way to demonstrate the quality of the automobile. The employee, being inexperienced, negligently ran the car onto the sidewalk, injuring a pedestrian, who sued the seller of the car and the prospective purchaser. The seller alone was held liable, because the chauffeur's act in surrendering the driving was within the scope of his employment, while the purchaser's employee's acceptance of the proposition to ride in the car and his subsequent acceptance of the invitation to run it were outside the scope of his employment.—Wooding vs. Thom, 148 N. Y. App. Div. 21.

Again, where a demonstrator surrendered the wheel to a prospective purchaser who had had only an hour's experience the day before, and the latter ran down and injured a person in a crowded part of the city, the pedestrian sued the seller and the purchaser. Negligence was admitted and the only question was which was liable, or were both. It was held that the seller alone was liable, his chauffeur having complete control of the driving of the car, which he had no right to surrender to the purchaser under the circumstances. In another case it appeared that immediately before the accident the defendant, who was the owner of the automobile, had gone accompanied by his son and coachman, to the railway in his automobile and had left it there; that at the time of the accident his son and coachman were the occupants of the car and that the son was guiding and controlling it. It was a disputed question whether the defendant on leaving the machine had committed its custody to his son or to his coachman. It was held that the court might properly charge the jury as follows: "If the jury find either that the defendant left the automobile in charge of his son to take it home, or in charge of his son and coachmen together to take it home, or in charge of the coachman alone and the coachman neglected his duty in that regard and allowed the son to run the machine, and by the negligence of the son the accident occurred, without contributory negligence on the plaintiff's part, then in either case the defendant is responsible and liable for that negligence and its consequences." The jury found for the defendant, and, an order to set aside the verdict being granted and affirmed on appeal, the parties were left in the position in which they were before the trial.—Colard vs. Beach, 81 N. Y. App. Div. 582.

It will be seen from consideration of these cases that while the rule is clear, its application may sometimes be attended with difficulty, especially when, as frequently happens, the evidence is conflicting as to the facts.

REPAIR PARTS.

How to Know What is Used and to Find What is on Hand.

From W. Robinson, Georgia.—I have noticed in several automobile magazines that there is often some discussion of the problem of the dealer, and I have thought that the keeping of a stock of repair parts must not be among the least of them. For some time I have had charge of a stock room, and since I have been there we have installed what seems to me to be a particularly fine card system. By means of this card system we are able to tell at a glance exactly how much, or how many, of any particular part we have on hand, and are also in a position to take stock at the close of any day's business.

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Thinking that it may help some one else, I am going to pass it along.

We had a quantity of cards printed, about 3½ by 5 inches, ruled and headed like the enclosed illustration. This specimen I have made up just as if it were a card in my stock room, and a careful study of it will show that practically all the information that could be wanted is on the card. In the first column, the catalogue number of the part is 2517. The name is differential case bushing. The maximum number to carry in stock (for our size room) is 8; the minimum is 4; the code word is "accite," in case we need to wire for any, and the price is 30 cents. The "Location Number" applies to the whole card, and it will be explained later. A possible improvement on the card would be to state the number of each part required per car, which would be 2, 1 and 10 respectively, on the sample card.

When the system is installed, say we have 7 of the number 2517 on hand. It goes in the bin num-

4	5	6	7	9
2517	2521	252413	2528	
2518	252113	2525	2539	
2519	2522	2525 B	2530	
2512 A	2522 B	2526	2532	
2520 B	2524	2527	2547	
RED	GREEN	WHITE	RED	GREEN

NUMBER OF PARTS	2517		2518		2519	
NAME " "	DIFFERENTIAL CASE BUSHING		DIFFERENTIAL DRIVE GEAR		DRIVE GEAR SCREWS	
MAXIMUM	8		18		50	
MINIMUM	4		9		25	
CODE WORDS	ACCITE		ACCOST		ACCOV	
PRICE	$.30		$4.00		$.02	
LOCATION NUMBER 4			13		46	
FIRST DAY	7		10		35	
SECOND " SOLD 2	5		8			
ORDERED 5 MORE						
THIRD DAY SOLD 2	3					
FOURTH " " 1	2					
FIFTH DAY NONE SOLD 5 MORE PUT IN STOCK	7					

Stock Cards.

bered 2517, and "7" is put on the card (see specimen). Next day two of them are sold, so right under the 7 we put the number left, 5. The next day two are sold, and the day after one, which leaves only two on hand, but when we sold the first two it left only one more than the minimum, so we ordered five more. The number ordered depends on how fast the part sells. A slow seller would only be to order enough to make the maximum. On the fifth day our order arrives, and we add the number received to the number on hand, which makes seven again. Column 2 shows No. 2518 below the minimum, and it is time to order ten more; 2519 still has ten more than the minimum. At the end of the day the sales books and invoices are posted direct to the cards. By this method, it is easy to see, all information is conveniently arranged, the cards gone over twice a week and an order made out. Stock can be taken at almost any minute, and by comparing the stock according to the cards, and the stock by count in the bins, thefts and waste can be detected at once.

The bins are divided into tiers, 6 bins high, and 1 bin wide (this can be varied to suit the stock). Each tier has a number (see enclosed diagram) and the edges of all the bins in that tier are painted a distinctive color. The numbers of articles too large to go in bins are put separate from the others, on a card, the location number of which is "Office," and the parts are then placed in a convenient place in the room. Accessories, etc., all are card indexed in the same way, and the cards are subdivided in the box into groups, each under its separate head by cards with tabs bearing the name of the division like "Rear Axle," "Front Axle," "Steering Gear," "Transmission," "Accessories," etc.

CARBURETION ANOMALIES.

The Problem of Proportion of Fuel to Air and of Vaporization.

P. S. Tice to the Indiana S. A. E.—As time goes on, a more intelligent recognition is being accorded those physical phenomena which inherently occur in the act of carburetion of air with a liquid fuel or its vapor. Each of these several phenomena is in itself an event the progress of which follows an inflexible rule, capable of simple and straightforward statement. But the conditions under which the act of carburetion must go forward bring into the matter variables in the correlation of simultaneous phenomena. And these variables are often most difficult of reconciliation with the desired result.

At the outset, in motor-propelled vehicles, the nature of our fuels places a limitation upon the sort used—it must be liquid. This immediately brings into being the two main problems of carburetion; proportioning of the mixture ingredients; and vaporization of the fuel. While the performance of the two functions of the carbureting device cannot be said to be diametrically opposed in character, it surely does not follow that excellence in the performance of one of them presupposes an equally meritorious result in the other.

It has been stated that there are essentially two problems, namely: proportioning of the fuel to the air and vaporization of the fuel. Let us first run through the points involved in the satisfaction of each, as if it stood alone; and later let us see the state of agreement or disagreement in the carbureting system following the attempt to make the two functions go on simultaneously.

In the following there will be no reference to this or that type of carburetor, as distinguished from its fellows. In each case and in each make of device the results attempted are, or should be, the same. Starting at this point, the field is cleared for an abstract consideration of the relations of principles and methods.

In all carbureting devices to date, capable of satisfactory use in motor cars, the liquid fuel is brought into the presence of the air with which it is to combine by means of a pressure depression exerted upon the discharge end of a passage so located as to cause the fuel to be carried off by a moving column of air. This is the fundamental point of similarity in carburetors. But here this basic similarity ends, since at least two variations are employed to create this depression on the fuel passage exit. In any case, it is sought to control the quantity of fuel discharged by virtue of this depression to give a relationship, or set of relationships over the range of the motor, between the quantity of air and quantity of fuel aspirated by the motor.

The possible variations in the means and combinations of means used to accomplish this result constitute the most interesting phase of carburetor

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design, as we know it. All embrace the following two items, either singly or in combination: (1) variable depression on fuel orifice or orifices; and (2) variable fuel orifice or orifices. That the possibly usable variations are almost endless is proven by the great variety of devices with which the market is stocked.

But, whatever may be the means of securing proportioning, and whatever may be the degree of its perfection under constant conditions, it is subject to irregularities as a result of temperature change. By this is not meant seasonal changes of atmospheric temperature alone, since most carburetors provide means for compensating in large measure for this variation. The most mischievous temperature change is that due to the activity, or lack of activity, of the motor itself. Naturally the temperature changes from the latter source are greatest, and therefore most difficult, with low atmospheric temperatures; and, as a consequence, irregularities in mixture proportioning are greater in the cold than in the warm months.

Change in temperature, either of the air entering the carburetor, or the carburetor water jacket, or of the motor proper, works to change mixture proportions in the following ways:

(a) If the air entering the carburetor is subject to temperature change from moment to moment, or from hour to hour, as is the temperature under the hood of the car, the depression of pressure in the carburetor, with a given throttle opening, is ordinarily changed somewhat inversely as the temperature. This effect, while small, rather tends to maintain than alter proportions. But, unfortunately, it is not unaccompanied by effects of considerably greater magnitude, which operate in the other direction. Not only are the surface tension or capillary and the internal friction or viscosity of the fuel lowered with temperature increase, making for a considerably higher discharge rate under unchanged depression, but the coefficient of efflux of the nozzle or jet increases with a rising temperature. The converse is, of course, equally true. The result is that mixture proportions cannot be maintained in the face of changing air temperature, without readjustment of the carburetor.

The remedy in this case lies in providing means for running normally with the air entering the carburetor at a temperature considerably higher than the highest atmospheric temperature likely to be encountered throughout the year. Such an expedient, of course, requires a control, automatic or otherwise, to minimize changes in normal air temperature. In this way the effect of air temperature change can be confined almost wholly to the period of "warming up."

(b) If the temperature of the entering air remains practically constant, the effect of a carburetor water jacket is identical with that noted for change of air temperature. Of course its effect is not nearly so great, since the jet or nozzle temperatures most nearly follow those of the air-stream passing. On the other hand, if both air and jacket temperature vary, the disturbance in this case may be much greater than in a device without jacket.

(c) In the case of the motor proper being the only temperature variable, conditions, so far as proportioning is concerned, are considerably improved, since the effects upon the carburetor, as noted, will be only those due to atmospheric temperature changes.

In the foregoing no cognizance is taken of the means incorporated in the carburetor to secure proportioning throughout the range of the motor. A discussion of these things would hardly serve at this time, since their merits or demerits, as compared with each other, are matters of personal opinion rather than facts or truths universally recognized. The fact it is attempted to point is that no matter what the type or device, there is no irregularity in proportioning occasioned by a change in its working temperature.

There are further considerations in the proportioning of the mixture ingredients, but, from the manner in which they are bound up with that other function of the system, vaporization of the fuel, it will be better to take them up later when their full significance can be more easily presented.

It is admitted without question by all who have done work in this direction that the more nearly the process of vaporization is carried to its completion before the ignition of the mixture, the more flexible and responsive will be the motor, and the more economical can be its operation. But in this direction, as in most others, there are limits beyond which it is neither advisable nor necessary to go.

It is coming to be realized that to secure complete vaporization of the fuel before its entry into the cylinders is bootless, since in the cylinders themselves, after they are at working temperatures, we have a most powerful aid to vaporization. Nevertheless, as most of us know, there is much to be done before we can sit back with the bland self-assurance that the process of carburetion is being completed for us by an accommodating motor.

Let us sum up a few of the facts in the case. To get the greatest possible volumetric efficiency in a motor is desirable. This means that mixture temperatures must be kept down. To accelerate the process of vaporization is equally desirable. But this latter in its accomplishment presupposes a heat input, which, unless it can be entirely represented by fuel vaporized before the entry of the mixture into the cylinders, represents a loss in possible volumetric efficiency. It is recognized, of course, that up to a certain point such a loss in volumetric efficiency is, in practice, more than justified by the improved vaporizing conditions. Almost every one has had experience of this.

Another way to accelerate vaporization, and one, by the way, that should in all cases be carried to the limit, is to make the most of the heat supply available in the air, without resort to outside or forced supply, by subdividing the liquid fuel as finely as possible upon its entry into the air-stream. Quite remarkable results have been accomplished experimentally in this way.

No matter what is done to the fuel in the way of spraying or atomization, a certain amount of heat must be taken up by it before it can be vapor. This quantity, called the total heat of vaporization, is, for ordinary gasoline of from 58 degrees to 60 degrees Baume, and an initial temperature of 60 degrees F., in the neighborhood of 370 B. T. U.'s per pound. That the heat of compression alone is several times greater than sufficient to accomplish the transference of the whole of this amount is obvious. But the time in which it can do so is very limited; and, more important still, the fuel is very seldom

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present in the cylinder in such form as make so rapid a transfer possible.

The fact that it is not, is proven when it is considered that the transfer of 375 B. T. U.'s from 15 odd pounds of air to 1 pound of fuel represents only some 84 degrees to 85 degrees F. temperature drop in the air, assuming no other interchange. In the circumstances, other interchanges do take place, and they are very difficult to measure, or eliminate, even experimentally.

The writer has certain data on temperature drop through the carburetor, the temperatures being measured in the air-making port of the carburetor, and at a point four inches above the jet, which show a maximum drop of 139 degrees F. The carburetor used was one giving extreme atomization of the fuel, and the temperatures used were high, that at the intake to the carburetor being 248 degrees F., and that of the mixture 109 degrees F. Some of this drop is accounted for by direct radiation and convection from the carburetor metal, and by the expansion of the air through the throat-piece surrounding the nozzle; but, in any case, since this was the greatest drop in temperature that could be obtained, it is certain that the fuel was vaporized almost completely even at four inches beyond the jet. With this same carburetor it was found that no gain was made in economy of operation with a temperature drop greater than 76 degrees F.

If it is taken, as it safely may be, that 85 degrees temperature drop, without other interchange, represents complete vaporization of the fuel, then, calculating losses in the same proportion as when the maximum drop of 139 degrees F. was obtained, we have.

Total Temp. Drop.		Due to Vaporization.		Loss.	
139	—	85	=	54	in the one case.
76	—	46	=	30	in the other.

From this it appears that when gain ceased from increased vaporization in the carburetor, approximately only one-half of the fuel discharged from the jet had been vaporized. Since it is inconceivable that less than complete vaporization should be conducive to greater economy than complete vaporization, it seems that the heat of the cylinders and of compression can be relied upon to complete the latter and more difficult half of the process of vaporization.

This premise seems to be supported by another experience. In some work on kerosene fuel, preliminary to the design of a carbuertor for that fuel, it was found that the most economical mixture temperature, over the whole range of the motor, was 160 degrees F., in face of the fact that vaporization of the kerosene was known to be incomplete in the carburetor at temperatures less than 288 degrees F.

The above figures are not offered as being conclusive, but only as evidence in support of the statement that, in vaporization in the carbureting system, there are limits beyond which it is neither desirable nor necessary to go.

There is one point on which they are very conclusive, however; a very considerable part of the total heat applied in an attempt to secure vaporization remains in the mixture as a temperature value, thereby greatly reducing the volumetric efficiency of the motor. And this is equally true, no matter in what way the heat is applied.

While on the subject of vaporization, it seems to be well to enlarge a little upon the prime importa of securing a very fine mechanical division of t fuel upon its entry into the air-stream. Not o can vaporization be accelerated in this way witho any very extensive recourse to heating and its co plications, but, as accompanying advantages, t carburetor becomes less sensitive, the motor mo economical and responsive and, last but not lea loading can be eliminated.

As far as we have gone in the foregoing, thr points have been brought forward, namely: (1 That temperature variations in the carburetor di turb mixture proportions; (2) that heat supply mu be made to secure a sufficient vaporization, and (3 that the necessary heat supply for vaporization ca be greatly reduced with a proper atomization. Th statement of another point (4), that the mor nearly vaporized the fuel at the time of ignition, th leaner the mixture that can be used to secure given result or output, completes the list the write desires to present.

Let us see how these four premises agree in th operation of a carbureting device. The fact tha proportions are disturbed by changes of temperatur does not fit in particularly well with the fact tha heat must be supplied to secure a sufficient vaporization. If the second premise is acted upon, there are bound to be temperature variations in the carburetor. If heat is applied only after the mixture is clear of the carburetor, mixture proportions are not apt to be disturbed by it.

But, is it then possible so to apply the heat as to secure rapid vaporization? The writer believes that it is at least much more difficult to do so. This belief is based on experimental evidence, which shows that of all portions of the intake passage, that immediately beyond the carburetor is most effective in securing vaporization. And the reasons are not far to seek: When the fuel leaves the jet it is subdivided more or less finely, and is entrained in the air in comparatively small portions, each distinct from the other. Thus, the ratio of its surface to its volume is great, and vaporization progresses rapidly. After the mixture has entered the distributing branches, but very little of the unvaporized fuel remains entrained, because of the effect of the bend or bends. The greater portion remaining unvaporized is in contact with walls, thus reducing the ratio of exposed surface to volume of liquid.

The third point, that atomization largely relieves the need for heating, seems to offer a measure of relief. But, as stated in the preceding paragraph, the time to apply the heat is while the fuel is entrained and suspended in the air-stream. And, of course, this argument applies with the greater force the more perfect atomization, and, therefore, the entrainment.

The fourth statement, of the dependence of mixture proportion upon the degree of vaporization, clashes strongly with that on the effect of temperature change upon mixture proportions. As a result of increased carburetor temperature the mixture becomes enriched, when, in fact, it should become leaner, to fulfill the requirements of economical and satisfactory operation.

Always slow down at corners, sound your horn, and keep on your right side of the road when taking them.

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NEW AND INTERESTING THINGS IN MOTORDOM

Manzel Engine Driven Tire Pumps.

These pumps are especially made for use on Ford cars and they are driven by the engine. The manufacturers state that one of these tire pumps will inflate any Ford tire in less than two minutes, and can be installed by anyone. There are no holes to drill or machine work of any kind to be done in making the attachment, and the pump sells for $7.50 complete. For those desiring a larger tire pump for cars other than the Ford, or for garage use, the same manufacturers have a two-cylinder tire pump which is sold for only $20 complete with fittings, and these fittings can be furnished for over 150 different models of cars. Write to-day in regard to this line of pumps to Manzel Brothers Company, 321 Babcock St., Buffalo, N. Y.

The Cataract Auto-Vehicle Washer.

This is a very simple but effective device for washing an automobile. It may be readily attached to your garden hose and it cannot scratch or streak the varnish, as a soft mop is used. With the stop cock handle and mop complete the price of the Cataract vehicle washer is $2, with plain handle and mop, $1.50, and with short handle and mop, $1. Extra mops, 50 cents. Extension handle to enable you to reach all parts of the car, 50 cents extra. Send your orders and inquiries to the Cataract Auto-Vehicle Washer Company, East Belmont Ave., Topeka, Kansas.

Change of Name and Address.

The Commercial Specialty Company, formerly located at 405 Commercial Bldg., Cleveland, Ohio, has changed its name to the Commercial Mfg. Company, and they have also moved to 508 Commercial Bldg., Cleveland, Ohio. This company manufactures the Commercial Auto Lock which is a practical attachment, that holds the starting lever of the car in neutral position, making it impossible to connect the engine with the driving mechanism. The price of this device is $2 complete prepaid to any address in the United States.

Affa Clevis Silencer.

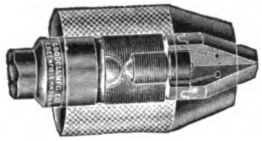
This is a device for taking up the looseness in the brake rod preventing vibration and rattle. It is guaranteed by the manufacturers to last for the life of the car and can be attached readily to any car. This handy device retails for only 50 cents and will be sent to any address in the United States for this price. Address W. S. Graffam & Co., Northampton, Mass.

Cigars on Trial.

When a cigar manufacturer is willing to send you a box of cigars and gives you the privilege of smoking ten out of the box, to decide whether you like them or not, he must be pretty sure of the quality of such cigars. This is what Herbert D. Shivers, 913 Filbert St., Philadelphia, Pa., will do for every reader of the Automobile Dealer and Repairer who is a smoker. See his advertisement on another page. All you have to do is to write to him, tell him you saw his announcement in the Automobile Dealer and Repairer and would like to test his panatelas, telling him whether you want a mild, medium or strong cigar, and the cigars will be sent to you, postage prepaid. You smoke ten and if you don't like them, send them back at his expense, understand, not yours. Now that seems to be about as fair a proposition as any cigar manufacturer could possibly make.

The Greenfield Drill Chuck.

This is a strong, accurate, and well-made drill chuck at a popular price, ond it is especially adapted for use in automobile garages and repair shops. The shell is one piece, and the jaws are of tool steel, carefully hardened and tempered. It has ball-bearing thrust, and the thread of the shank being concealed, there is no chance for it to become bruised or injured. The bearing in the Greenfield Drill Chuck is in the center of the shell, which produces an accurate and more reliable chuck than when the bearing is at the extreme rear. The



A Good Drill Chuck.

chuck has such a strong grip that no spanner wrench is required to tighten, but one is furnished with the two larger sizes, as occasionally one is needed to loosen. The shank forms part of the chuck, making it complete, ready for use. For prices and full particulars write to the Goodell Manufacturing Company, Greenfield, Mass.

Metal Spinning and Lamp Repairing.

Automobile owners who have old broken lamps should not throw them away because in many cases these lamps may be repaired and made as good as new. Work of this kind is done, and done well, by Collins & Hatch Co., 150½ Elm St., Amesbury, Mass. The same company does metal spinning of all kinds for the trade and makes a specialty of experimental work. No order for this work will be too small to be considered, or they will be glad to figure on larger contract work for the trade. Samples, blue prints, or specifications should be sent for estimates. Prompt service and reasonable prices are guaranteed.

An Improved Machine for Reseating Valves.

No longer need garage and repair men devote four or five hours in regrinding valve seats. H. G. Paro, 719 Michigan Boulevard Building, Chicago, is marketing a device which does the work in one-fourth the time required by the old-fashioned hand method. The machine is known as the Fosnacht valve reseater. In addition to the time saved by the operator of this machine, absolutely accurate work is insured by its use. Further, no oil or emery is needed where the machine is employed, making its operation a clean process. It often saves the reboring of cylinders and the replacing of rings. By its use the maximum efficiency is obtained by the repairmen. It occupies very little space in the repair kit, and is handy to carry and to use. Every person doing valve reseating should by all means send for the booklet sent free and find out all the splendid features which recommend the appliance.

Krit Motor Car Co. Reorganized.

There has been a complete reorganization of the Krit Motor Car Company, and this will interest many dealers throughout the country, as since the temporary receiver was appointed for this company, December 28th, there have been a large number of inquiries regarding the future of the enterprise. It is now stated that the new concern is amply financed and it is believed that permanency of the Krit Motor Car Company is insured. The product of this company is too well known to need exploitation and their factory is located at Detroit, Mich.

Greenfield Taps and Dies.

The Greenfield Tap and Die Corporation of Greenfield, Mass., which is comprised of the following screw cutting tools' manufacturers: Wells Brothers Company, Wiley & Russell Mfg. Company and A. J. Smart Mfg. Company, has made the following changes in its New York, Philadelphia and Chicago stores: The corporation maintains now one store only in New York, which is located at 28 Warren St., the former location of the Wiley & Russell store. The Wells Brothers Company's store at 107 Lafayette St. has been discontinued. In Chicago, the Wiley & Russell Mfg. Company's store at 545 West Washington Blvd., has been discontinued, and the stores consolidated at 13 South Clinton St., the former location of Wells Bros. Company's store. At both of these stores as well as at 38 North Sixth St., Philadelphia, a complete stock of Wells Bros.', Wiley & Russell Mfg. Co.'s and A. J. Smart Mfg. Co.'s goods are carried. The consolidation of the stores in this manner makes a very decided improvement in the service offered by the different companies, as a much more complete and varied stock is thereby displayed for the needs of the many users of taps, dies, screw plates, reamers and other tools and machines of interest to those interested in screw cutting. Each of the stores has its same competent management as in the past and careful attention to all orders will be given as heretofore.

Imperial Welding and Cutting Equipment.

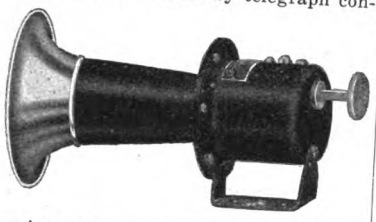
This is a complete oxy-acetylene welding and cutting equipment manufactured by an excellent firm in the best possible manner, and offered at a reasonable price to the trade. Write to-day for prices, and full particulars to the Imperial Brass Mfg. Co., 520 South Racine Ave., Chicago, Ill.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Klaxon to Bring Out $4 Hand Horn.

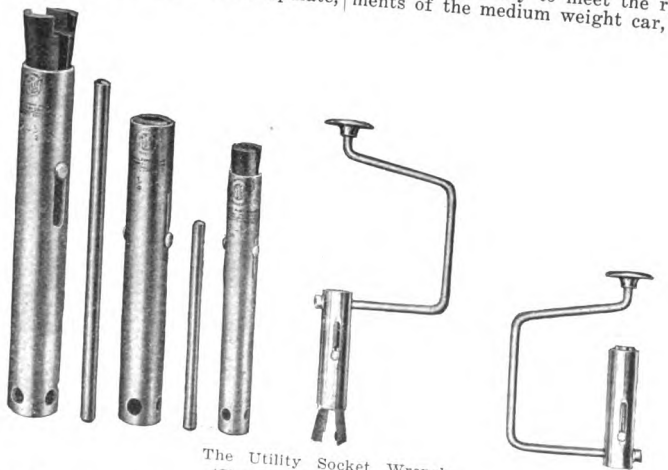
The Lovell-McConnell Mfg. Company, Newark, N. J., makers of the Klaxon, announce a new hand signal ready for delivery May first. It is called the Hand Klaxonet and retails at Four Dollars. The Hand Klaxonet operates on an entirely novel principle. The plunger projects from the back rather than from the top. It operates at the slightest touch and a slight movement produces a very loud note. Development work on the Hand Klaxonet has been going forward for the past few months. The Hand Klaxonet carries the regular Klaxon permanent guarantee and has standard Klaxon quality built into it. The Klaxon salesmen were notified by telegraph con-



cerning the new instrument and were given no other information than that the Klaxon makers would produce a new hand instrument, listing at four dollars and carrying regular Klaxon finishes and guarantee. On the day they received these telegrams they sent in orders for nearly ten thousand instruments. They had no idea what they were selling and the Klaxon customers did not know what they were buying. They merely knew that the company announced a four dollar instrument and when they said that the instrument carried the Klaxon guarantee it was enough for them. This is a remarkable example of the confidence in which the trade hold the Klaxon name and reputation for quality.

The Utility Socket Wrench Set.

This set illustrated herewith, has all the advantages of socket wrench sets, consisting of fourteen wrenches. Instant in adjustment. No screws to manipulate,



The Utility Socket Wrench
(Showing Method of Use.)

or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench. The illustration tells the story. This wrench set is made by the Hill Pump and Valve Co., 18-20 E. Kinzie Street, Chicago, Ill., to whom all inquiries should be addressed. This set sells for $2.50 complete.

Catalogue of Ford Specialties.

Dealers, garage owners and repairmen are urged to write to Charles Friedlander & Co., 56-58 Warren Street, New York City, for their free 56-page catalogue of Ford specialties. This house sells goods at wholesale exclusively and not to consumers at any price, and in applying for the catalogue it is necessary for you to identify yourself as a dealer or repairman by means of your letter head or business card. The catalogue is an extremely interesting one, and it illustrates a line of goods which ought to interest every dealer.

The Handy Blow Torch

This is a new torch which has just been put on the market, and it is extremely handy for all car owners, dealers or garage men. It is made of heavy solid brass, including the pump, and it will hold one pint. For use in soldering, repairing terminals and lamp clamps, and other parts of the car, this is an extremely handy tool. It sells for only $3, and all inquiries concerning it should be sent to The Handy Torch Company, 69 Genesee St., Utica, N. Y.

Rubber Automobile Sundries.

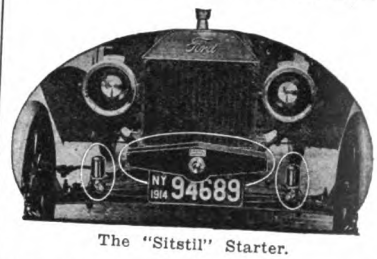
These are manufactured in great variety for the trade by the Essex Rubber Co. of Trenton, N. J. Their line includes blow-out patches, reliners, tire plasters, outer boots, unvulcanized shoe liners, radiator hose, and almost everything that can be imagined in the way of rubber specialties for the automobile. Readers are urged to write for the illustrated catalogue, issued by this Company, which will be sent free for the asking.

The Right Shock Absorber.

This is a twin cylinder shock absorber designed especially to meet the requirements of the medium weight car, and is especially adapted for cars weighing from 1,800 to 3,500 pounds. This is a high class necessity for any dealer and it sells readily. The price of this Shock Absorber is $15 per set, and is guaranteed for life. Address all inquiri and orders to the Right Motor Specialti Co., 1320 Michigan Ave., Chicago, Ill.

Two Live Ford Specialties.

We illustrate two of the Ford Specia ties, which have been placed on the ma ket by the Troy Auto Specialty Co. o Troy, N. Y. One of these is the Sitsti Cranker, which starts the car from th seat every time, and with not nearly a



The "Sitstil" Starter.

much effort as in cranking. The Sitstil turns the Ford motor over five times as fast as you can crank it by hand. It is operated by a foot pedal, and it can easily be done by a lady or a child. The price of the Sitstil Cranker is $15 and it will be put out if desired on ten days' trial, and if it does not give full satisfaction the money will be refunded.

Another specialty manufactured by



the same Company is the Tasco Shock Absorbers for Ford cars. This appliance is built of steel, and it is designed for hard service. The cost is only $6 for the full set of 4, and this shock absorber is made of the finest material, properly designed, and with strong lively flexible springs. Live demonstrators are wanted.

Knowlson's Spring Leaf Spreader.

The manufacturers of this device claim that it gives 100 per cent. easier riding and stops the squeak. It is a practical, durable tool for spreading spring leaves for lubricating, and it is also used for a temporary repair clamp. One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive, which is adjustable to any size auto spring. This device is sent prepaid anywhere for $1.50. Send your inquiries and orders to the Spring Leaf Lubricator Co., 1000 Forest Ave., Ann Arbor, Mich.

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Tire-Doh for Repairing Tires.

Tire-Doh is so well known to manufacturers throughout the country that it hardly needs exploitation at our hands. The manufacturers state that no matter how big the puncture, blow-out or tear, with Tire-Doh you can repair it in a jiffy. It can be used anywhere, in the garage, or on the road, without heat, without tools, and the cost of repairing the average puncture with Tire-Doh is only 2 cents. This article has been six years on the market, and more than 250,000 car owners are using Tire-Doh while thousands of dealers sell it all over the country. It may be obtained at your dealers, or will be sent direct to you for $1.00. The same manufacturers have 18 other Tire-Doh products including the following: Silver Quick, Stop That Radiator Leaking, Day Tire Valve, Nomore Rust Rim, Paint, Blac-Namel, Sunshine Metal Polish, Everwear Nickel Polish, Metal-Lac, Renew-O Leather Dressing, X-Ray Top Dressing, Nu-Stain Top Lining Dye, Preserv-O Tire Paint, Destroy-O Carbon Remover, Sta-On Engine Paint, See-Kleer, Chemico Blowout Patch, Body Gloss. In regard to Tire-Doh or any of these other articles, write to Atlas Auto Supply Co., 3203 W. Lake St., Chicago, Ill.

A Fine Electric Lantern.

The Lightning Bug Lantern is a modern, portable electric lantern, a handy and economical illuminator which has numerous points of practical excellence in its favor. This lantern is not only practical, strongly made and suitable for either in or outdoor service, but is attractively designed as well, and the exceedingly reasonable price brings it within the reach of all. It is intended for general use around the house, barn, camp, garage and in fact, wherever the oil lantern and flash light have been used, or where a good light is needed. It is clean, convenient and effective, no matches, no danger of fire, and always ready. With its use one can read ordinary print at a distance of 50 feet. The producing of this powerful light from an ordinary single cell battery, is one of the



Lightning Bug Lantern.

greatest accomplishments of modern science, and has been made possible only by the latest development of the Tungsten Electric Filament in connection with a new scientifically designed reflector in this lantern. This achievement which is one of the latest in electrical discoveries makes it possible to obtain a strong, brilliant light from a very low electric current. Their low price and cost to maintain, one battery lasting with ordinary use from six to twelve months, their safety and adaptability to all requirements, under all conditions, is bound to make these lanterns mighty attractive sellers. It is made by the Stewart, Skinner Co., Worcester, Mass.

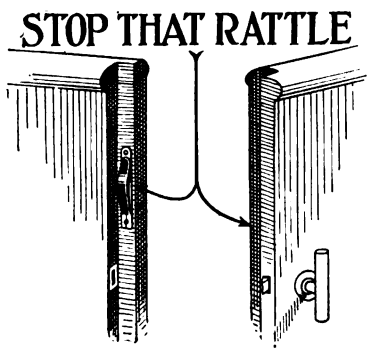
The C. B. Anti-Door Rattler.

This is a device to stop the rattling of automobile doors, and no doubt the same plan could be applied to windows



Good Anti-Door Rattler.

or movable panels of any kind. The device is placed on the door step with two small screws which are entirely out of the way, and this device also throws the door open when it is unlatched. This Anti-Door Rattler is made of special non-corrosive metals. It is highly polished, and will last a lifetime. It



Same Applied to Automobile Door.

absolutely stops the disagreeable rattling and may be obtained for only 25 cents. The device will be sent post-paid upon receipt of the price to any reader of this magazine. Address all inquiries and orders to William J. Bailey, 401-7 Mulberry St., Newark, N. J.

Something New.

Get Buob & Scheu's 1915 Coyprighted Order Blanks, showing how to order Automobile Top Covers, which consist of roof, quarters, stays, back curtain with celluloid light, welts, etc., which are sewed, finished, made ready to draw on. These covers can be drawn on by anyone without any experience. By buying B. & S. Top Covers, you can save over half the cost of a new top. Then again you can save freight charges. It is customary to send the old frame into the manufacturer, but with these copyrighted order blanks, this is not necessary. If these are filled out with proper measurements, covers can be made that will fit tops for any make of cars. Write for B. & S. 1915 Coyprighted Order Blanks to Buob & Scheu, Court and Broadway, Cincinnati, Ohio.

Valuable U-Sav-Your Products.

U-Sav-Your Dressing for washing automobiles is very highly recommended by all who have used it. The manufacturers state that no one should use soap and water on a motor car,—because if the water is too hot it cracks the varnish, and if too cold it cracks it also. In either event it kills the varnish. You must stop washing your car with water and soap, gasoline and kerosene, but if you simply take a bottle of U-Sav-Your, shake well, put on a piece of cheesecloth, and apply same to all parts of your car, it will astonish you. Why? Because it will remove hard dirt, oil, grease, and

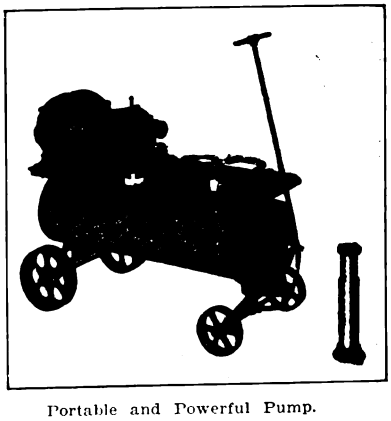


Car Treated With U-Sav-Your Dressing.

tarite immediately without scratching. It will polish the car, not deaden it like alkali, gasoline, kerosene, lye, potash, water, and soaps. It will never gum or catch dust like oil, etc. U-Sav-Your Dressing sells for only 50 cents per bottle. This preparation is not only good for automobiles, but it is a great life restorer for fine woodwork, enamel varnish, brass or leather surfaces of any kind. Send for sample bottle and it will surprise you. The same manufacturers also make U-Sav-Your Tire Remover, for removing Quick Detachable Rim Tires which remove these tires easily and automatically and sells for only $3 delivered in the United States or $3.50 in Canada. Address your orders and inquiries to the U-Sav-Your Manufacturing Co., Warren, Mass.

A New Garage Pump.

The Northern Engineering Works, Detroit, Mich., have placed on the market a new garage pump which differs



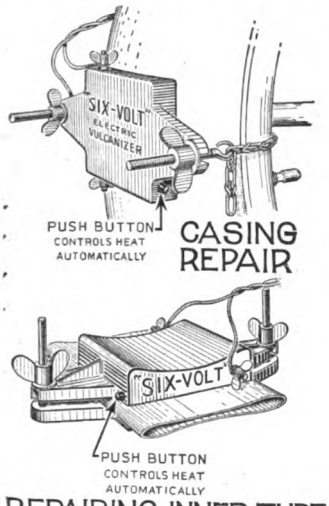
Portable and Powerful Pump.

from most others in its unusual power and of course in its range of use. As will be seen it is portable and no first-class garage should be without it.

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A New Electric Vulcanizer.

Motorists generally are rapidly being convinced that the portable vulcanizer designed especially for their use is a very valuable piece of apparatus to possess and when used intelligently, and in accordance with the directions furnished by the manufacturers, it means a material saving in tire expense every year, for with the portable vulcanizer permanent patches can be made on inner-tubes in a very short time and small cuts in casings can be healed before moisture and dampness gets into the fabric of the casing, which causes it to



Showing Method of Using Premier Six-Volt Automatic Electric Vulcanizer.

weaken and rot, blow-outs being an early resultant trouble. The Premier "Six-volt" automatic electric vulcanizer is designed to operate from the regular 6-volt storage battery furnished as regular equipment to all up-to-date motor cars and eliminates the danger from fire resulting from the use of highly inflammable liquid spirits as fuel. Burned or overcured tubes or casings is an absolute impossibility with the Premier "Six-volt" vulcanizer, as the electric current is controlled automatically by the heat temperature of the vulcanizer, and the electric current is automatically cut off or opened the very instant the vulcanizer attains the correct heat to properly vulcanize the repair. Great simplicity of operation is claimed for this new vulcanizer, as there is nothing to do but simply connect the "Six-volt" to your battery, apply it to the tube or casing, and press the button, this pressing of the button completes the electric circuit through the vulcanizer and lets the electric current heat it to the desired temperature to vulcanize rubber, and when it attains this temperature the thermostatic cut-out automatically opens the circuit. The vulcanizer then cools off and is ready for another job, the automatic cut-out being capable of operation several hundred times before becoming exhausted. The "Six-volt" also is very small and compact and less cumbersome than other portable vulcanizers and as it weighs approximately two pounds it is not a burden to carry in the tool compartment but is always ready to put a patch on an inner-tube that "stays put" and to heal cuts in casings while fresh, which means much toward cutting down tire expense. The Premier "Six-volt" is manufactured by the Premier Electric Co., 4038 Ravenswood Ave., who will be glad to furnish circular matter free to all live dealers upon request. This device will repair inner-tubes and casings up to 5 inches in diameter and furnished complete with ten feet of flexible connecting cord, repair gum, cement, scissors, casing tire tool and wax paper ready for use. Price, $3.50.

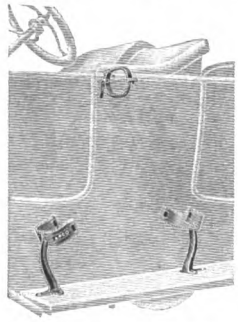
Brilliant Kerosene Gas Lighting Systems.

The Brilliant Gas Lamp Co., 1009 South Wabash Ave., Chicago, Ill., is marketing a line of lamps and kerosene gas lighting systems which are the outcome of continuous experiments to obtain the exactly right adjustment and combination of parts which would produce a perfectly satisfactory and safe incandescent light of 500 to 1,000 candle power, fully as safe in use as ordinary coal gas illumination, free from all elements of danger and inefficiency and from the grounding or crossing of electric wires. Brilliant Kerosene Gas Lamps are faultless in performance, owing to the absolutely perfect adjustment and combination of every part. They burn common kerosene or coal oil that you can buy at any grocery store. So perfectly is the action of this remarkable burner that it can be in use daily for a whole year and yet will not produce enough carbon and oxide deposits to necessitate the changing of the generator. These lamps are well adapted for lighting public and private garages. Address the manufacturers for prices and full particulars.

New Apco Specialties.

Dealers and the trade stocking for the spring trade will be interested to learn that the Auto Parts Company, Providence, R. I., manufacturers of the well established line of Apco specialties for worth investigating. They are practical and necessary equipment and are sold with the usual liberal Apco guarantee of "satisfaction or your money back."

The Apco side tire holders are designed to be placed on the left hand side the Ford car, has brought out four new devices for this machine which are of the car, a location that makes them



"Apco" Side Tire Holder.

quickly accessible. Another advantage of the side position is that the tail light bracket does not require altering, and a tire trunk can be fitted if desired. No straps are used with the Apco holders. The shape of the holders is such that one or two shoes can be carried without their chafing, and the Apco design will take two 3½-inch tires or one 3-inch and one 3½-inch.

A tire can be removed or replaced in five seconds. A solid brass mail type of lock, having a rubber covered clasp, and which opens automatically when the key is turned, is furnished, but its use is not necessary as the catch locks securely. They weigh but seven pounds, come complete with screws, bolts, etc., and sell for the small sum of $2.

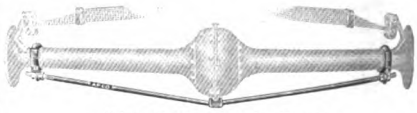
Another new Apco specialty for the Ford car is the spring leaf lubricators. These not only stop all squeaks, but keep the leaves lubricated, making the car ride better and prevent breakage. Each lubricator consists of a pair of plates having oil reservoirs and felt inserts. The inserts are soaked with oil, and resting against the sides of the springs feed the lubricant by capillary action.



"Apco" Spring Leaf Lubricator.

The frictional surfaces are thus automatically lubricated and without attention. The maker calls attention to the design of the Apco lubricators, stating that it is the only type that lubricates both sides of the spring. They are attached in a few minutes with a screw driver and a small wrench, and a set includes four pairs, two pairs for each spring. Each plate, which is of semi-steel, has an oil cup for renewing the supply of lubricant. The Apco lubricators sell for $2 the set of four pairs.

After much experimentation and tests the Auto Parts Company has perfected



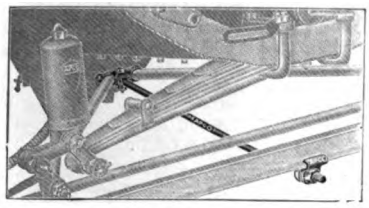
"Apco" Rear Axle Truss.

a rear axle truss that can be fitted in 10 minutes with an ordinary wrench. The Apco truss is designed for cars made previous to 1915 although it is a practical device for the latest models as it greatly strengthens the rear axle. The Apco rear axle truss is not only adjustable, but will prevent leakage of lubricant from the differential and eliminate noisy operation of gears caused by a sagging housing. The price complete is $1.50.

The front radius rod of the Ford car is utilized to maintain the front axle parallel with the motor and to prevent it moving backward when an obstruction in the road is encountered. As it is constructed of tubing there is more or less spring or give to it which allows the axle to tip backward affecting the steering the car. To overcome this trouble and to improve the operation of the radius rod the Auto Parts Company, Providence, R. I., has perfected a simple and ingenious front axle brace. It consists of a half-inch steel rod and two novel clamps. One of these clamps is

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attached to the V of the radius rod by three bolts and these bolts and the end of the rod have square heads which prevent their turning. The square head of the rod is integral with it. The other clamp is made in two sections and is secured to the front of the axle by bolts

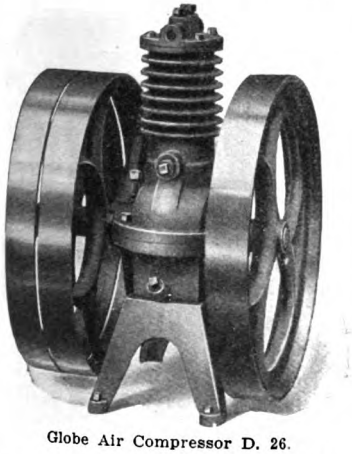


"Apco" Front Axle Brace.

which pass through both havles. Anyone can fit the brace in five minutes with a wrench. The Apco brace comes finished in black enamel, and weights but three pounds. It lists for $1.50.

The Globe Single Stage Compressor.

This new compressor has several desirable features in addition to its attractive price. Every bearing, including piston end of connecting rod, is adjustable to take up wear and the provision for such adjustment is more convenient than in any other type of compressor with which we are acquainted. For instance, to take up the main crank shaft bearing it is only necessary to loosen a single lock nut, adjust a single set

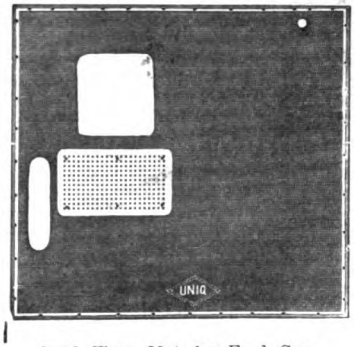


Globe Air Compressor D. 26.

screw and retighten the lock nut. Many of the garage compressors on the market have no provision at all for taking up even the crank shaft bearings, so that when the bearing becomes worn slightly, the compressor either goes on pounding or a new bushing must be substituted. The compressor valves, which are hardened tool steel, are arranged for vacuum, as well as pressure. The intake valve is tapped for pipe connection to a vacuum tank, so that anyone having one of these compressors can use same for both vacuum and pressure without making any alterations. This is a particularly valuable feature when used in a tire repair shop as the vacuum tank can be used to deflate inner tubes, saving much time over the old way of rolling the air out by hand. Equipment D 26 herewith illustrated retails for $25.00. For particulars regarding this and other types of compressor, address the Globe Manufacturing Co., Battle Creek, Mich.

The "Uniq" Floor Mat for Ford Cars.

This floor mat is made of genuine heavy cork linoleum, and has a wire edging covered with aluminum or brass molding which keeps the edges of the mat perfectly flat without screwing or nailing it to the floor boards. An aluminum pyramid heelplate is securely attached to the mat just below the pedal opening where the heels usually wear holes in an ordinary mat. This mat is made especially to fit the Ford car and has the regulation openings for pedals, shifting lever and speedometer shaft



Good Floor Mat for Ford Cars.

tube. It is extremely durable and is very neat in appearance. It is made in grey or brown colors to match the "Uniq" running boards. The price of this mat ready for use is $2.50 with aluminum binding or $3 for brass binding. The same manufacturers are making complete running boards for Ford cars, also Ford valve grinders, combination valve tool for Ford engines and other specialties for the Ford car. Address all inquiries and orders to the C. Spiro Mfg. Co., 68 East 131st St., New York City.

A Good Ford Fan Belt.

The No-Slip, No-Stretch Ford Fan Belt here shown is made of a strong nelastic fabric, having a ply of chrome eather sewed on the inside where it omes in contact with the pulleys. The whole belt is treated by a special pro-



A Good Ford Fan Belt.

cess which makes it waterproof and gives the leather a rubber-like finish, which makes it hold perfectly to the pulleys without the use of belt-dressing. These belts give long wear and will not stretch out. They retail for 40 cents each and are made by the Leather Tire Goods Co., Niagara Falls, N. Y.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.

71-73 Murray St., New York.

Opco Carbon Remover.

Something over a year ago an expert in lubricating and volatile oils conceived the idea of eliminating carbon trouble by a chemical process having an oil base

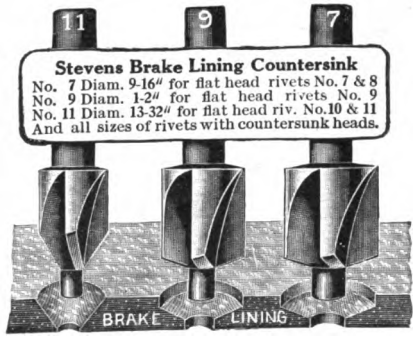


For Removing Carbon.

and applied in such a manner as to reach every part of the motor itself. After a series of tests, covering a period of several months, the question was solved and not only resulted in removing severe cases of carbon trouble by a single application and preventing a recurrence of the same by the use of a small quantity once a week, but also had the advantage of increasing the efficiency of the motor by cleaning and lubricating every working part of the motor itself. These facts are testified to by well-known and acknowledged experts and users. Opco carbon remover is the formula of oil experts. There is nothing in the cylinder cleaner to injure any part of the engine, as it is absolutely harmless to everything except carbon, which is destroys, It penetrates, softens and completely removes carbon, and it is easily introduced through spark plug taps. A large cam containing sufficient to clean 16 cylinders sells for $1. This product is manufactured by the American Oil Products Co., Inc., Buffalo, New York, to whom all inquiries should be addressed.

Stevens Brake Lining Countersink.

This is an extremely well made tool and it is handy in any repair shop or garage for countersinking the brake



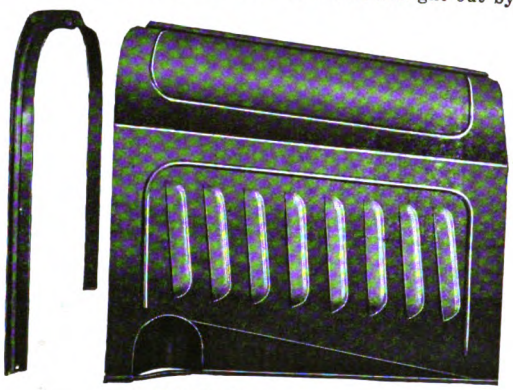
Tells its Own Story.

lining for attachment to the car. The inscription on the accompanying cut shows the various sizes of these countersinks and prices and full information concerning them will be furnished to our readers by the manufacturers, Stevens & Company, 375 Broadway, New York.

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Sloping Hood for Ford Cars.

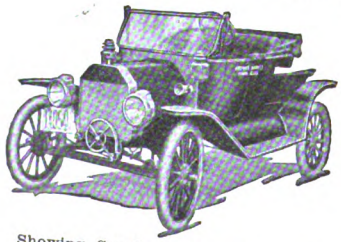
The Livingston Radiator and Mfg. Company, of Amsterdam Ave. and 75th St., New York, have recently announced a sloping hood for Ford cars. This hood adds to the appearance and beauty of a Ford car, by giving it a long streamline effect, and is made of No. 20 B. & S. gauge steel, finished in black enamel. It is constructed with vents or fins on the sides, so as to allow the heat generated from the motor to escape from under the hood. It is easily attached to the Ford car, as a hood ledge is furnished free with each sloping hood. The hood hooks used as regular equipment of a Ford car fit this new hood, making it absolutely interchangeable with any hood on any Ford car. It is made to fit any Ford type of radiator, but in conjunction with the Livingston Pointed Front radiator it gives the Ford car a distinctive and individual appearance. It is listed at the extremely low price of $8, and is sold by dealers generally throughout the country. This bonnet is finished in the same complete way that have made Livingston radiators so popular with the drivers of Ford automobiles. As these bonnets are packed in pasteboard cartons they can be shipped by parcels post.



New Hood for Ford Cars.

The Sandbo Starter.

This is a mechanical pull starter, operated by means of a cable from the seat, and the manufacturers state that it is the only Two Compression starter on the market. A polished handle fits in a neat socket in the dash. From this the cable leads under the hood, over a pulley to the odd shaped wheel in front of the radiator. This wheel is nickel plated and an ornament to any car. One sharp pull of the cable turns the crank a complete revolution and over two compressions and past two ignition points. This system insures a quick and satisfactory starting of the car. The Sandbo Starter which is manufactured at Rock Island, Ill., is handled in New York by the Star Rubber Tire Co., 1781 Broadway, and we understand that a great many New York manufacturers are installing this device.



Showing Sandbo Starter Attached.

A Booklet of Allen Specialties.

Every motorist or dealer who reads this magazine is likely to be interested in a very attractive booklet which has just been brought out by the Allen Auto Specialty Company, 1926 Broadway, New York City. This booklet describes and illustrates the well known line of Allen tire cases, also the Allen Tyrometer, or tire pressure gauge, Allen tire locks, radiator covers, blue book covers, and a long list of other useful and attractive automobile specialties. We understand that this booklet will be sent free for the asking to any of our readers.

Superior Hood for Ford Cars.

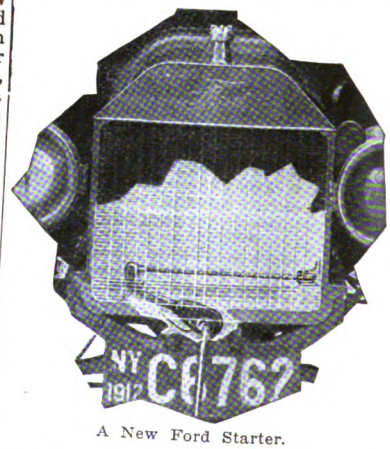
This is a new Stream-Line hood which has been brought out especially for the Ford car by removing the old hood rest and screwing on the new one. This new hood is set on the car and your Ford is completely changed in appearance. The tapered Stream-Line of this hood produces longer up-to-date lines for the whole car. This hood is built solidly and substantially and will not rattle or creak. It tapers to the top of the wood dashboard, also tapers on both sides and has a separate hood rest ready to screw on the dash. There are no exposed hinges on the top and the old hood hooks fit the new hood perfectly and snugly. This hood has six ventilator grills raised on each side allowing the heated air pr duced by the motor to escape. This fe ture can be appreciated in warm weath and it is claimed that the cooling improved 100 per cent. on this accoun This hood is sold complete ready to a tach for only $11.40 and many Ford ow ers will undoubtedly be interested in i This is also a big proposition for deal ers. Write for full particulars to th Superior Lamp Mfg. Co., 136 West 52n St., New York City. The same com pany manufactures a V Type radiato for the Ford car and they will allow $ to any Ford owner on his old radiato regardless of its condition.



Stream-Line Hood for Ford Cars.

Robertson's Pres-Toe Ford Starter.

Described as a starter that places the Ford in the $5,000 class and a starter that the ladies can operate, Pres-Toe starter is a mechanical device operated by a lever, pressed by the toe. Pres-Toe Starters are the result of several years experimenting by the manufacturers to produce a reliable, serviceable and easy to operate method of starting the motor from the seat. All these features have been accomplished in the Pres-Toe Starter. By actual test Pres-Toe starters have proven 100 per cent. efficiency. A novel test was recently indulged in to cross a stream 16 inches deep 100 times, stopping the motor in the center. The motor started every time on the first attempt. The impelling unit is a very ingenious part, constructed entirely of high grade hardened steel with full ball bearings running on hardened ground steel cones, thereby placing the device on an almost never wear out basis. In the impelling feature noisy ratchet teeth are entirely eliminated. A ball and socket joint is used which is positive and all danger of broken teeth dispensed with. Pres-Toe starter is provided with an automatic release to eliminate all dangers from back firing of the motor. The entire system is installed under the hood, even the original starting crank is left in place. To install the Pres-Toe starter no holes are drilled or the present arrangement disturbed and with the instructions attached to each starter any owner can install it perfectly with his present outfit of tools. No driver of a Ford car can appreciate the extreme pleasure and convenience that is attained by the Pres-Toe starter until he has one installed. Pres-Toe starters will save the cost of installation



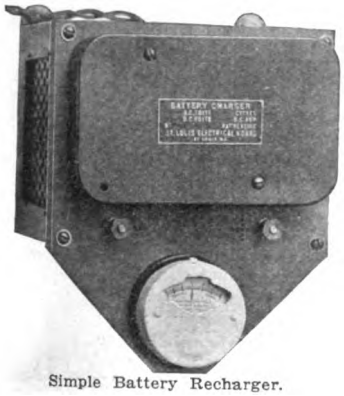
A New Ford Starter.

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in a very short time through the saving of gas and oil consumed by the motor running while standing, as many drivers do rather than get out and crank. What is more annoying to a driver than to have to get out and crank a stalled motor in a busy thoroughfare? With Pres-Toe Starter installed you are wise, press the toe and away you go. Write to-day to the manufacturer, W. Robertson, 32 Greenwood Place, Buffalo, N. Y.

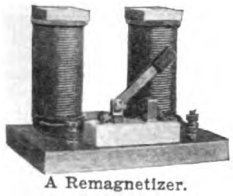
A New Battery Recharger.

The St. Louis Electrical Works, Arlington and Easton Aves., St. Louis, Mo., are making a battery recharger or rectifier of a simple and inexpensive type. It is convenient to use, simple to operate, small and light. It will charge a dead battery in the proper direction and is designed to operate on circuits of a wide variation. It is guaranteed free from all mechanical or other defects for



Simple Battery Recharger.

a period of one year. A different size is made for different kinds of work and those interested would do well to send for a booklet which the company issues and which describes these chargers and



A Remagnetizer.

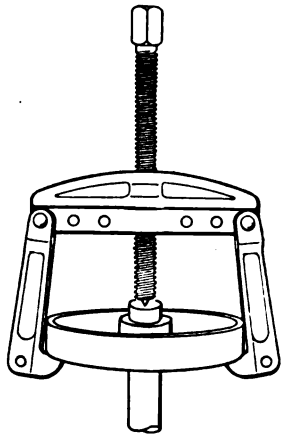
likewise a magnetizer. They are both useful in a garage or for private use.

Bethlehem Steel Back of Silvex.

It is important that the consumer as well as the dealer can depend upon the manufacturer back of a product. In this respect the Silvex Company holds a unique position in the automobile accessory business. Rumors have been current from time to time as to the backing of this company. All doubts have now been set at rest on this point by a recent statement from Mr. J. W. Fischer, vice-president and sales manager of this company. Mr. Fischer states: "We are endeavoring to acquaint both the automobile owner and the dealer—the jobber has already been posted and knows—with the fact that the Silvex Company is headed by Mr. Chas. M. Schwab, president of the Bethlehem Steel Company, a man head and shoulders over anybody connected with the steel industry. Our goods are manufactured at South Bethlehem, Pa., the mecca of all skilled mechanics in the metal working trade. The name 'Bethlehem' on any product is an absolute guarantee as to mechanical skill, workmanship and quality. There are but few automobile accessories with such a standing before the consuming public as that of the Bethlehem Five Point Spark Plug."

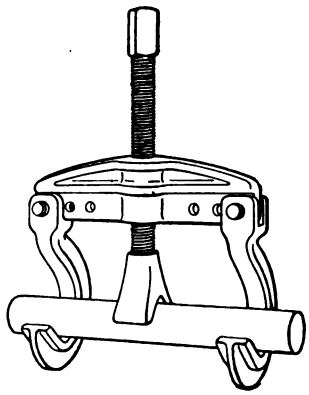
New Model Crane Wheel and Gear Puller

This device which we illustrate herewith is an extremely handy tool in any



Showing Use of Crane Puller.

garage or repair shop, and the cuts herewith shown serve to illustrate the uses to which this tool can be put. The line of work done by the Crane Puller includes removing automobile wheels, flywheels, transmission and cam shaft gears, commutators, sprockets, collars, couplings, etc., and there are various attachments which render it possible to do a great variety of work. One of the illustrations shows the pipe bending and shaft straightening attachment so clearly that an explanation is hardly necessary, and the other cut shows the method of removing a pulley from the end of a



Pipe Bending and Shaft Strengthening Attachment.

shaft. For heavy work a three arm puller is made by the same manufacturers, and there are also extension arms provided for work beyond the reach of one set of arms. The Crane Puller is put out under an unusually strong guarantee. If one of these tools is broken on any legitimate work, the broken parts may be returned express paid with a description of the way it was broken, and another puller will be sent absolutely free of charge. This amounts to a complete guarantee against any defect in workmanship, and it shows that the manufacturers have made an exhausted study as to the material and method of construction in making this remarkably strong application. This apparatus ought to interest every repairman in the country and any who may be interested are urged to write for full description and price lists to the Crane Puller Co., 54 Lake Street, Arlington, Mass.

Eklips Spark Plugs.

This is a new line of spark plugs which has just been placed on the mar-



The "Eklips" Plug.

ket by The Fulton Company of Milwaukee, manufacturers of the well known Aermore Exhaust Horn. The Eklips plugs have many new and ingenious features to keep them free from oil and soot, and it is claimed by the manufacturers that they give more power with less gas. Four types are put out in porcelain insulation listing at $1.25, $1, 75 cents, and 50 cents, and two Mica types are listed at $1.25 and $1. These plugs are made in all sizes for automobiles, motorcycles, and motorboats by The Fulton Company, 726 National Ave., Milwaukee, Wis. Write for full particulars.

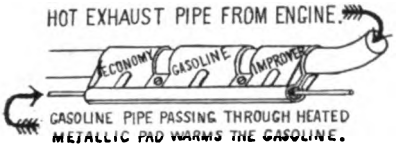
Veedol for Lubrication.

The life and efficiency of the car is dependent largely on the lubrication. The manufacturers of Veedol are anxious to get before our readers the facts in regard to this excellent lubricating medium, and they want as many of our subscribers as possible to write for the Veedol book on automobile lubrication, which will be sent free upon request. Veedol is to be extensively advertised, and it makes an excellent article for dealers to handle, and dealers throughout the country before they buy any more oil should see the Veedol salesmen. Dealers are requested to write for the special portfolio describing the advertising campaign which the manufacturers of Veedol have inaugurated for 1915. All communications should be addressed to the Platt & Washburn Refining Company, 20 Broadway, New York City.

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The Economy Gasoline Improver.

This is a device for warming the fuel supply on Ford and other automobiles, and the method of applying the invention is well illustrated in the engraving which accompanies this article. The gasoline is warmed by a heated metallic pad, through which a gasoline pipe is passed, and the heat is furnished from the exhaust pipe of the engine. The device clamps over the exhaust pipe and around the gasoline feed line from the outside of the exhaust pipe, and is conducted through the walls of the cylindrical chamber, which is filled with a soft metallic pad, thus thoroughly warming the fuel supply. The Economy Gasoline Improver can be attached to a Ford car in ten minutes by any one, and it is claimed by the manufacturers that it increases the power of the engine materially, gives a large increase in miles per gallon, decreases the accumulation of carbon, and adds greatly to the smooth running qualifications of the motor. The cost of the apparatus complete is $2.35, and it is manufactured by the Inst Lighter Company, No. 58 E. Main Street, Columbus, Ohio, to whom all inquiries should be addressed.



Showing How Fuel Supply is Warmed.

Prize Offered by Rajah Auto Supply Company.

In connection with the forthcoming Vanderbilt Cup and Grand Prize Races, the Rajah Auto Supply Company, of Bloomfield, N. J., manufacturers of the Rajah Spark Plugs, are offering a prize of three hundred dollars in gold to the driver making the best time for the first hundred miles of the Grand Prize Race. This is a sporting proposition on the part of the Rajah Company, as no restrictions are placed on the car being equipped with their product. Heretofore, almost all accessory prizes have been contingent upon the car using the product of the manufacturer who offers the prize, but in this case there is no such restriction.

Electric Starters and Batteries Repaired.

Neither the car owner, nor the average garage owner understands repairing electric starters and batteries, but the work is done and done well by the Electric Self Starter Repair Company, 244 West 49th Street, New York City. They absolutely guarantee all their work and they repair not only electric starters and batteries of all kinds but coils and magnetos and they also rewire motors when this is required. They have experienced battery and starter repairmen who were formerly connected with the Packard Company. Readers who are interested should send in their orders and they may be assured of satisfactory results.

New Agent for Republic Tires.

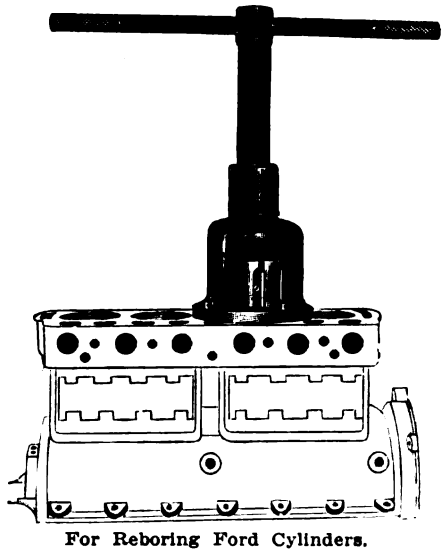
William M. Perrett has been chosen branch manager at Detroit, Mich., for the Republic Rubber Company at Youngstown, Ohio. Mr. Perrett is a veteran in the tire business by virtue of 20 years actual service, and is exceptionally well equipped for his new post. Mr. Perrett is very prominent in Masonic circles, at present being Grand Master for the State of Michigan, and also past potentate of the Shriners at Detroit. Mr. Parrett's headquarters as branch manager of the Republic Rubber Company will be at 1001 Woodward Avenue, Detroit.

"Blitz-Blank," the Magic Glass Cleaner.

Many accidents could be avoided if the driver of an automobile could always be sure of a clean windshield. "Blitz-Blank" is a preparation for cleaning glass which is of such excellence, that it may well be called, "the magic glass cleaner." When applied to the windshield, it positively prevents frosting, steaming, or smearing caused by moisture, dust, grease, change of temperature or rain. It sheds the rain quickly and evenly from the windshield and insures to the driver a clear vision and an effective safeguard against accidents. It is always ready for instant use, is non-injurious and can be easily applied. It sells for 25 cents and should be carried in the stock of every dealer as it is a great seller. To dealers, an attractive display card is offered and so low a price on the goods that it affords an excellent profit. For full particulars, address the manufacturers, The Utility Mfg. Co., 6 East Lake Street, Chicago, Ill.

The Davis Cylinder Reboring Jig and Reamer.

This is a special tool for reboring Ford cylinders, and the manner in which it is used is well indicated by the illustration. The Ford Company furnishes pistons, one thirty-second of an inch over size, and the tool here illustrated rebores cylinders to fit these special pistons; and it is claimed by some, that after the cylinders are thus rebored, the motor is even better than when new, because it is claimed that old cylinders which have seen months of alternate expansion and contraction are seasoned out, and are far superior to new castings. One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Readers who are interested should write to the Hinckley Machine Works, Hinckley, Ill. They manufacture this device, and will gladly quote prices, and give all information concerning this handy tool.



For Reboring Ford Cylinders.

Gasolette.

This is a new product which it is claimed, will increase the power of the motor, through the lessening of gasoline consumption. It is being placed on the market by Bergman Bros., No. 1777 Broadway, New York City, and this same concern is factory representative of the Auto Parts Company of Providence, Culver, Stearns Mfg. Company of Worcester, Mass., and Marvel Auto Supply Co., of Cleveland, Ohio. They state that it is an article of exceptional merit, which will, no doubt, become well known to the accessory trade.



The Bosch-Ford Attachment.

The manufacturers state that the newest Bosch-Ford Attachment is an efficiency promoter, as it makes possible an easy and mechanically correct installation of the Bosch Magneto on Fords, and results in a positive betterment of the car; gives more power, more speed and more economy, and, due to even and positive ignition, reduces the wear on the engine and the car in general. The magneto used with this outfit is a Bosch Magneto, the same quality which goes into the highest class of automobile, and the few fittings which are necessary are also made in the Bosch factories. This Bosch-Ford Attachment offers an especially attractive proposition to dealers, and many readers who sell automobile accessories will wish to take advantage of this opportunity to handle a good seller. Stock a few of these attachments now and your orders will have prompt attention and be shipped by a nearby supply station. A Bosch-Ford book will be sent on request by any who will take the trouble to ask for it. Address all inquiries and orders to the Bosch Magneto Company, 202 West 46th Street, New York City.

Marathon Tires.

These tires are built entirely by hand, of the finest materials obtainable, and they are vulcanized by the unit-cure wrapped-tread method. To the dealer who is desirous of securing the better class of trade the agency for these tires represents a good business opportunity. Write for exclusive agency proposition by which the dealer controls his own territory. Your inquiry will bring you full particulars as to selling plan and co-operation with the dealer. Address all inquiries to the Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio.

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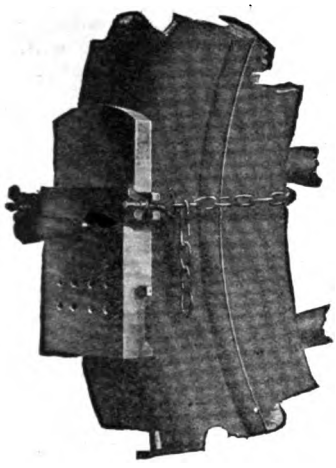
"WIZARD" AND "G WIZ"

STEAM VULCANIZERS

WILL CUT YOUR TIRE EXPENSE IN HALF

HOW TO GET MORE MILES OUT OF YOUR TIRES: You lose thousands of tire miles by not keeping them properly inflated; by applying brakes too quickly, by rubbing against curb stones, by letting car set on oily floors, etc. However, the greatest abuse is to **neglect those small cuts in casings.** Layers of fabric supply strength to the tire, and the rubber covering is to protect them. Small cuts expose the fabric to water and sand, forming sand blisters and rotting the fabric. A blowout at the weakened spot is the sure result. Keep those cuts vulcanized and your tire will last until the rubber tread is worn off all the way around, giving you double the usual mileage.

WHICH IS THE BEST VULCANIZER FOR YOU? The fact that we are the oldest and largest manufacturer of portable steam vulcanizers in the world should mean a lot to you in deciding. Our vulcanizers have been adopted by the U. S. and many foreign governments, and are recommended by the large tire factories. We use **steam heat** in all our machines. **Steam** will not burn or overcure the tire. **Steam** is used by **all** tire makers and large repair shops **exclusively.** Our long experience and large factory facilities guarantee you a better vulcanizer for less money than you can get elsewhere. If you do not find it so, send it back and get your money.

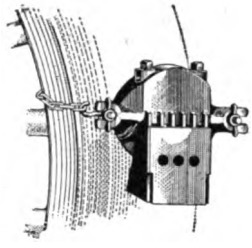


WIZARD Automatic Steam Vulcanizer

For both tubes and casings of any size. Burns gasoline with no smoke and no flame exposed. Requires no watching, as heat is automatically controlled. Water put in at factory and never needs refilling. Steam is the only safe method of vulcanizing. Vulcanizing surface 3″x6″, curved for casings and clamps against plate for tubes. Highly polished and nickel plated all over. Insulated handle. Weight six pounds. It has saved thousands of dollars for our customers. No experience required to use it.

PRICE, With Instructions and All Supplies by Mail, Prepaid, $3.50

Order to-day and save those tires.

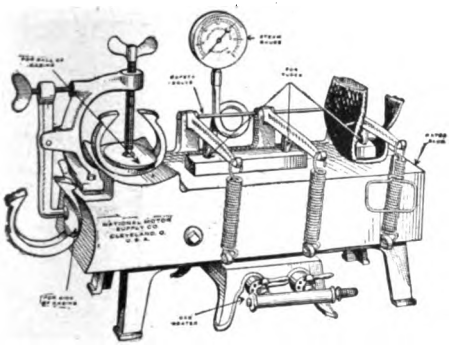


G-WIZ Automatic Steam Vulcanizer

For both tubes and casings 3½″ or smaller. Works like Wizard in every way, the only difference being that it is made for small tires. Guaranteed to do perfect work. Thousands of satisfied users. Saves its cost in repairing one tire, and will last forever. Weight 3 lbs.

PRICE, With Instructions and All Supplies by Mail, Prepaid, $1.80

10 DAYS' FREE TRIAL! After you have tried any of our vulcanizers ten days, if not entirely satisfied, return, get your money.



GARAGE AND REPAIR MEN, LOOK!

Thousands of garagemen all over the world are making big profits with our

National Garage Steam Vulcanizer

Vulcanizes three tubes and two casings at a time. Heated by either gas or gasoline. We have made this machine without any change for six years, which shows how satisfactory it is. You might as well have the big profits for vulcanizing in your vicinity. The National is the easiest and cheapest machine to operate on the market.

LIST PRICE, $60.00

Write for full details and discounts. A card will do.

MANUFACTURED BY

THE NATIONAL MOTOR SUPPLY CO.

Main Office and Factory
5633 Euclid Avenue, CLEVELAND, OHIO

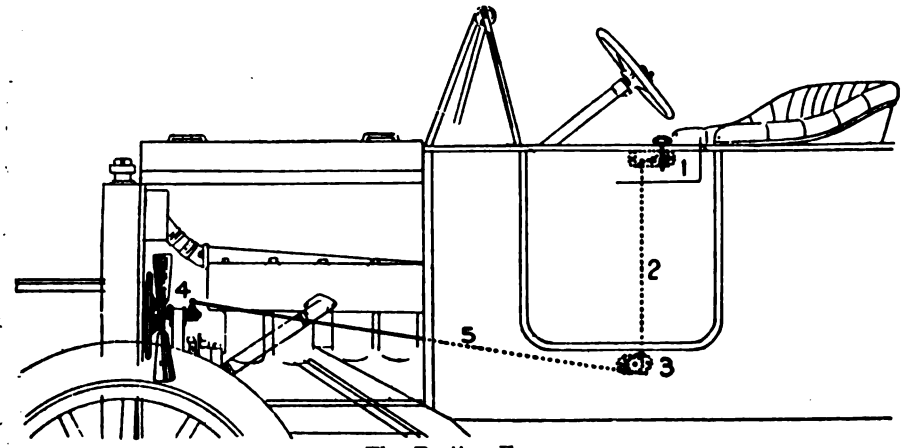
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Combined Horn and Fan.

Credit is given an Indianapolis company for producing what is called the Oakes-Beartone, a combination of horn and fan. Beartone is being marketed for the Ford cars. The Oakes Company is an old one, having been in the metal stamping business for some time, and especially having been manufacturers of automobile motor fans. The builders of the Continental Motor build motors for 128 cars and trucks, and the Oakes is used as standard equipment on Continental motors, besides many other motors.



The Bartine Fan.

Because of their fan success the Oakes Company was the logical manufacturers to sponsor the combination of fan and horn. This Oakes Beartone horn has no trumpet. It is operated by attaching a button at the driver's seat, and the driver can regulate the volume of sound and its range by the pressure upon this button. The advantages of the Beartone are said to be many. In the first place, the owner has a fan that does not have to be replaced, but is capable of long wear. The horn being an integral part of the fan, eliminates complicated mechanism. The theory of the Beartone is that the driver of a car never needs to use his horn, except when the motor is running, and whenever the motor is running the fan is revolving, and whenever the fan is revolving by a pressure of the button at the driver's seat a signal can always be obtained from this fan and horn combined.

Gearless Differentials.

Technical writers and automobile engineers have long acknowledged the drawbacks of gear differentials, either of the bevel or spur-pinion types, but since differential action is considered essential to a motor car, the disadvantages have been accepted as necessary evils. Several unorthodox types have been built in the form of worm gears, chain mechanisms, slipping and over-running clutches, which for the most part have had the defects which have kept them from general adoption. There is now, however, upon the market a device which not only has overcome the drawbacks of the usual balance gear, but which seems to have overcome the difficulties experienced with former substitutes for the gear differential. This is the latest development of the Gearless Differential Company, Detroit, U. S. A. The new mechanism takes the place of the gear differential at the center of the rear axle, and in the case of the model "T" size can be substituted in a Ford rear axle without in any way altering the axle housing, ring gear, shafts or bearings. The claims of superiority over the gear differential are numerous, and are substantiated by the testimony of many prominent users, who say that this device does all, and more, than is claimed for it, and serves to prove that "cars are safer to drive." Some very strong claims are made for this device as to its strength and efficiency over the differential gear. A positive drive to both rear wheels is transmitted, therefore one rear wheel cannot spin on a slippery surface and the other stand still. Dangerous skids are eliminated, and a Ford car has a positive service brake on both rear wheels, regardless of road conditions. There being no sideways at high speed, the danger of overturning is greatly diminished. A saving of fuel and tires is effected by absence of slippage, acceleration when one wheel is thrown from the ground, and tendency of back wheels to get out of line (using power to bring them back), also the driving on the wheel traveling the shortest distance, all mean less revolutions of the motor, thus an actual saving in fuel and wear on tires of about 25 per cent.

Imperial Oxy-Acetylene Equipment.

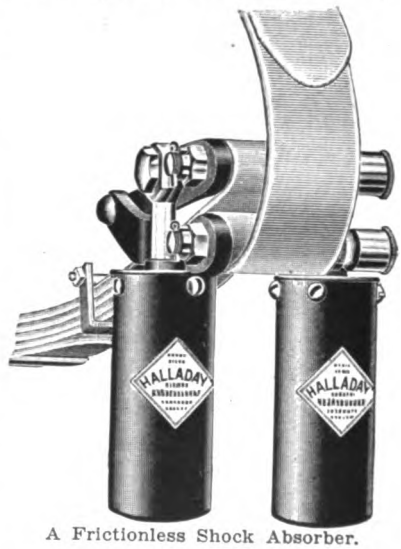
An oxy-acetylene welding and cutting equipment possessing some new exclusive features has recently been placed on the market by the Imperial Brass Mfg. Co., Harrison and Racine Aves., Chicago. Two vital points necessary to safe, efficient, economical and continuous operation of oxy-acetylene equipment are: 1—Thorough and uniform mixing of the two gases employed. This can be accomplished only by designs that are scientifically and mechanically correct and extremely careful and accurate workmanship and properly selected materials in the manufacture of the various parts involved. 2—Close and accurate regulation of both volume and velocity of the gases delivered to the mixing chamber of the torch and ability to maintain a constant fixed pressure under continuous operating conditions as well as to control a wide range of pressures called for by the various requirements of service. The great importance of these two points will be fully appreciated when it is realized that the safety and efficiency of operation and the life of the equipment are directly dependent upon them, as their successful solution eliminates danger of back-firing, undue consumption of gases and burning of tips. The superiority of Imperial equipment, aside from highest quality of materials and workmanship, is largely due to a new exclusive principle fully protected by numerous patents pending, by which the oxygen is mixed with the acetylene to a degree of uniformity not accomplished with any other method. For full particulars address the manufacturers as above.

Cray Tops for Ford Cars.

A special opportunity for dealers is offered in a line of Ford tops now being placed on the market by Cray Brothers, 1119 West 11th St., Cleveland, Ohio. This line gives the dealer or repair man an opportunity to make a great deal of extra money. The Cray line of tops is sold to dealers on exceptionally favorable terms, and the line is of unusual merit, as may be judged by consulting the advertisement from this company in the present issue. The Cray Ford one-man top is described as the most easily operated one-man top made, and the Cray Ford extension top has many special features which commend it to the Ford owner. Cray Brothers publish a free book to auto repair men which they will be glad to send on request to any of our readers who are in the trade. This book consists of 512 pages of bargains, about 8,000 illustrations, and it is a complete auto repairers' guide and price maker, quoting the latest wholesale prices on first quality automobile supplies and accessories of every description. To obtain this valuable book it is necessary to identify yourself as a dealer, automobile repairer or garage owner, and also to fill out and sign the coupon attached to the full page advertisement of Cray Bros. appearing in this issue of our magazine.

The Halladay Shock Absorber.

These shock absorbers are frictionless and are designed for all makes of cars, for three-quarter or full elliptic trucks.

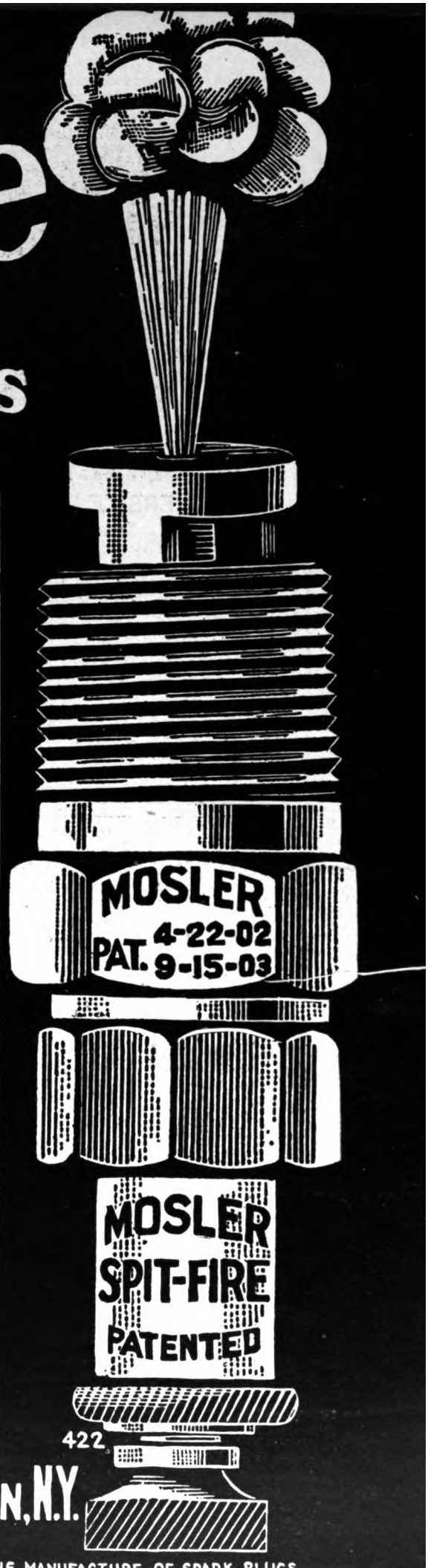


A Frictionless Shock Absorber.

They are fully guaranteed and no grease need be used for their lubrication. They will add to the life of the car and likewise to the enjoyment of riding in it. It is claimed that there is a saving in tires. They are quickly attached and there is nothing to rattle loose and nothing to be adjusted. The price is low, considering their high quality and construction, as well as their elimination of shock. They are manufactured by H. P. Halladay Co., Streator, Ill.

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Mosler SpitFire Plugs



Let Mosler Spark Plugs Put More Money in Your Pocket

Every time you sell a Mosler Spark Plug you make a ***real*** profit—and you make a friend, too. Don't miss the chance of making both—stock up now on

SPITFIRE *and* VESUVIUS

These two brands will be advertised to the consumer in big, smashing, selling style, through the 1915 season. It's going to be easier than ever to sell Mosler Plugs—and that means more profitable.

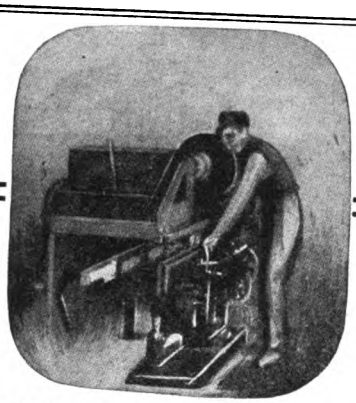
Write *now* for our proposition and be ready!

(Ask for Mosler's Spark-Plug Chart—it shows the right kind, type and size to get the best result out of every car—free on request.)

A. R. MOSLER & CO., P.O. BOX "M" MT. VERNON, N.Y.

WE OWN THE LARGEST FACTORY IN THE WORLD DEVOTED EXCLUSIVELY TO THE MANUFACTURE OF SPARK PLUGS

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CYLINDER REGRINDING
AND OVERSIZE PISTONS AND RINGS

High Grade Work Guaranteed

Cylinders ground perfectly straight on a HEALD GRINDER and guaranteed that there will not be more than 1-2000 of an inch variation in a set of cylinders, and the same close work will apply on the pistons.

Piston rings made to fit perfectly, every set ground round specially for each job.

Our Slogan is QUALITY

Write for estimates and state number of cylinders and bore diametors.

OXY-CARBI CO.
396 GEORGE STREET NEW HAVEN, CONN.

An Aid to Starting

Take a small bottle or tin with a little gaso in it and place it for a few minutes in hot w until the gasoline is hot, then place a few drop the hot gasoline in the compression tap and in into the cylinder. This method has been a hel starting. It may be useful to know this as th is no possible danger with it.

Real Platinum Points.

From W. F. Wooster, Washington.—If somec complains to you of faulty ignition through a make of master vibrator tell them to have so jeweler put on some real platinum contacts. solved much of my trouble with a 1913 model Ford in this way. If you think it worth while will explain to any one just how to do the work.

Testing the Compression.

When a cylinder fails to hold compression it is n always easy to tell whether leakage is taking pla past the valves, etc., or past the piston rings. the breather, or crank case compression releas pipe, is examined when the engine is pulled ove compression when hot, it will be found that at eac compression stroke oily gas will be blown out of th breather pipe if the leak is past the piston. It i obviously of no use making this test when the en gine is cold.

A New Dixon Booklet.

In a sixteen-page booklet, descriptive of Dixon's Graphite Automobile Lubricants, the first four pages are devoted to a brief but pointed address to those interested in graphite lubrication. Following this is an individual description of the members of the Dixon Lubricant family. A distinct feature of this description and one that lifts it from the ordinary is the use of a series of well drawn pen-and-ink sketches. The last few pages contain, in detail, recommendations for the use of each lubricant. Altogether this booklet is worth writing for and a request is all that's required by the Joseph Dixon Crucible Company, Jersey City, N. J.

C. P. Valve Lifter.

This is a good tool which the manufacturers state works like a vise, and holds like a vise. It holds the spring rigid, and can be used on any car. The price of this valve lifter is $1, by mail. Send your orders and inquiries to Clinton Machine Works, 460 High St., Clinton, Mass.

The Tuthill Springs.

It may not be generally known that one of the most difficult things to construct for an automobile is the springs. To secure a spring that under all conditions of load and road will answer the purpose, is something not as easy as may be imagined. Then the question of breaking is an important one. Some springs break in the center and some on the ends, but probably 75 out of 100 are liable to center breakage. In the Tuthill spring there is no center bolt whatever. The Tuthill Titanic springs are made in all styles and sizes, for pleasure cars, trucks and commercial vehicles and they never break. For full information concerning this spring address Tuthill Spring Co., Chicago, Ill.

No-Leak-O Piston Ring.

This is described by the manufacturers as a scientific oil packing piston ring. The oil grooves in this ring are kept full of oil, making a perfect fit, also forming a seal, which prevents the escape of gas, and also lubricates the piston ring, thus giving, it is claimed, perfect compression without waste, maximum power with less gasoline, and perfect lubrication without carbon, smoke and oily plugs. Any who may be interested should write for prices and full particulars to the Automobile Accessories Company, 816 West North Ave., Baltimore, Md.

Voltalyte.

This is an acidulated distilled water solution for recharging storage batteries, and the manufacturers state that practical results are being obtained from the use of this preparation. All good reliable manufacturers recommend the use of distilled water for charging batteries, but the acidulated water known as Voltalyte is ideal for the purpose intended. Voltalyte is manufactured by the L. & M. Auto Specialty Co., of 1104 Lexington Ave., New York City, to whom all inquiries should be addressed.

S. O. S. Storage Batteries

These storage batteries are manufactured by the Arsenal Varnish Co., 2501 Fourth Ave., Rock Island, Ill. The manufacturers state that aside from their high voltage maintenance, they will guarantee that S. O. S. battery plates positively will not buckle or sulphate during the life of battery, under any conditions of use or abuse. They can be overheated and overcharged and entirely discharged without injury. Dead short circuits will not harm them. They can stand idle for months without care or attention, and upon being charged will operate to their full rated capacity. They are more nearly fool proof than any other lead plate battery now made. For Varnish Co. and dealers should bear in mind that good selling agents are wanted for this battery in their territory.

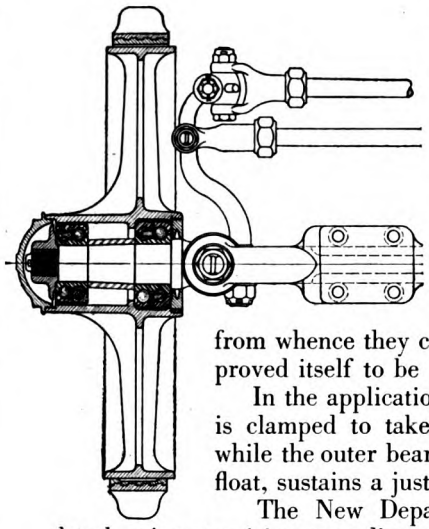
Clouse Tire Repair School.

There are many garages and repair shops where a great deal of extra money might by made by adding a tire repair department, and the Clouse Tire Repair School is prepared to teach you every phase of tire repairing and tire construction by practical demonstration, in a school equipped with every necessary appliance. This is not a correspondence course. You get your training by actually using equipment and repair material. All who are interested should send for their free booklet C to Clouse Tire Repair School, Euclid Ave. and 90th St., Cleveland, Ohio.

A Reliable Motor Lock.

A new motor lock is being manufactured by the Atlantic Machine Company, 255 East 15th St., Brooklyn, N. Y. It can be applied to any kind of on engine and it operates with timer ignition. If used on a Ford motor the Elevated Timer Bracket should be included in the outfit. It is easy to apply, simple to operate and is absolutely effective. It is not a complicated or cumbersome device and will not get out of order under any circumstances. The price is low and a car owner may rest assured that when used it makes an engine absolutely inoperative. For full particulars address the manufacturers as above.

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NEW DEPARTURE BALL BEARINGS

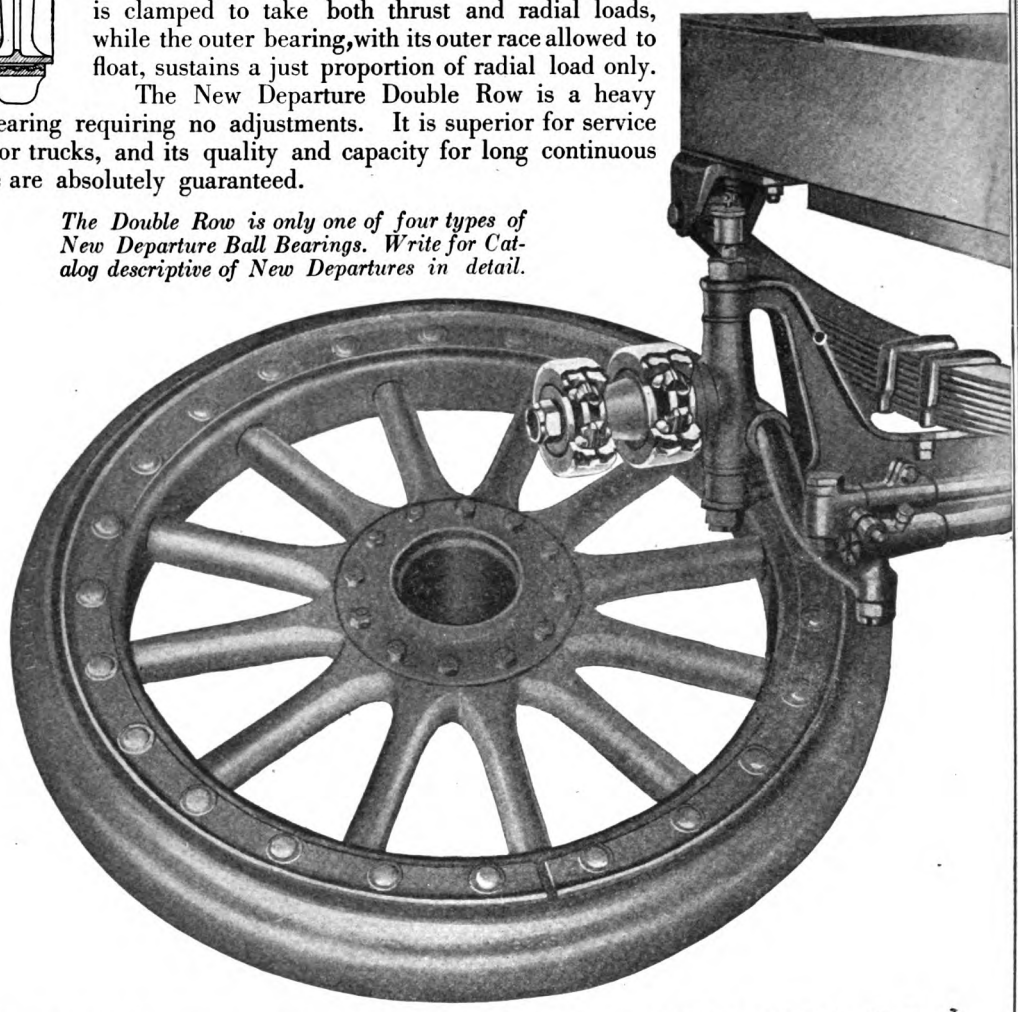
American Made for American Trade

BY reason of their ability to successfully withstand the heaviest of load stresses, regardless of the direction from whence they come, the New Departure Double Row Ball Bearing has proved itself to be particularly well adapted for use in heavy truck wheels.

In the application here shown the inner bearing is clamped to take both thrust and radial loads, while the outer bearing, with its outer race allowed to float, sustains a just proportion of radial load only.

The New Departure Double Row is a heavy duty bearing requiring no adjustments. It is superior for service in motor trucks, and its quality and capacity for long continuous service are absolutely guaranteed.

The Double Row is only one of four types of New Departure Ball Bearings. Write for Catalog descriptive of New Departures in detail.



THE NEW DEPARTURE MANUFACTURING CO.

Distributors in Trade Centers Throughout the United States

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We forced them to reduce their prices, but our prices still beat theirs.

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Including all necessary attachments.

GUARANTEED HAND OPERATED HORNS
Complete with attaching brackets, $4.50

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Stewart,	Newtone
Warner, etc.	Jones, etc.

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Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	.75
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
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A few of our bargains are specified herewith:—

Fur coats, $15; lined gloves, 75c.; robes, $2.75 up; tire covers, 95c.; double action pumps, $1.75; Stewart speedometer, model 100, complete, for any size wheel, $8; windshields, $5 up; two cyl. vibrating battery coil, $7 up; 4 cyl. $10; self-starters, $5 and $1.50; velvet shock absorbers, $10 set; Moudex shock absorbers, $20 set; magnetos, $5 up; Remy new dual magnetos, $15; mechanical oilers, $4 up; spark plug pump, $5.75; spark plugs, 15c. up; gas headlights, 10½ in., black and nickel, $5.50 pair; master vibrators, $3.50; carburetors, every standard make, $1.50 up (Ford-Holley, $3.50); racing seats, $10 each; bulb horns, 75c.; complete electric horns, $1.95; mechanical hand horns, $2.50; exhaust chimes, $2.50; eight day clocks, $3.50; Prest-o-lite tanks, $10; Buick, type 10, radiators, $19.75; new Buick, 16-17, $32; Hudson, "20," $25; Pierce Arrow, $30; Cadillac, $33; all others equally low; old ones can be traded in; Herschel-Spillman 4 and 6 cyl. motors, $275; Timken axles, $50; Weston-Mott, $15 up; runabout bodies, $25 up; foredoor touring bodies, $85 (new); tops, $15 and $25. Thousands of other bargains; send for our complete catalogue, free. Many bargains in cars and trucks; special proposition on 1,000 to 1,500 pound trucks on easy time payments.

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World's Largest Dealers
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Equip your cars with Seat Covers. Our direct to car-owner plan will save you money. Ten thousand satisfied customers last year.

GLOBE SEAT COVER CO.,
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FORD SANDBO STARTER, $14.00
Double Compression. Agents Wanted.
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SPECIAL PRICES FOR DEALERS

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Ford Shock Absorbers, per set of 4	$5.00
Radius Rod Anti-Rattlers—Bronze	.35
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Marvel Steam Vulcanizer	2.05
Sterling Pocket Ammeter	.45
Exhaust Horns for Fords	1.25
Ford Rubber Pedal Pads	.35
Triple-End Socket Wrenches	.38
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Ford Piston Rings	.05
Ford Emergency Brake Shoes—Lined	.60
Ford Lighting Outfit—Complete	1.90
Ford Foot Accelerator	.80
Ford Brake Rod Supports	.30
Gasoline Tank Guage	.90
Oak Running Boards—per pair	4.50
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Write for catalogue and other special cash prices.

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AMERICAN VOITURETTE CO.

SOLD AT AUCTION

This factory consisted of 7-passenger Keeton Cars and the Carnation Cycle Cars.

We bought nearly all the parts and cars and can furnish any repair parts for these cars.

7-passenger Keeton cars, new, guaranteed, complete with silk mohair top, speedometer, clock, windshield, two storage batteries, electric starter, lighter, large size tires, 6-cylinder 4-speed selective transmission, painted maroon, dark green, blue, yellow, brown or black. The regular price is $3,500. We will sell a few at the special price of.....$1,500.00
4-passenger Car-Nation Cars..... 325.00
Splitdorf Magnetos, Type A, new.... 15.00
Splitdorf High Tension Magnetos, EU-4, new..... 20.00
Eisemanf Magnetos, new, 6-cylinder.. 35.00
Jones Electric Starters, new..... 40.00
Stewart Speedometers, suitable for Carnation or Ford cars..... 6.00
Carter Carburetors, new, suitable for Ford cars..... 5.00
Rear Oil Tail Lights, black and nickel..... 1.00
Exide Storage Batteries, 6-140..... 15.00
Meyer Carburetors, ¾ inch..... 3.00
Gas Bags for generators, each..... .05
100 34x4½ slightly used Casings, each 7.00
100 36x4½ slightly used Casings, each 7.00
Running Board Tire Brackets, per set..... 1.00
Ford Wire Wheels, per set..... 12.00
30x3 Car-Nation Wire Wheels, per set..... 12.00
5,000 feet Starter Cable, per ft..... .10
47 Spicer ,Universal Joints, 1⅜x1⅛ sq..... 5.00
500 sets Car-Nation Shaft Drive Rear Axles, complete, with front axle and wire wheels, per set..... 30.00
Barnes Carnation Steering Gears, complete with wheel, locking gear type..... 5.00
Wire Wheels, 34x4½, each..... 4.00
Keeton 4-Speed Transmissions, selective sliding gear type..... 50.00
1 Garage Portable Gasoline Tank, with register..... 75.00
1 Drill Press..... 60.00
1 Electric Bench Grinder..... 20.00
5,000 yards Mohair, per yard..... .70
Racing Seats, upholstered in mohair, each..... 9.00
4-Cylinder Motors, new..... 75.00
Storage Batteries, 6-120..... 12.00
4 cyl. A. C. Premier, used motor, $40.00; 4 cyl. 2 cycle Reliance Motor, $70.00; 4 cyl. 4¼x5½ Michigan, slightly used, $115.00; 6 cyl. Maxwell, 40 H. P., $170.00; 2 cyl. upright, 2 cycle Atlas, $55.00; transmission and clutch for Atlas motor, $30.00; 2 cyl. opposed Davis with magneto, $75.00; 12 H. P. White Steamer, $25.00; used Columbia Shaft Drive Axle, $20.00; used Standard Shaft Drive Axle, $25.00; Oakland W. M. Co. Shaft Drive and I-Beam Front Axle, per pair, $32.50; new W. M. Co. full floating 39 inch Spring Centers, $65.00; I-Beam, 2x3, 30½ inch Spring, C. to C., N. D. bearings, $21.00; solid 1½x2 Roller Bearing Hubs, $23.00; 34x4 Firestone Wheels, 1¾ inch spokes, 9 inch flange, demountable rims, set of four, $20.00; 30x3½ Detroit Demountable, set, $17.00; 34x3½, 36x3½, 34x4, Q. D. Clincher Rims, set of four, $7.00.

We make radiators at prices lower than can be bought elsewhere. Send sketch and measurements. V-shaped Ford brass, $26.00; nickel, $28.00; Roadster and Touring Car Bodies, not upholstered, $10.00, $15.00 and $20.00. Send sketch and measurements for quotation; 3 and 4 inch side members, 100 and 168 inches long, $3.00 and up.

Electric Starters, same as the American, $25.00; Disco Starters, $19.50; Apelco Generator and Cut-out, $29.00; Eiseman High Tension Automatic Magneto, $35.00; Briggs 4 cyl. with coil, $20.00; Bosch low tension A. R. H., $10.00. Send for our Bargain Sheet.

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We are closing out our Auto Jacks at $1.25 per set of 4. Will handle any car with projecting hub up to 3000 lbs.
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CADILLAC 1914 Motor Without Removing the Electric Timing Apparatus
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PERFECT VALVE SPRING LIFTER

WITHOUT EVEN REMOVING THE VALVE SPRINGS

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For sale by leading dealers or sent direct upon receipt of price. Returnable if not satisfactory.

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Double Tread Tires a Specialty.
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Why not reclaim your old worn out or rim cut tires and have from
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Send us two old tires, one with a good bead, the rubber could be all worn off, and the other with a good tread but can be all rim cut or blown out on the side, and we will combine them into a sound one by our
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For a cost of from $2.00 to $4.00.
If you have only one tire in this shape we can furnish you with the other one at a cost of from $4.00 to $9.00. If you have no old tires to have remade you can purchase ready remade ones that we carry in stock. All sizes, from $4.00 to $12.00.
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Double Tread Tire Expert
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Day and Night Service.
Branch: 5904 Central Ave., Cleveland, Ohio
We pay express charges on receiving your old tires and will send them back C. O. D.

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	Plain	Skid		Plain	Skid
30x3	$9.00	$9.45	33x4	$19.05	$20.00
30x3½	11.60	12.20	34x4	19.40	20.35
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All sizes up to 38x5½
Guaranteed for 3500 Miles

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30x3½	6.00	7.00	2.55	3.20
32x3½	7.00	8.00	2.70	3.44
32x4	8.00	9.00	3.35	4.14
33x4	9.00	10.00	3.46	4.14
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Points the way to tire satisfaction and will surely save you 75% of your tire expense

Size	Plain	Skid	Size	Plain	Skid
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30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Our tires are practically puncture-proofed.
Terms C. O. D. 10% deposit.
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The Home of Double-Tread Tires

TIRES
GUARANTEED 5,000 MILES
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Size	Tires	Tubes	Size	Tires	Tubes
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30x3½	7.50	2.42	34x4	10.00	3.35
32x3½	8.00	2.55	36x4	10.50	3.58
34x3½	8.50	3.00	34x4½	11.50	4.24
30x4	8.00	2.97	36x4½	12.50	4.55
32x4	8.50	3.17	37x5	14.75	5.30

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Limousine, Laudaulet, Cab Bodies, $100 to $600
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LARGEST DISTRIBUTORS.
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IDEAL WELDER AND DECARBONIZER
The investment is small, profits are large.
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HIGH CLASS WELDING on all metals, aluminum special. Crown Welding Works, 157 W. 54th St., New York. Phone 8887 Col.

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Our charges are nominal—all work guaranteed.
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CYLINDERS REBORED AND REGROUND and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.
McCADDEN MACHINE WORKS,
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PAINT YOUR OWN CAR
We supply material and instruction. Write for particulars. ECONOMY SERVICE CO., Indianapolis, Ind., 2714 Boulevard Place.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

AUTOMOBILES FOR SALE.
Stanley Car Condensers, Kerosene-Distillate Burners, High Pressure, Direct Reading Gauges. 526 Fourteenth, Denver, Colo.

TOPS BUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

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GREATER EFFICIENCY
QUICKER WORK
LOWER PRICES
are the result of specializing in a single line. By taking advantage of our service you can get cylinders reground or rebored and fitted with new pistons and heat-treated rings, at the finest equipped plant specializing exclusively in this line. We guarantee absolutely every piece against poor workmanship. 20 years' practical experience is back of us.
BRIDGEPORT PISTON RING CO.
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NEW YORK BRIDGEPORT
Work called for and delivered—PROMPTLY by New York Office: Phone, Columbus 6529.

CYLINDERS REGROUND
and fitted with new pistons and rings for $5 to $11 per cylinder. We do this class of work exclusively and give you the highest quality of work at these prices. Ford cylinders reground and fitted with pistons, rings and wrist-pins for $20, discount to dealers.
CROWN MACHINE SHOP
Crown Point, Ind.

AUTOMOBILE AND MOTORCYCLE TOURS —Three hundred and fifty trips over the best roads in every state; 56 large pages of maps and road direction; 25 cents postpaid. Motor Tours, 51 Chambers St., New York.

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We fill your scores with a silver composition by patent electric process. No heating to warp cylinders. Welding in all its branches. L. Lawrence & Co., Newark, N. J.

CARBON REMOVED—Economy, convenience. Ball Carbon Remover keeps your cylinders free of carbon; does the trick quickly, effectively, inexpensively. Investigate now. The Bowling Green Sales Co., 323 Decatur St., Brooklyn, N. Y.

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Best quality piston and rings fitted, any make and size. $3.00 and up.
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NEW SUBSTITUTE FOR WELDING ALUMINUM
by our **aluminum solder** (German process) at only **fractional cost of welding**, as evidenced by favorable notices in Automobile Magazines. Territorial Rights negotiated. Big money for repair shops.
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NICKEL PLATE your Auto Trimmings with Nickel Powder. Prevents brass from tarnishing. Iron from rusting. (Must not be confused with silver washes.) $1.00 per can, prepaid. Gunmetal Company, Decatur, Ill.

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Increase power of motor. Prices and circular on request. Cylinders reground at $4.00 to $9.00 per cylinder. Interesting proposition for dealers.
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A LIVE SELLING AGENCY is open to handle few additional lines on commission basis. Manufacturers, if you are not already represented in Eastern territory, communicate with us. Sales, P. O. Box 654, New York City.

Miscellaneous

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TO DEATH!
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NEW PISTONS AND RINGS FITTED CORRECTLY.
GEARS and other parts to order.
Prompt and reasonable.
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200,000 1915 N. E. REGISTRATIONS $13.00
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MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. Motor List Co. of America, 1111 Locust St., Des Moines, Iowa.

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30,370 Auto Dealers, U. S.	$40.00 or $2.50
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Have every other Auto Trade list.
All Typewritten, Showing Financial Rating.
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Write us for Prices, or 'Phone.
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Write for pamphlet and prices. Economy Service Company, 2714 Boulevard Place, Indianapolis, Ind.

FORD PLEASURE BODIES—Make your old car a new car by putting on a brand new 1914 Ford body. We have them at prices that will appeal to you. London Auto Supply Company, 2548 Wabash Ave., Chicago, Ill.

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VULCANIZERS—Shop and individual use. A slightly used shop vulcanizer; A1 condition. Write at once. Vanderpool, Springfield, Ohio.

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WANTED—Live Garage, Dealer or Repairman to install and handle sale of live selling automobile accessory. Quick sales, large profits. Reply quick for proposition. The Noxal Co., 1400-1402 Michigan Ave., Chicago, Ill., U. S. A.

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WANTED—Names of Ford owners. We pay $5.00 per 100. Send 25 cents for contract blanks, particulars, instructions and outfit. Universal Syndicate, 1123 13th Ave., Moline, Ill.

MEN AND WOMEN WANTED—For U. S. Government life jobs; $65 to $150 month. Common education sufficient. Write immediately for list of positions open to you. Franklin Institute, Dept. R78, Rochester, N. Y.

Manufacturers of high-class, exclusive electrical specialties, want man of proven ability and unquestionable standing; familar with big propositions, for General District Manager in all open territory. May require investment up to $500. Should net $3,000 to $6,000 first year. State age and experience. THE STERLING CORPORATION, 1276 West Third St., Cleveland, Ohio.

Patents

RIGHT WITHIN CALL—Beekman 3396

It may save a good invention, ensure a good patent and save you money to enquire about any patent matters before action. No charge, but information gladly furnished.

Patent Attorney, JAMES F. DUHANNE 132 Nassau St., New York City

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building, Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law In Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 15 William Street, New York, N. Y.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Men who buy their cigars from me know that they have the "inside track" in cigar buying. They know they are buying cigars that suit them at about half what they would have to pay at a retail store.

So they pass them out occasionally. And when the cigar is complimented they explain that it "is the Shivers Panatela, made by Shivers, the man in Philadelphia who sells his cigars direct from his factory, you know."



Shivers' Panatelas
EXACT SIZE AND SHAPE

And in nearly every case the other man says: "Why, sure, I know whom you mean," etc.

He has seen my advertisements, but somehow he never has ordered my cigars.

I wonder why not. Does he read the advertisements through? Does he read my offer, set in blackface type?

MY OFFER is: I will, upon request, send fifty Shivers' Panatelas, on approval, to a reader of the *Automobile Dealer and Repairer*, express prepaid. He may smoke ten cigars and return the remaining forty at my expense and no charge for the ten smoked if he is not pleased with them; if he is pleased with them and keeps them he agrees to remit the price, $2.50, within ten days.

Are *you* one of the men who have never ordered?

I make my Panatela with Genuine Cuban Grown, Havana Tobacco. The filler is *all* Havana, long leaf. The wrapper is Sumatra. The cigar is rolled by hand by skilled adult male cigarmakers. It has all the bouquet of Havana, all the uniformity and free burning quality of the hand-made cigar because it *is* a hand-made Havana filled cigar.

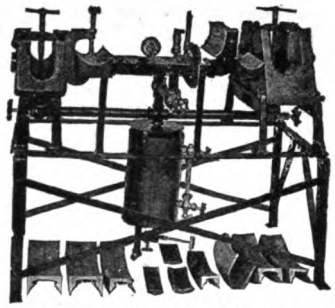
You can't lose by trying them. You don't pay out a cent for cigars or express charges until you are sure you are pleased and then you pay only for the cigars. I prepay all shipments.

Since I sell by the box and sell direct, my prices are of course very low, as I have said—about half.

The cigars will sell themselves if you give them half a chance.

In ordering, please use business stationery or give reference and state whether you prefer mild, medium or strong cigars.

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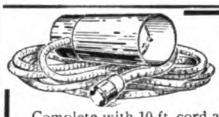


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with permanent or detachable trimming. Racing bodies, tops, tanks, hoods, and all equipment for changing your car into a raceabout. Write for prices.

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"STICKALITE" AUTO TROUBLE LAMP $1.00

Has magnet in base—Sticks on iron or steel

—Complete with 10-ft. cord and plug which fits any socket on car—**A Fast Seller for Dealers—Get Discounts.**

PREMIER ELECTRIC CO., 4038 Ravenswood, CHICAGO

Goodrich Safety Tread Tires

Best in the Long Run

The Perfect Fountain Brush.

This is a brush, especially made for washing automobiles. It can be readily attached to any garden hose, and by its use your car may be effectually washed in fifteen minutes. It is warranted not to scratch or damage the car, and it is also guaranteed to last longer than your car will last. This brush is manufactured by the Howard W. Hicks Brush Company, Denver, Colo., and the No. 2 size, which is the most popular type of this brush, sells for only $4.50, delivered anywhere in the United States. Send your orders and inquiries direct to the manufacturers. If you want a satisfactory washing device, this will probably answer every purpose.

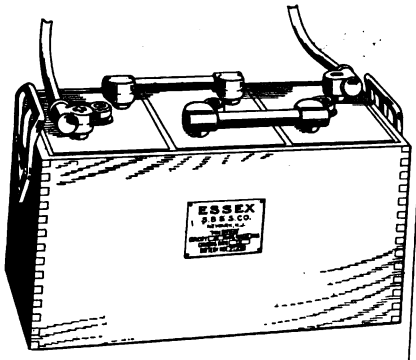
New Era Master Vibrator.

The manufacturers state that this master vibrator is guaranteed for life. Its size is 2x2x5 inches. It is enclosed in a black steel case, weighing only two pounds and fitted with the New Era Indestructible Spark Points. This vibrator is sold under a thirty day trial guarantee of money back if wanted and positively guaranteed for life with no restrictions. The price is $7 by parcel post free, with the dealers' usual discounts. Address all inquiries direct to the manufacturers, New Era Spring and Specialty Company, 872 Woodward Ave., Detroit, Mich.

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Storage Battery Replacements

The Essex Storage Battery & Supply Co., Inc., 272 Halsey Street, Newark, N. J., makes a specialty of replacing storage batteries with batteries of their own manufacture of the same type and size as the batteries taken out. This company has made a study of all the different sizes which are brought out by the other manufacturers of batteries and no



matter what the shape or the size of your battery box may be, they can arrange for a prompt replacement. The Essex storage batteries are of the highest quality and guaranteed to give perfect satisfaction. Correspondence is invited from car owners and garage proprietors.

Tire Dealer Comes Into His Own.

Thousands of tire dealers have indorsed the Goodrich "fair list" price plan—to sell tires on a price list which is net, instead of selling by discounts. Consumers everywhere are recognizing the value of the "fair price list" which puts tire buying on a one-price basis—every man knowing he is getting just as low a price as his neighbor. This condition is impossible under the discount plan in which the padded price list has played such a part in the past. The Goodrich "fair list" plan carries with it a substantial price reduction, and the move which has effected the whole tire industry and which means so much to the tire user, still is the chief topic of discussion among automobile and tire men and motorists. This is no price-cutting war involving tire manufacturers. It is an effort on the part of the manufacturers to protect the consumer from concerns which slash prices on a list "marked up" for that very purpose, so that the user is puzzled to know whether he is getting the best or the worst of it. The deliberate reduction of prices and establishment of a "fair price list" that is standard for that specific make of tires, it is believed, will conserve the interests of the motorist and promote better feeling between tire maker and car owner. With Goodrich "Fair-listed" tires he now can be sure of just that—he knows he is paying the fair price—that he is buying a standard, high-grade article that has one price the country over, whether he buys in Maine or California, whether he buys in the city store or the road side shop, in a hurry or not, he always pays one price—a fair one—that protects motorist and dealer alike.

New Era Toricle Goggles.

The manufacturers of these goggles claim that they have many special features of merit and dealers as well as car owners are notified to write for full particulars concerning this line of goggles to the New Era Optical Co., 123 W. Madison St., Chicago, Ill.

Change of Ownership.

The Service Gear & Machine Co. of Reading, Pa., has purchased the entire stock of gears and shafts, patterns and eccentrics of the service department of the American Die & Tool Company of the same city, the well known manufacturers of tranmission and rear axle equipment for automobiles. The Service Gear and Machine Co. will endeavor to maintain a permanent stock of the transmission gears, splice shafts, countershafts, bevel differential gears and axle shafts for the majority of the obsolete cars manufactured in this country. The stock will be carried at Reading and dealers will be appointed throughout the country to act as agents for this concern. The Service Gear and Machine Company will have no connection whatever with the American Die & Tool Co., which will continue its existence as a separate organization.

Ford Valves.

The Michigan Engine Valve Company of Detroit, Mich., manufactures valves of every description and makes a specialty of Ford valves. Their valves are made with carbon or nickel steel stems and cast iron heads, fused by an up-to-date process that fuses the head and stem together the entire length of contact. Every valve is guaranteed as to quality. Valve blanks can be furnished for any size valve for repair work and valves can be furnished to blue prints or samples. Write for prices on finished valves or price list on blanks. Prompt service and reasonable prices are guaranteed, together with a first class product.

The Comfort Safety Steering Device.

This is a special device for Ford cars for relieving the driver of strain and tension of the muscles, and it is claimed that it reduces fatigue to a minimum. It also eliminates the possibility of wheels "doubling up" when driving through the sand, and lessens the friction and vibration of the steering column. It saves the tires by preventing the wabbling of wheels. Dealers find a ready market for this device. The list price is $5.50 and where you cannot obtain the article from your dealer the manufacturers will ship it to you anywhere in the United States on receipt of the price. Address The Comfort Motor Machine Company, Denver, Colo.

Vulcan Process
Oxyacetylene Welding and Cutting of Metals
Vulcan Process Co.
Minneapolis, Minn.
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THE KING DRAG
The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

We will send a **sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

Address the

MOTOR VEHICLE PUBLISHING COMPANY, - 71 Murray St., New York City

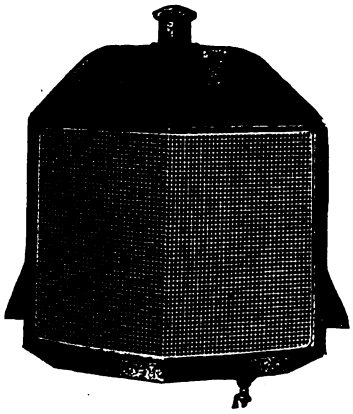
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A New Rome-Turney Radiator will make the biggest improvement in appearance and efficiency you can possibly add to your car. Thousands of Ford owners are taking advantage of this means to make their cars better and handsomer.

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Extended V-Front Ford Radiator.

Genuine Square Tube Honeycomb construction.

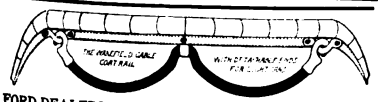
We Replace Any Make of Radiator.

Large Stock Carried for Immediate Shipment.

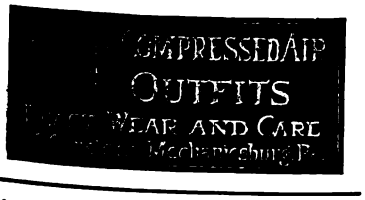
Write for details.

ROME-TURNEY RADIATOR COMPANY,

Whitesboro Street, ROME, N. Y.



FORD DEALERS sell this robe rail for 75c. Quick turnovers and large profits.
WAKEFIELD SALES CO. - Trempealeau, Wis.
Travelers Wanted—Good Commissions.



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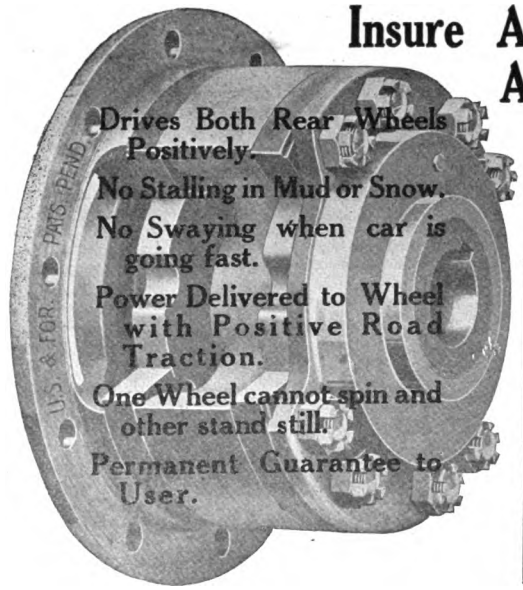
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CAUSE
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Dealers, get our money-making proposition.

Read our claims carefully.

Is it worth while to replace broken gears in your differential, and pay big garage charges, when we give you a permanent guarantee and save you enough in 5,000 miles to pay for installing a Gearless Differential and ½ cent a mile thereafter?

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"There is More Fabric in Miller's Tires"

"The One Cure Wrapped and "Cog" Tread Tires"

SIZE	No. 1 Un-Guaranteed Wrapped Tread	No. 2 Standard Guarantee and Quality Wrapped Tread	No. 5 3500 Mile Guarantee HighGrade Ex. Heavy "COG" Tread Best Quality	No. 7 HighGrade Extra Strong Red Tubes
28x3	$6.30	$8.50	$11.55	$2.50
30x3	6.75	9.00	12.35	2.60
32x3	7.15	9.90	13.10	2.80
34x3	7.60	10.45	....	2.90
29x3½	8.75	11.10	16.05	2.95
30x3½	9.05	11.60	16.60	3.00
31x3½	9.35	12.15	17.10	3.05
32x3½	9.70	13.35	17.65	3.10
33x3½	10.05	14.20	18.20	3.20
34x3½	10.40	14.90	18.70	3.30
36x3½	10.95	15.65	19.75	3.45
30x4	12.15	17.15	22.30	4.00
31x4	12.65	17.95	23.15	4.10
32x4	13.05	18.25	23.95	4.20
33x4	13.55	19.05	24.80	4.35
34x4	14.10	19.40	25.65	4.45
35x4	14.55	20.20	26.50	4.55
36x4	15.05	20.50	27.30	4.65
37x4	15.45	21.30	28.20	4.80
34x4½	18.95	26.00	34.75	5.55
35x4½	19.55	27.00	35.85	5.65
36x4½	20.15	27.35	36.90	5.80
37x4½	20.70	28.35	37.90	5.90
35x5	22.75	30.75	41.65	6.75
36x5	23.45	31.15	42.90	6.90
37x5	24.15	32.30	44.20	7.80

Caution:—Be sure to specify type, i. e., Regular, Q. D. or Straight Side; also style of tread, i. e., Wrapped, Non-Skid or "Cog," when ordering.

NOTE:—If you dealer does not handle our tires, deduct 5% for cash with order. **Express charges prepaid.** This offer is good only until an agency is established in your vicinity.

DEALERS:—**Write for exclusive agency.**

MILLER Extra Heavy "Cog" Tread TIRES

Do Not Blow Out Until They Are Worn Out. This is what the *Extra Fabric* does to make motoring more pleasant.

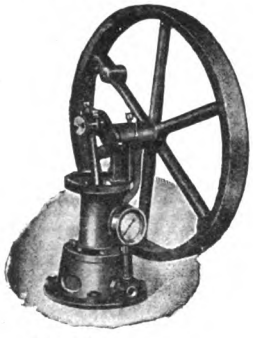
Buy the **"Cog" Tread** for **"All Season"** driving. They *eliminate* the use of chains. The extreme wide *traction surface* is more than double that of the ordinary non-skid tire and gives greatest efficiency.

MILLER'S High Pressure Air Pump

Made in Four Styles

MILLER'S HIGH PRESSURE AIR PUMP is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. presure.**

PUMP ONLY, PRICE, SINGLE, $35.00



ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers; adjustable sectional vulcanizers; inner tube vulcanizers; inside vulcanizers; retreading vulcanizers; adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Rubber Instruction Book
Price Prepaid, $2.00

MILLER'S REPAIR MATERIALS

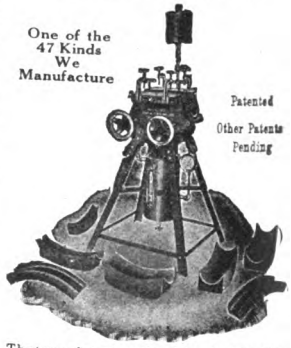
Common Tread Stock, per lb.	$0.50
Standard Tread Stock, per lb.	.70
High Grade Tread Stock, per lb.	.85
Cement Stock for Casings	1.25
Cement Stock for Tubes	1.75
Inside Tube Patching Rubber, cured one side, per lb	1.50
No-Cement Patches, per dozen packages	2.50
No-Cement Patching Rubber, sheet form, per lb.	2.00
Fabric Sea Island Cotton, 17½ ounces, one or two sides	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides	.65
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, Net,	2.00
*Miller's Three in One Repair Stock	1.20

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 10 lb. lots or over, 10 and 5 per cent. On 20 pound orders, 25 and 5 per cent for cash.

MILLER'S IMPROVED ADJUSTABLE SECTIONAL VULCANIZERS

One of the 47 Kinds We Manufacture

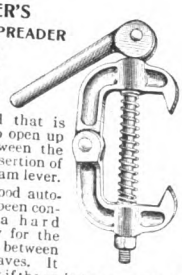


Patented
Other Patents Pending

That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Models.....$42.00

MILLER'S SPRING SPREADER



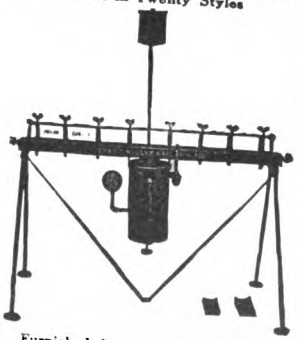
Quickly adjusted to any width of spring and when adjusted all that is necessary to open up a space between the leaves for insertion of oil is to tilt cam lever.

Many a good automobile has been condemned as a hard rider, simply for the want of oil between the spring leaves. It is a fact, that if the springs are not oiled occasionally that they will rust and stiffen, nearly equal to a solid bar of iron.

Price $1.00

Miller's Inner Tube Vulcanizers

Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

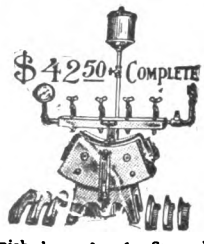
PRICES FROM $5.00 to $30.00

For Steam Line or with Gas or Gasoline Burner } Furnished complete with Molds.....$95.00

MILLER'S SECTIONAL VULCANIZER

with Tube Attachment

Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes and Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and Molded Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*



Furnished complete for Steam Line } Gas or Gasoline Burner.

CHAS. E. MILLER
Anderson Rubber Works
ANDERSON, IND., U. S. A.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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New York Coil Co.

"Easy Selling" FORD Accessories

Six Years of Success on Thousands of Ford Cars is the Record of

THE NEW YORK MASTER VIBRATOR

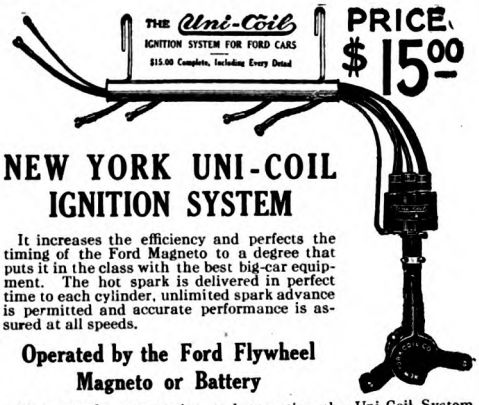
It blazed the way for better operation through improved ignition. Many times imitated, it has had no rival in efficiency and knows no competition to-day. It has an immediate effect on Ford performance. Thousands of users have found that smoother running, better ignition and easier starting resulted at once from an installation of this master vibrator.



Does Not Stick
Never Gets Out of Order

The "New York" makes the minimum of demand on the time and attention of the user. No other type of master vibrator can run so long with so little adjustment and correction. The hot powerful spark that it produces means clean and complete combustion. This eliminates the prime cause of carbon deposits in the cylinders. A clean motor is economical—there is no waste of fuel and no decarbonizing expense. Special contact points are provided and these are supplied in **sealed red envelopes** bearing our name—the user's protection.

Price Complete, $10.00



NEW YORK UNI-COIL IGNITION SYSTEM

It increases the efficiency and perfects the timing of the Ford Magneto to a degree that puts it in the class with the best big-car equipment. The hot spark is delivered in perfect time to each cylinder, unlimited spark advance is permitted and accurate performance is assured at all speeds.

Operated by the Ford Flywheel Magneto or Battery

With simple construction and operation the Uni-Coil System embodies all the vital factors in magneto efficiency—for example: a magneto contact breaker with only one pair of adjustable contacts. Another feature is an advanced type of high tension distributor, using but one of the standard Ford coil units. A complete installation is readily effected and the result is to simplify the Ford ignition apparatus, eliminating the complex wiring and timers and substituting a system that every Ford owner can understand.

Price $15.00 Complete

The Highest Priced Cars are No More Comfortable than the Ford if our Shock Absorbers are fitted

It is quite possible to secure the most luxurious riding qualities in a Ford car—when you show the Ford owner how to do this at a minimum of cost, he will spend his money with you. It will cost him just seven dollars and fifteen minutes' work installing the

NEW YORK SHOCK ABSORBER



on his car. He won't have to remove wheels, radius rods or spring perches—nothing is touched but the shackles. A set of four ($7.00) can be installed without difficulty and the car driven away twenty minutes after the first move is made. The result will be noticeable at the first bump, but the bump won't be. This is due to the **all-around** shock absorbing efficiency of the "New York." It operates in two directions and eliminates side-sway as well as jolt and vibration.

Price $7.00 Set of Four

Our Selling Terms Insure You a Liberal Margin of Profit

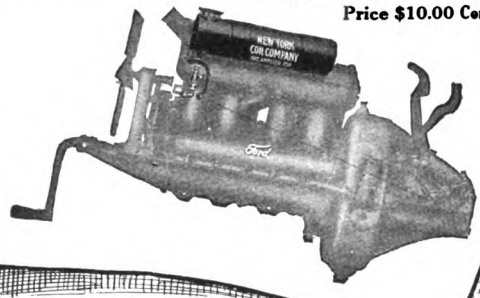
Perfect Lubrication Conserves Mechanical Efficiency

Hap-hazard lubrication is poor economy. Too much or too little oil costs more than just enough. Excess means stickiness and gumming with heavy carbonization—shortage of oil means friction leading to rapid depreciation of moving parts. The solution of the problem lies in the installation of the

NEW YORK Constant Level Lubricator

A scientific lubricating controller that works in accurate unison with the motor. **Oiling starts or stops with the starting or stopping of the car. A constant level** is maintained in the crank case. Fresh unused oil is supplied at the demand of the motor. The device is of simple construction and unfailing efficiency. No gears, belts, cams, rods, air pressure or other dubious resorts are used. There is nothing complex to cause trouble. Technical details on request.

Installed in 15 minutes
Price $10.00 Complete



NEW YORK COIL CO.

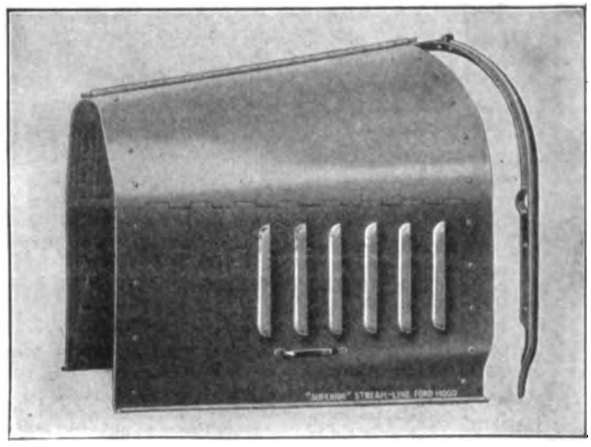
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"SUPERIOR"

Stream-Line Ford Hoods



Two New Types **$8.00** EACH Complete

Finished in Heavy Black-Baked Enamel

Type No. 1 Fits All 1912-13-14 Ford Cars

Type No. 2 Fits All 1915 Ford Cars

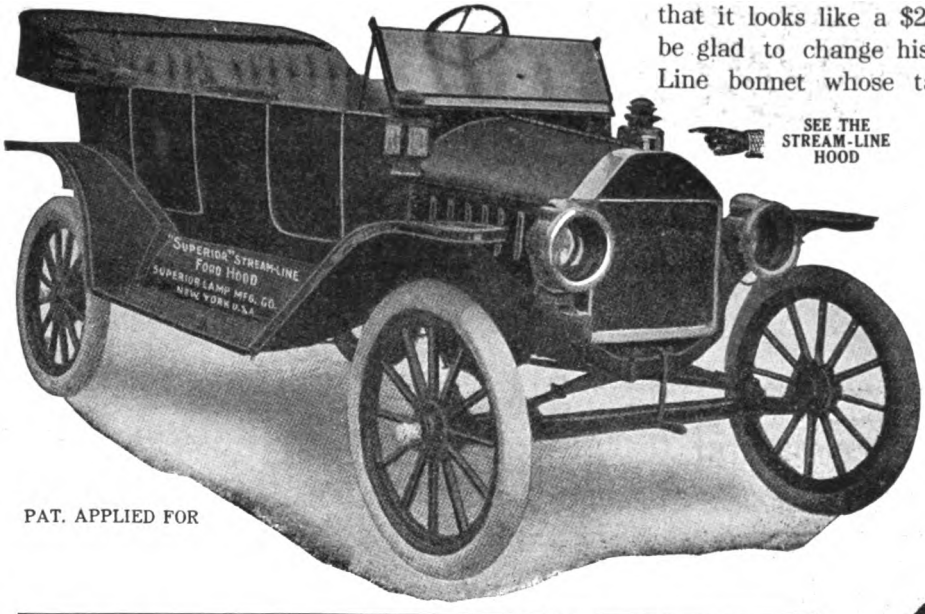
DEALERS!

Don't wait until the other fellow gets the business. Every day you delay means money lost.

WRITE US AT ONCE!

MAKES THE FORD A CAR OF BEAUTY

This is a Ford Specialty which any dealer can sell in great quantities for it so transforms the Ford that it looks like a $2000 car. Any Ford owner will be glad to change his homely hood for this Stream-Line bonnet whose tapered up-to-date lines add so much distinction to the appearance of his car, at such Little Cost.



PAT. APPLIED FOR

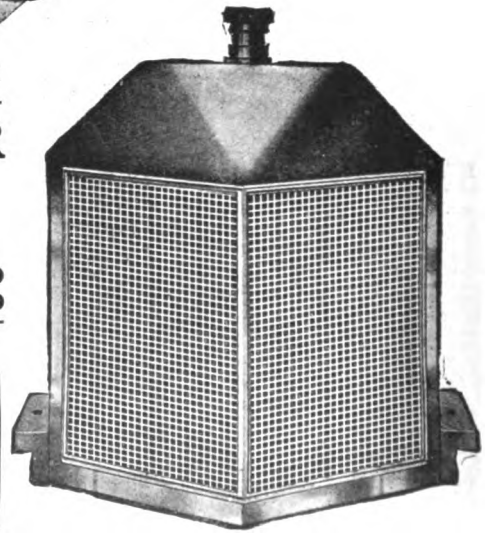
The "Superior" Stream-Line Hood is made of heavy gauge pressed steel, and has 7 ventilator gills on each side; is built solidly and substantially and will not rattle or creak. There are no exposed hinges on top, preventing rain or water from getting on the motor or wiring—and comes ready to attach. A special hood rest is included.

IMMEDIATE DELIVERY

IMPROVE YOUR FORD CAR

WITH A

"Superior" V-Type Radiator



NEW TYPE WITH HANDLE	BRASS	$34.70
	GERMAN SILVER	38.00

ALL MAKES OF RADIATORS BUILT AND REPAIRED

NOTICE TO THE TRADE

We beg to call the attention of the trade to the fact that patent application has been filed for our "*Superior*" Stream-Line Hood.

In view of said patent rights, which cover our improved "*Superior*" Stream-Line Ford Hood, we herewith notify the trade thereof, so that it may act accordingly.

BEWARE OF IMITATIONS

SUPERIOR LAMP MFG. CO., 136 West 52nd Street, New York, U.S.A.

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DISCARD the SLEDGE and Save Money with the WEAVER GARAGE PRESS

20-TON CAPACITY

YOU can't afford to spend two or three hours on a job which *should* require only that many minutes. Neither can you afford to turn out a job which is crudely and unsatisfactorily executed simply because you haven't the equipment to do it as it should be done.

This Press Will Soon Pay For Itself

—in the time and labor it will save on the many different jobs you are daily attempting to handle with improvised methods,

—in the revenue on work which other shops will bring to you as a result of your installing this equipment,

—in the cost of the material and parts which you are now compelled to replace on account of their being ruined as a result of improper handling,

—in the additional patronage you will receive from the motor public as a result of your being equipped to give more prompt, efficient and satisfactory service.





Designed for Garage Service

This Press is built to accommodate all classes of garage work. Note that it has sufficient width to permit it to receive the largest wheel for pressing hubs, bearings, etc., in or out. (*See cut.*)

CRANK SHAFTS and similar BULKY pieces may also be readily handled by reason of the divided bolster as shown herewith.

Wonderful Leverage

The lever construction supplies a leverage of 1,500 to 1 so that the maximum pressure of 20 tons can be developed by one man with ease.

Vice Block Attachment

We furnish a vice block attachment as part of the regular equipment which operates beneath the screw and provides a means of holding work against a severe twisting strain.

CONSTRUCTION The frame is of one piece of heavy channel steel; the hand wheel is 15 inches in diameter, and the weight of wheel and screw is carried upon ball bearings. The hand lever has a leverage of over 1,500 to 1. The thrust of the screw is directed against heavy Bronze Thrust bearings. The screw is 2 inches in diameter, with 3-pitch Acme thread, and has a range of movement of 12 inches. ***The screw does not revolve.***

The bolster which carries the plate can be set at any desired height with extreme adjustment of 48 inches. The width between frame uprights is 32 inches. Floor space, 36x36 inches. Weight, 425 pounds.

NET PRICE, Complete with Equipment, **$48.00**

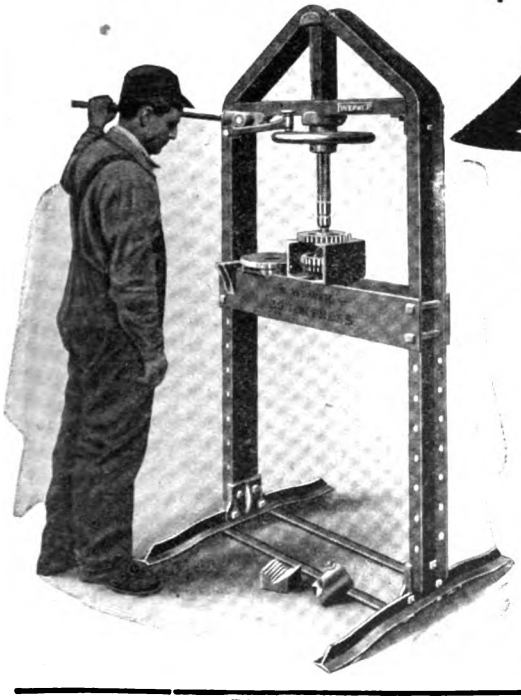
WHICH METHOD would YOU prefer FOR THESE JOBS ?

- Forcing Transmission Gears
- Forcing Fly-wheels from Crank Shafts
- Straightening Frames
- Pressing Piston Rings in or out
- Forcing Hubs in Wheels
- Pressing Bushings on Connecting Rods
- Forcing Starter and Generator Gears
- Straightening Axles
- Pressing Ball Bearings in Wheels
- Forcing Drive Shaft Gears
- Straightening Shafts
- Forcing Ball Bearings from Crank Shafts
- Straightening Rear Systems

WITH VICE BLOCK

- Holding Differential Housings and Other Awkward Work
- Holding Pipes and Rods for Cutting Threads
- Holding Axles and Shafts Against Twisting Strain

THE SAVING on a very few of these operations **WILL OFFSET THE ORIGINAL COST of the PRESS.**



WEAVER AUTO TWIN-JACKS

Made in two sizes. A Complete garage equipment in one convenient unit.

CARS can be handled in any desired manner on these Jacks even though all four wheels are demounted.

Ball and Roller Bearing Casters and Lifting Mechanism

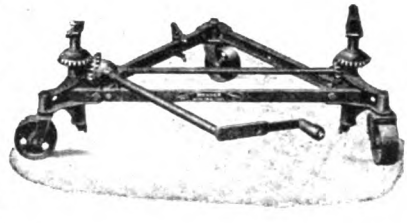
Safe screw hoist; enormous lifting leverage; will apply to either axle of the car.



Now Made in Two Sizes

EXTRA HEAVY (Capacity 8,000 lbs.)
Two (one for each axle) - **$36.00**
Singly - - - - - - - - **20.00**

REGULAR TYPE (Capacity 4,000 lbs.)
Two (one for each axle) - **$20.00**
Singly - - - - - - - - **12.00**



WEAVER AUTO AMBULANCE

FOR CRIPPLED CARS

THIS simple, compact towing truck can be quickly applied to either front or rear axle of any car. It has a full range of adjustment to meet all conditions.

Roller Bearing Cast Steel Wheels

1¼-inch steel axle. Telescoping tongue. Weight, 140 lbs.

LIST PRICE - - - - - - **$30.00**

WEAVER MFG. CO., 2169-79 So. 9th Street, Springfield, Illinois.

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Automobile Wrenches

that are designed especially for nothing but Auto work.

No. 340 Take Down



Handle for Sockets

To get down into the heart of things.



Included in No. 14 Set is a pair of **Sterling 100 Nickled Pliers** with knurled handle. 6-inch slip joint. Guaranteed.

No. 14 SET

and its component parts and——Why!



No. 350 Ratchet Wrench Handle for Sockets.

Positive and Guaranteed Action.

This is Honestly the Standard.



No. 320 10-inch Offset Handle for Sockets

Gives lateral leverage of considerable power.



37 Sockets of finest grade rolled steel.

The most guaranteed of any on the market.



Reversible

A clever little **Pipe Wrench** for quick service.



The Most Used Socket Wrench Set

MOSSBERG No. 14

and a closer view of its contents.

Send prepaid to any address on receipt of price

Ask for Catalog No. 14-A.

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

Wrenchsmiths for 16 years.

The Only Good Cotter Pin Extractor



⅓ SIZE

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A POSITIVE GUARANTY

THE STRONGEST EVER MADE

Guaranty

Every part of the Hoosier Tandem guaranteed absolutely for one year. This includes the contact points. Any necessary replacements will be made, free of charge, at the factory, the user paying simply the transportation charges.



HOOSIER TANDEM MASTER VIBRATOR

Dealers and Jobbers can now assure their customers of continuous satisfaction.

The Only Vibrator Which Cannot Stall The Car By Sticking.

The Hoosier Tandem has TWO PAIRS OF CONTACT POINTS—instead of one, as have all other vibrators.

Sticking points have always been the cause of vibrator troubles—of vibrator-equipped Ford cars stalling.

The heat produced by the sparking of the points is what makes single-point vibrators stick.

It's the tandem points that make the Hoosier different.

No other vibrator has them.

The kick switch has a removable key, preventing tampering with the car.

The case is solid mahogany, highly polished, 7 inches high, 4 inches wide and 3 inches deep.

The Hoosier Tandem points cannot heat to the sticking point—because they alternate the work of sparking. Neither operates long enough at a time to make sticking possible. The two sets of points are constantly automatically relieving each other under service.

Write us now, today, about your 1915 vibrator requirements. We have a proposition that means more vibrator sales and bigger profits to jobber, dealer and garageman.

If you dealer does not carry the Hoosier Tandem in stock, MR. FORD OWNER, order one direct from the factory. We guarantee it to you on a "money back" basis.

THE HOOSIER COIL COMPANY

118 EAST JEFFERSON BLVD., SOUTH BEND, IND.

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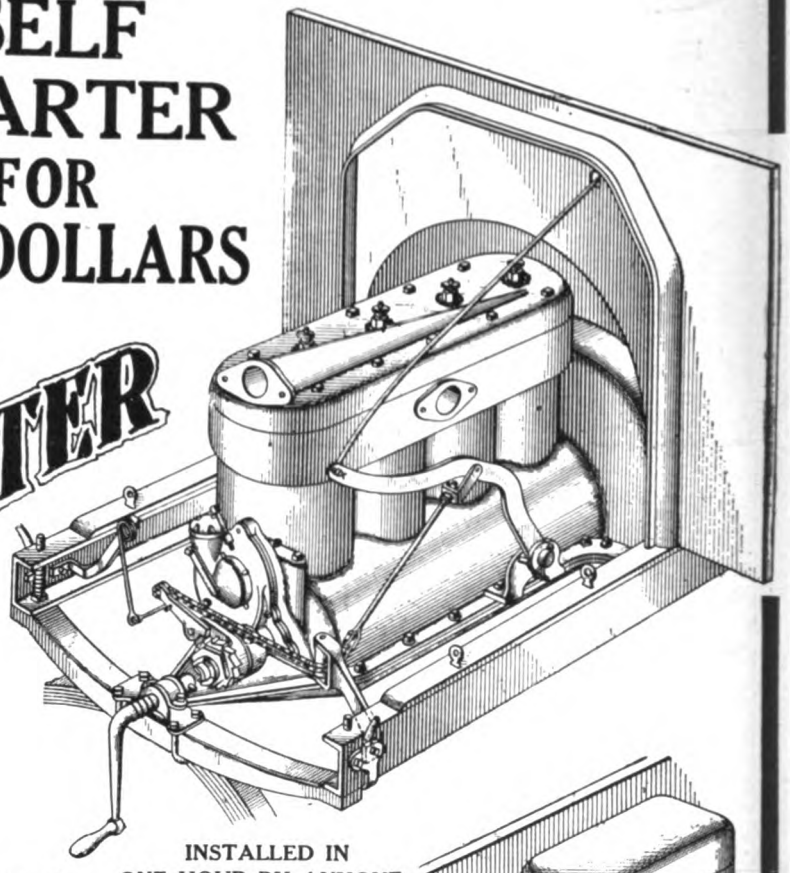
$10

Think of it!

A SELF STARTER FOR 10 DOLLARS

The HUNTER

Complete with all attachments and instructions

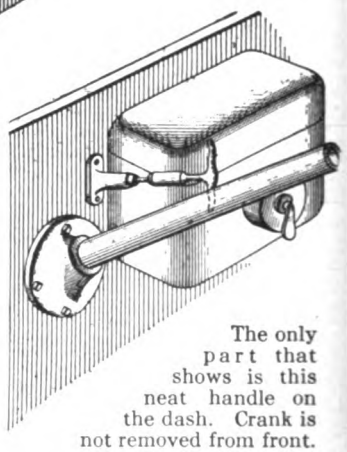


JUST WHAT THE FORD OWNER HAS BEEN LOOKING FOR

At Last Mr. Ford Owner!

Your wish has come true. The best starter for a Ford car ever devised and costs less money. It gives you every convenience of the bigger, costlier cars (as you can use electric headlights on your magneto current).

INSTALLED IN ONE HOUR BY ANYONE



The only part that shows is this neat handle on the dash. Crank is not removed from front.

INCREASES THE VALUE OF A FORD THREE TIMES

Note the Advantages

Powerful—The straight pull and powerful leverage enable a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

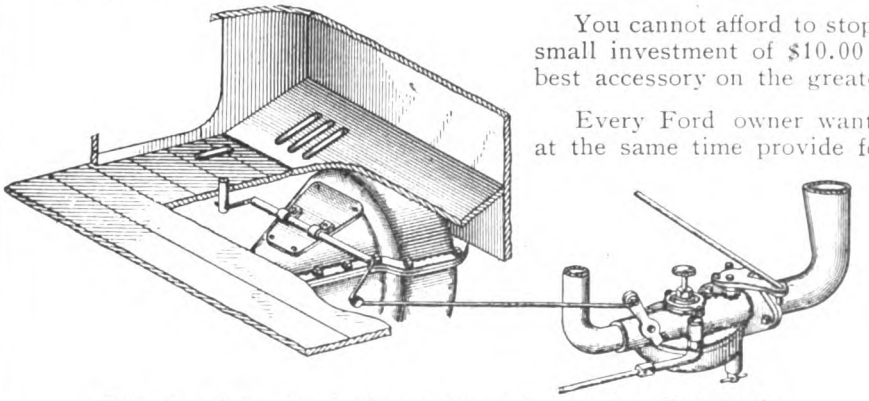
Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

You cannot afford to stop at the small investment of $10.00 for the best accessory on the greatest automobile on the market.

Every Ford owner wants to make his car up-to-date and at the same time provide for comfort.



This view shows the simple attachment for shutting off air intake of carburetor to insure easy starting in winter weather.

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS for FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. Price, $1.00. Quickly installed. Sold by leading dealers.

THE HUNTER AUTO SUPPLY CO.

HUNTER BUILDING 337 W. MADISON STREET CHICAGO, ILL.

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While the MAYO Pumps the Tire You Take It Easy

No more backache, blistered hands and lame arms, splitting headache, perspiration streaming and a day's pleasure spoiled by working over an out-of-date hand pump.

Enjoy tire pumping! Take 5 minutes of complete relaxation by the roadside with a

$10 MAYO SPARK PLUG PUMP $10

Complete Complete

The MAYO pumps your tires to **proper pressure** while you rest.
It is guaranteed to pump pure, fresh air only. It inflates a tire faster than any other power pump on the market. Why pay more than $10 for a pump that won't do any more than a MAYO?

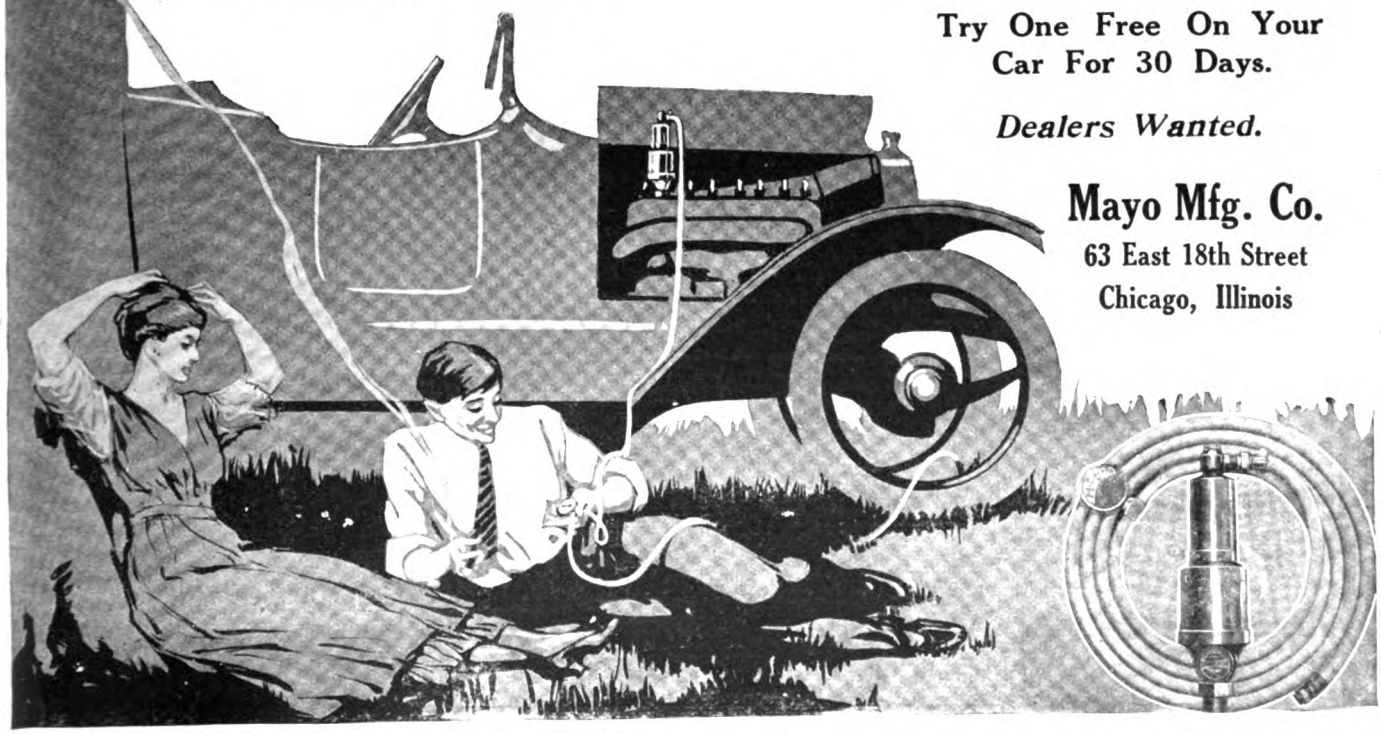
Weight 2½ lbs. Fits any tool-box. Handsomely finished in black lacquer.

Instantly substituted for any spark plug. No machine work required—no costly work of installing as with other pumps. Built with metal rings like your motor—and will last as long. Complete, with 12 ft. hose and gauge, $10. MAYO Q. D. Spark Plug, $1.50 extra. MAYO Ford Pump, $8 complete. MAYO Valve Cap Pump, for permanent attachment to motor, $15.

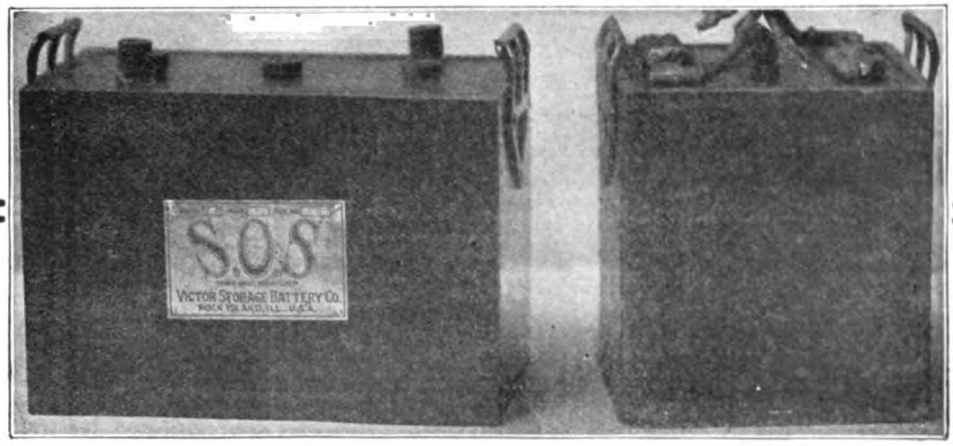
Try One Free On Your Car For 30 Days.

Dealers Wanted.

Mayo Mfg. Co.
63 East 18th Street
Chicago, Illinois



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Compare These Two Batteries

Both are 6 volt 80 ampere hour lighting batteries. They are an eloquent object lesson. The smaller battery purchased from a Chicago jobber, August 27th, 1914, contains only five plates per cell yet is rated as a 6 volt 80 ampere hour battery.

The S. O. S. battery illustrated is rated as a 6 volt 80 ampere hour battery and contains thirteen plates per cell. By a jobber the S. O. S. would be rated as a 6 volt 120 ampere hour battery. S. O. S. batteries are conservatively rated, while most jobbers' batteries are much overrated to enable them to make a close price. An S. O. S. battery means full rated capacity and SATISFACTION.

Owing to a slight change in sizes of S. O. S. 6 volt 80 ampere hour lighting batteries, we have 150 of them, the following outside dimensions, that we are selling while they last at $20 each. Length 11 inches, width 7½ inches, height 9 inches. Shipping weight boxed 65 lbs. These are the same as battery illustrated. If you want the best lighting battery made, order today.

Paint Your Own Car

SAVE $25 to $50

Our big, 36-page book, "THE CAR BEAUTIFUL," is the recognized authority on the Home Painting of Motor Cars. After reading it, you yourself, without previous painting experience, can successfully repaint your car or only revarnish it, or enamal the hood and fenders, enamel or silverplate the lamps, etc., redress the top and cushions, paint the wheels a different color—in fact, do anything you otherwise would have to pay a professional painter big money to do.

During the past eight years, thousands of motorists have successfully painted their own cars with our materials. The Arsenal System of repainting Motor Cars (for novices) is one of the big successes of the industry. DON'T SPEND A CENT FOR PAINTING MATERIALS UNTIL YOU HAVE READ THIS BOOK. Send for your copy today. It is FREE.

Replace Your Broken Curtain Light Yourself



THE REPLACE CURTAIN LIGHT is a complete unit and can be installed by anyone without experience. No sewing is necessary, and no tools required. Each light is complete with fasteners for applying. Curtain lights break easily and must be replaced from time to time. If no carriage trimmer is available and a light is to be replaced, the curtain must be taken off and shipped to some repair shop or factory. Heretofore the celluloid lights have of necessity been sewed in the curtain until the REPLACE CURTAIN LIGHT was invented. Now it is only necessary to order the lights from us and you can put them in yourself without taking off the curtains.

Back Curtain Lights for 1912, '13 or '14 Ford touring cars, prepaid, each, $1.50.

Overland touring cars, 1913-14, each $2.50. Others in proportion.

Order a light today and put it in yourself.

NOTE—Patents are pending on the Replace Curtain Light and infringements will be vigorously prosecuted. REPLACE CURTAIN LIGHTS are fully described in our booklet "The Car Beautiful." It is FREE. Send for your copy today.

ARSENAL VARNISH CO.

Specialists for Motorists

2501 Fourth Avenue **Rock Island, Ill.**

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S.O.S

Trade Mark Registered

Storage Batteries

No other starting battery now on the market can give the satisfactory service and long life that the S. O. S. battery will give—bar none

Aside from their high voltage maintenance, we guarantee that S. O. S. battery plates **positively will not buckle or sulphate during** the life of battery, under any conditions of use or abuse. They can be **overheated** and **overcharged** and **entirely discharged without injury.**

Dead short circuits will not harm them.

They can stand idle for months without care or attention, and upon being charged will operate to their full rated capacity. They will deliver full rated capacity during their entire life.

They are more nearly fool proof than any other lead plate battery now made.

Any S. O. S. dealer will be glad to make a dead short circuit test for you. Ask him to burn up a 20 penny nail by holding across terminals. Or he will weld a pair of steel files together for you in the same manner. This short circuiting causes plates to buckle. S. O. S. batteries can be entirely discharged in this manner without buckling of plates. BEFORE YOU BUY ANY BATTERY INSIST ON THIS TEST.

CAR OWNERS: The S. O. S. costs no more than any high grade battery. It is positive insurance against battery trouble. Send for our free battery book.

S. O. S. Storage Batteries for Starting, Lighting, Ignition, House Lighting, Railway Signal Service, etc. Catalog on Request.

ARSENAL VARNISH CO., 2501 FOURTH AVENUE ROCK ISLAND, ILLINOIS

SELLING AGENTS

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FOR OUR MUTUAL BENEFIT

we ask your consideration of a few facts regarding our product. Facts, which you will readily recognize and grant, but may have previously overlooked.

Who originated a Triple Socket Wrench for Ford Car use? **WALDEN-WORCESTER.**
Who designed the popular short Valve Grinder? **WALDEN-WORCESTER.**
Who applied their time and spent their money in perfecting a Service Set of Tools for Ford Cars? **WALDEN-WORCESTER.**

Now, the Point—the Big Idea—Are you selling these **Walden-Worcester** Tools, or cheap imitations?

Are you selling wrenches **built to use,** or others merely "made to sell"?

In other words, are you using our goods, to not only make a profit for yourselves but to build up a permanent business, with patrons who will stick to you because of the quality of your merchandise, or, have you been deceived by the lure of a little more profit into selling "something just as good" and driving away the good-will of your patrons?

Some imitation tools have come to our notice which will not even fit the nut, for which we make a special socket. Do you not agree with us that such goods would drive away your trade?

You are in business to build up a permanent clientele and we ask your co-operation so that our tools may be a source of pride and profit to you in selling them, and of satisfaction to your patrons in using the **best made.**

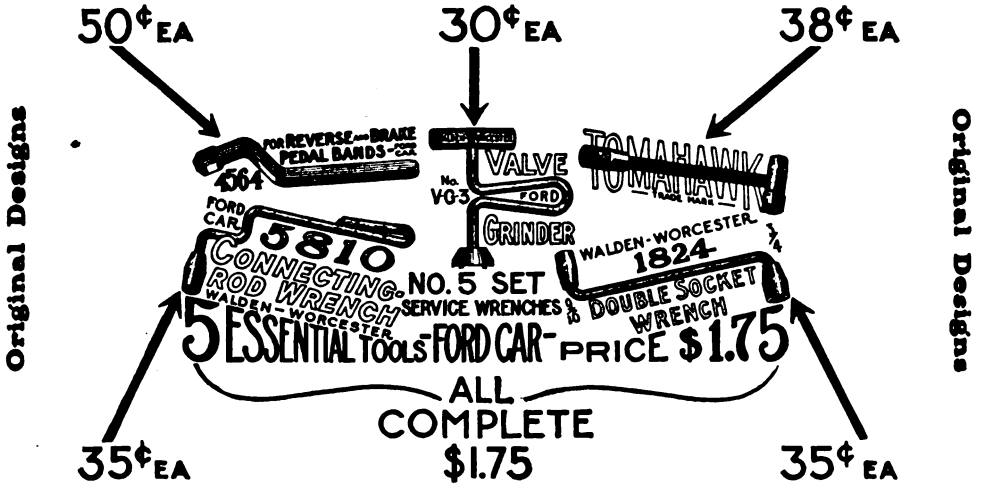
ALL ORIGINAL DESIGNS

WALDEN - WORCESTER GUARANTEED QUALITY TOOLS

The first wrench ever offered for use on brake and reverse bands, designed with a knowledge of clearance around the nuts. The peculiar shape of the handle is to allow for full working space.

New design, all steel tool. Bar handle swivels on cone bearing. Pins are hardened steel and socket shaped to fit valve head—a real tool.

Most useful single wrench for Ford Cars. Cylinder Head Bolts, rear axle nuts and housing, water intake pipes and sundry other places. Sockets are shaped to allow full clearance.



It will fit any rod in practically any position without removing the engine from the car. The first and only wrench on the market today which will accomplish this purpose.

There are many nuts and bolts on the Ford Car which with ordinary wrenches are very inaccessible, causing much loss of time when making adjustments or repairs. These tools are designed and tested under practical service conditions and greatly simplify the work, saving much time and annoyance. The tools are built to meet hardest service conditions and are fully guaranteed. Every Ford owner and garage needs these tools.

Sizes are ⅞ and ¾ in., to fit main bearings and engine base bolts and other parts. Most desirable tool for your Ford equipment.

DESIGNED AND PROVEN FOR EFFICIENCY AND SERVICE.

A NEW BIG VALUE IN SERVICE WRENCHES FOR FORD CAR

If your dealer or jobber does not carry these tools, advise name and we will ship, charges prepaid, on receipt of price.

Send for Catalog and Trade Prices. **Walden Mfg. Co., 64 Central St., Worcester, Mass.** **We Manufacture Wrenches Only.**

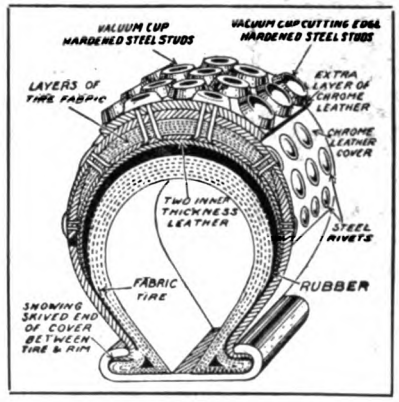
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10,000 MILES GUARANTEE BACKS THIS TIRE



Brictson Pneumatic Tires

TRY Brictson Pneumatic Tires at our expense. Don't pay until you are satisfied. At our risk find out for yourself what wonderful service Brictson Tires give—how resilient and easy riding they are. Get rid of punctures, blowouts and rim cuts. Brictson Tires are rut proof, oil proof and gasoline proof. They are sold under a specific 10,000 mile written service guarantee.



Read What One User Says

"Several months before beginning my trip from Detroit, Mich., to Detroit, Fla., I thoroughly investigated tires of several well advertised kinds. I finally decided for my trip that the Brictson was the most economical and durable tire that I could find.

I am daily asked if I have many punctures. I reply that I do not know what a puncture is. I am driving on all kinds of roads under all kinds of conditions and never have a thing to worry about.

I have been on the road since the 8th day of last October, and if all goes well will begin my Florida trip again about October 1st next. I consider the tires worth almost their weight in gold. I would not do without them at twice the price.

W. J. BREWSTER,
August 10, 1914. 236 Jefferson Avenue, Detroit, Mich."

Your Tires Rebuilt the Brictson Way

If the fabric in the tires you are now using is in good condition, we can take them, make them proof against rim-cutting, punctures, blowouts, side-wall breaks, skidding, ruts, oil, and give thousands of miles of additional service.

Sign and send back coupon for full information and details of our liberal Free Trial Plan.

THE BRICTSON MFG. CO.

135 BRICTSON BLDG., BROOKINGS, SO. DAKOTA

Mail Back This Coupon

Brictson Mfg. Co.,
135 Brictson Bldg.,
Brookings, So. Dak.

Please send me full particulars about Brictson Tires, explain your free trial plan, also explain how my own tires can be rebuilt the Brictson Way.

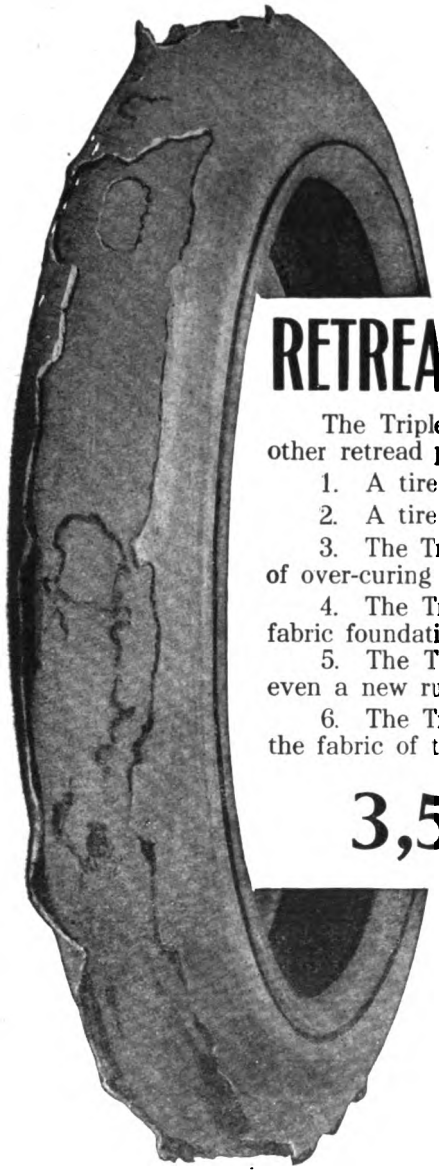
Size of Tires.....

Name.....

Address.....

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WHAT DO YOU DO WITH A TIRE LIKE THIS?



The fabric foundation of the tire is uninjured though the rubber tread is worn and torn away. If continued in service in its present condition with the fabric exposed to water-soaking and wear, the best that can be expected is a few hundred miles of service at the most.

If this tire is fitted with a new wearing surface that will keep water away from the fabric and take up the wear, it can reasonably be expected to give just as much mileage as if you bought a new tire, and best of all, the cost of having this tire rebuilt is but a fraction of the cost of a new tire.

Diamond, Goodrich, Fisk, Firestone, Goodyear, Miller and United States Tire Companies will all confirm this statement.

RETREAD IT BY THE TRIPLE TREAD PROCESS

The Triple Tread process of retreading has six marked points of superiority over any other retread process now on the market:—

1. A tire retreaded by the Triple Tread process is made absolutely non-skid.
2. A tire retreaded by the Triple Tread process is made practically puncture proof.
3. The Triple Tread process of retreading is the only one in which there is no possibility of over-curing the fabric foundation of the tire.
4. The Triple Tread process is the only retread process which will add strength to the fabric foundation of the tire so retreaded.
5. The Triple Tread gives better protection against glass cuts, stone-bruises, etc., than even a new rubber tire.
6. The Triple Tread is the only retread that is not absolutely dependent on the life of the fabric of the tire retreaded for its full mileage.

3,500 MILES GUARANTEED

The Triple Tread is guaranteed on the same basis as new tires, 3,500 miles, and is guaranteed perfect in material and workmanship.

Inside linings may reinforce the fabric from the inside but will not protect that fabric from wear or water-soaking after the rubber tread is injured.

Tire protectors will give protection against punctures and glass cuts but are unsightly, heavy, and cause friction between tire and tread which is injurious to both tire and inner tube.

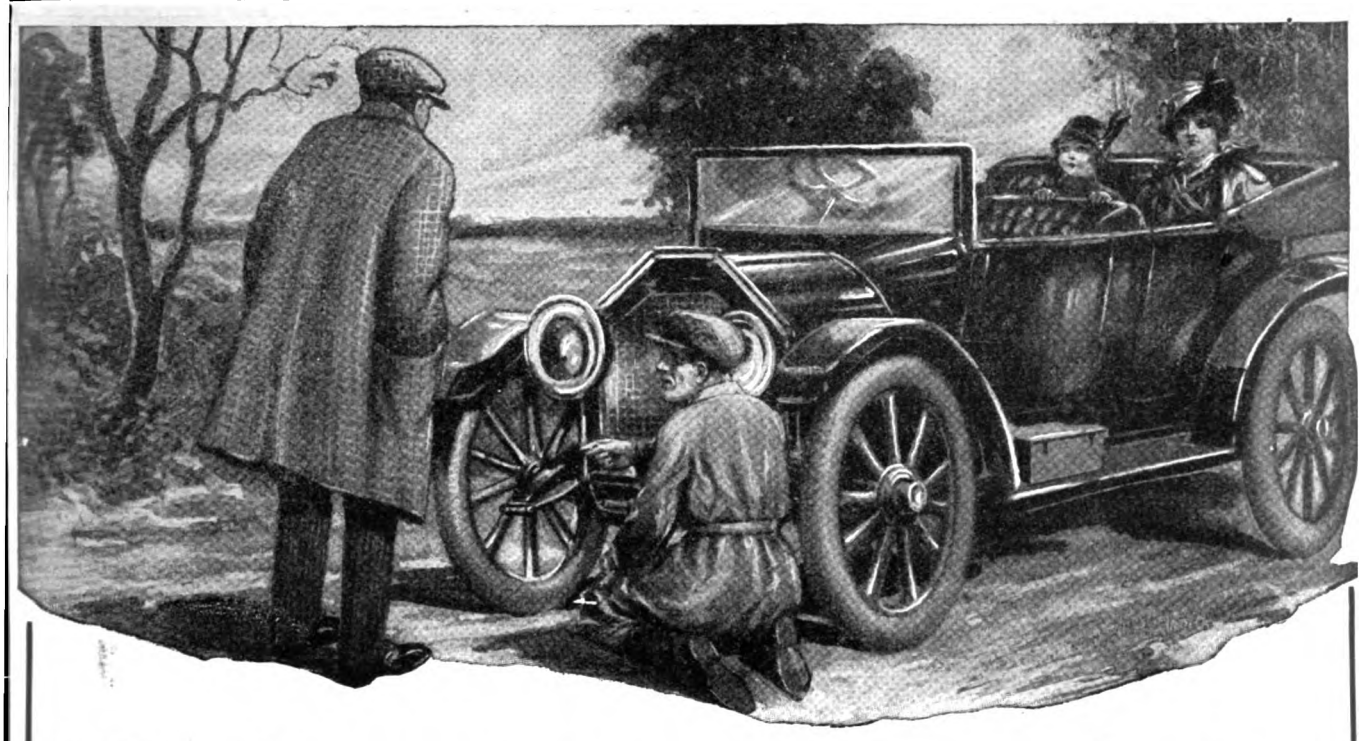
The Triple Tread process of retreading has a distinct individuality and is enabling hundreds of motorists to get thousands of extra miles out of tires that they formerly discarded as worthless.

Write for full particulars and prices today. Please mention the size of your tires.

TRIPLE TREAD MANUFACTURING CO.

1542 MICHIGAN AVENUE, CHICAGO

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When he comes to you for a new Spring—sell him a Tuthill Titanic

NO SPRING CAN BE MADE TOO STRONG

Don't be afraid of selling your trade a spring that is too strong—it can't be done.

When your customer comes into your place and asks for a Spring, tell him, "Here's the Tuthill Unbreakable Titanic—the best spring made, guaranteed forever against center breakage—a lubricated, easy riding spring that I personally guarantee will last as long as your car."

Tuthill Titanic Unbreakable Spring

GUARANTEED FOREVER AGAINST CENTER BREAKAGE

IMMEDIATE SHIPMENTS

It won't be long now till a lot of old cars will be awakened up from their long winter's sleep.

And new cars will be as thick as grasshoppers in your territory this Spring.

Just how are you going to "cash in" on this repair business that is sure to come?

It's easy. Just wire or write your jobber, or send direct to us. Most all jobbers carry a complete line of the different sizes of Tuthill Titanic Unbreakable Springs for all kinds of cars. Our Quick Service Supply Department never sleeps—we can ship most orders on the day they are received—any special order within 48 hours.

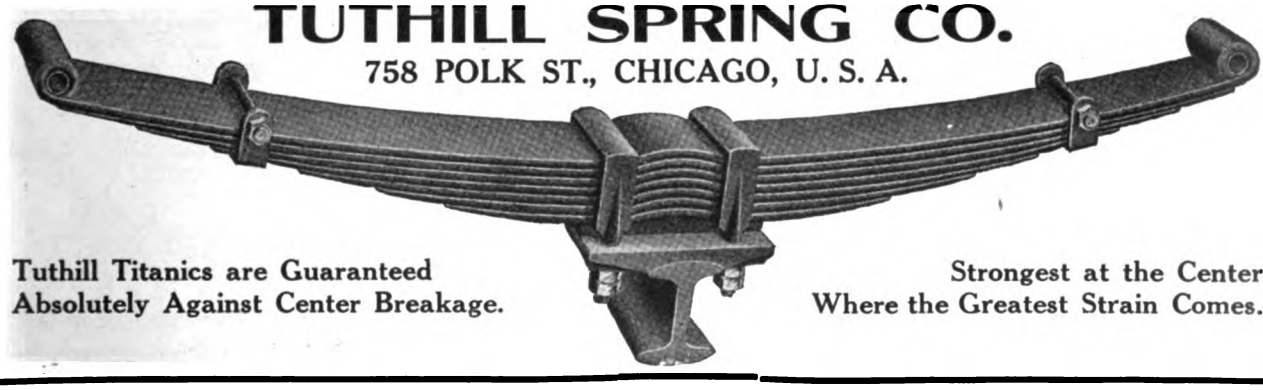
Write today for "Special Proposition."

Don't hesitate to make this guarantee—we will back you up—because the Tuthill has no Center Bolt—it is strongest where 75 out of 100 other springs break.

Tuthill "Titanic" can be easily adapted to any axle construction and quickly mounted, without any extra expense.

TUTHILL SPRING CO.

758 POLK ST., CHICAGO, U. S. A.



Tuthill Titanics are Guaranteed Absolutely Against Center Breakage.

Strongest at the Center Where the Greatest Strain Comes.

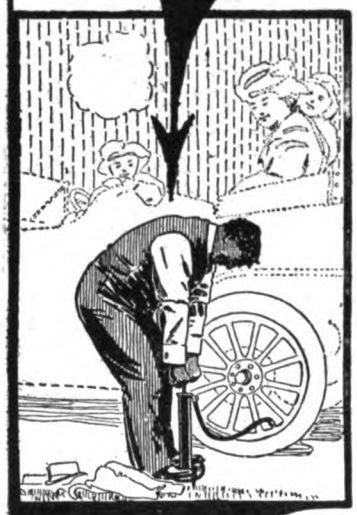
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Mr. CAR OWNER



SAVE YOUR BACK

DISCARD THE OLD LEAKY HAND PUMP



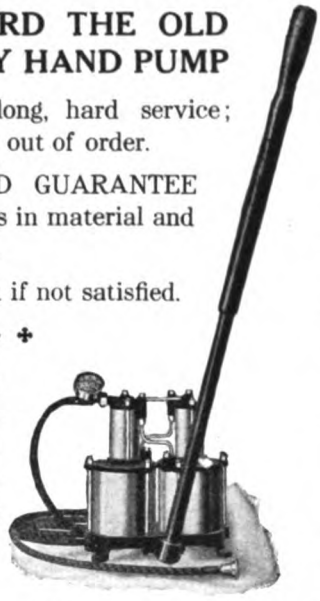
Made for long, hard service; nothing to get out of order.

UNLIMITED GUARANTEE against defects in material and workmanship.

Money back if not satisfied.

✣ ✣

Dealers can sell them quickly as every man will want one as soon as he sees it.



A Boy Can Operate The

"DEAD EASY"

tire pump and not tire himself in the least.

Watch the gauge—you cannot tell by "the feel" when the tire has all the air it needs because it still works "dead easy" after the tire is filled to its rated pressure.

POWERFUL RAPID DURABLE

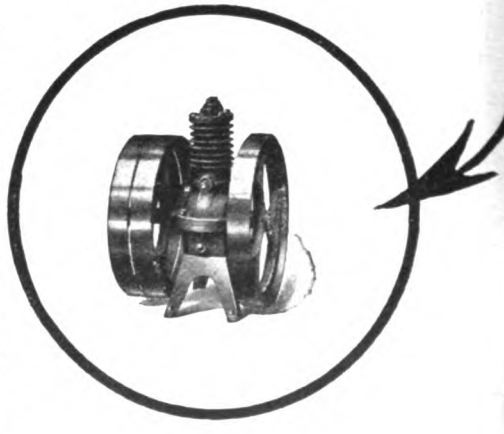
WRITE FOR PRICES TODAY

GARAGE OWNERS-REPAIRMEN-JOBBERS

A HIGH QUALITY AIR COMPRESSOR AT A LOW PRICE

Why buy an expensive air compressor, when you can buy this one for a price within your reach.

It is equal to the best, if not better in design and operation than any high-priced air compressor made. If you are "from Missouri" and want us to "show you" we will send you one of our Type D Compressors, and if it is not just as we say, send it back and your money will be cheerfully refunded.



DESCRIPTION

TYPE D COMPRESSORS are single-stage, air cooled, of very superior design and construction. All bearings are anti-friction, conveniently adjustable to take up wear, and self oiling. All working parts are enclosed. The valves are hardened tool steel, arranged for vacuum, as well as pressure.

EQUIPMENT D-26: Cylinder 3" bore with 3" piston stroke. Capacity 3 cubic feet per minute at 250 R.P.M. Ample for the average garage or tire repair shop. Will develop 150 pounds pressure and requires 1 to 1½ H.P. 16" heavy fly wheel and 16x2" tight and loose pulleys. Height over all 21". Floor space 16x16". Shipping weight 125 lbs.

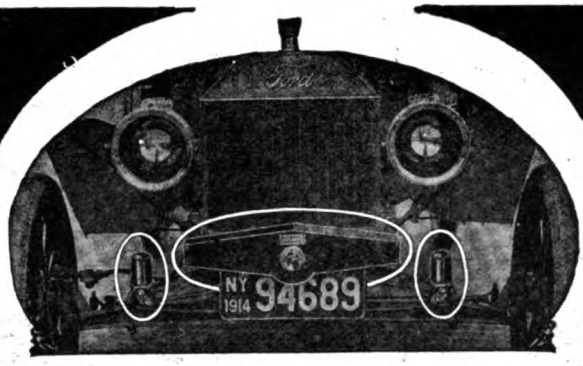
WRITE FOR PRICES AND DISCOUNTS

GLOBE MANUFACTURING COMPANY

BATTLE CREEK, MICH.

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SIT STIL!



START YOUR ENGINE FROM THE SEAT WITH A SIT STIL CRANKER

There is no need of getting out in the muddy gutter or dusty road to crank the motor. You can start it from the seat every time, without danger of getting hurt, and without as much effort as in cranking.

The Sitstil turns the Ford motor over five times as fast as you can crank it by hand. That means easy starting because the speed of the motor draws in a good charge of well vaporized gas, and the magneto generates a good fat spark to ignite it. Operated by a foot pedal—the easiest way. A woman can do it. It is more positive than the expensive electric starting systems.

$15. Ten Days' Trial—Money Refunded

We will cheerfully refund your money if you want it after you have tried the Sitstil on your Ford. Price includes seat Primer attachment. Easily installed. Simple, handsome, well-made best materials.

"TASCO" SHOCK ABSORBERS FOR FORD CARS

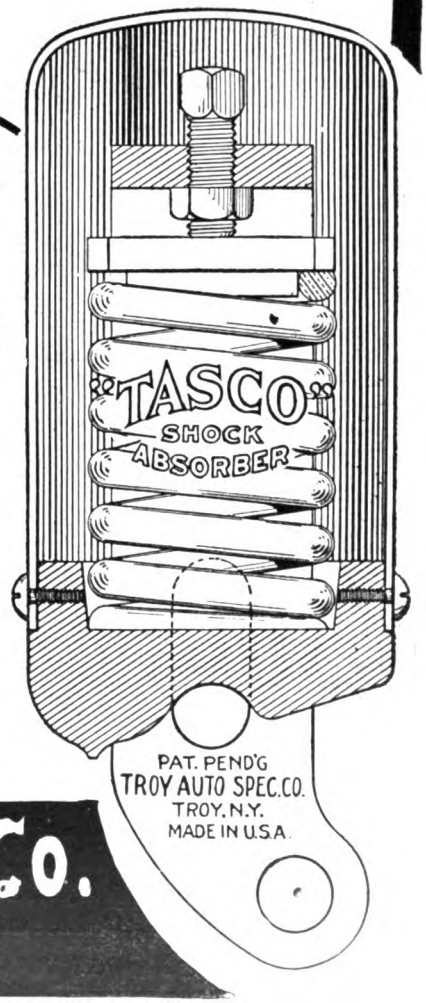


Built of Steel—Designed for Service.

$6.00 FULL SET OF FOUR

The day of high priced Ford Shock Absorbers is past. No Ford owner will pay more than $6.00 a set for them when he knows that the "Tasco" Shock Absorbers are not excelled by any in efficiency, strength and easy riding.

"Tasco" Shock Absorbers do not raise the car or change the suspension as designed by Ford engineers. Made of finest material, properly designed and have real springs—strong, lively and flexible. Springs are adjustable. Easily attached without even taking off wheels.



Ten Days' Trial—Money Refunded

DEALERS: We have a good proposition to make you. The "Sitstil" Cranker and "Tasco" Shock Absorbers are the best sellers of their kind on the market.

WE WANT LIVE DEMONSTRATORS IN EVERY TOWN. WRITE US TO-DAY.

TROY AUTO SPECIALTY CO.
TROY, N.Y.

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You can sell this new Gould Starting and Lighting Battery without half trying



Many of the earlier lighting and starting batteries are giving trouble and will soon have to be replaced.

This means good business to dealers and repairmen who arrange to sell the Gould hard-paste-plate high-capacity long life battery—which offers good profits and makes pleased customers every time.

As the point by point comparison shows, our improved 1915 type is the biggest advance ever made in lighting and starting battery construction.

This battery is solid as a rock, gives a wealth of power and will easily outlast the car in which it is installed. We furnish every desirable size.

Sixteen years of progressive development has made the Gould product a leader and has necessitated a plant employing over 4000 men.

Selling Gould Starting and Lighting Batteries for gas cars and Gould renewal plates which fit the jars of any electrically driven vehicles, is sure to develop into good business, especially that our policy is to aid local garages and charging stations in every possible way.

Mail the coupon and get our prices so that you will be in position to act the next time you need a battery.

TEAR OFF ALONG THIS LINE AND SEND TO US.

Gould Storage Battery Co.

General Offices: 30 East 42nd St., New York City. Works: Depew, New York

BOSTON—347 Newbury St.
PHILADELPHIA—613 Lincoln Building
CLEVELAND—1761 S. E. 18th St.
DETROIT—Kerr Building
LOS ANGELES—110 E. Pico St.
CHICAGO—225 E. 22nd St.
SAN FRANCISCO—1448 Van Ness Ave.

Please advise me about your agency proposition and quote price on

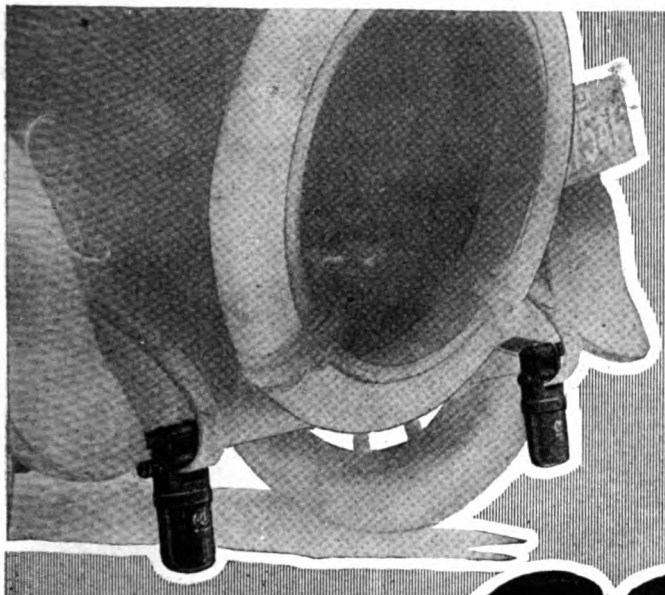
Starting and Lighting Battery for ..... car (State make, model and year of car).

Renewal plates for battery driving ..... electric car (State make, model and year of car or truck).

Name ..... Address .....

143

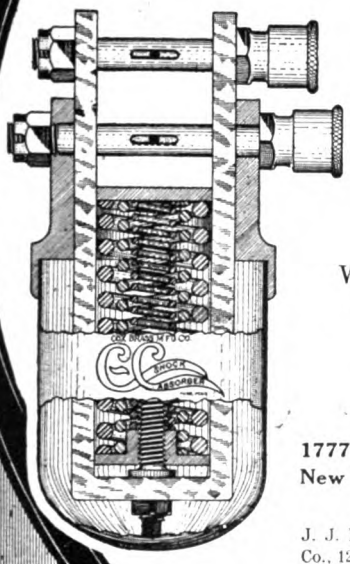
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Complete Set
For Rear
$10
for Any Car

C-C SHOCK ABSORBER

Here is a Shock Absorber that has been thoroughly tested and proven efficient. It is constructed of the best material obtainable for the purpose—all working parts are of special heat treated steel made to stand abuse. In short, the C-C is a quality product built with a mission that it effectively fulfills. It is a comfort producer, an expense reducer. Every set is absolutely guaranteed to give satisfaction or money refunded.



We are spending thousands of dollars to send the customers to you for C-C Shock Absorbers. Better get acquainted with the C-C family now. The exceptionally low price, the quality of the product and our co-operation are three big reasons why you should find this a profitable line to handle.

SPECIAL FORD MODEL $8.00 A SET OF FOUR
$4.50 A SET OF TWO

Write for folder "H," and dealer's discounts.

COX BRASS MFG. CO.

Established 1872

Albany, N. Y.

1777 Broadway
New York City

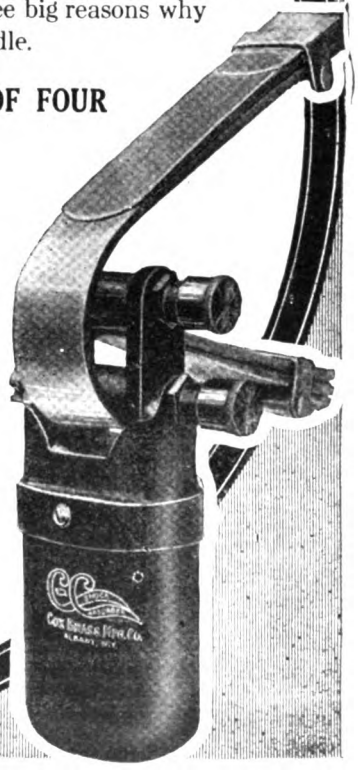
2129 Michigan Avenue
Chicago, Ill.

Distributors:

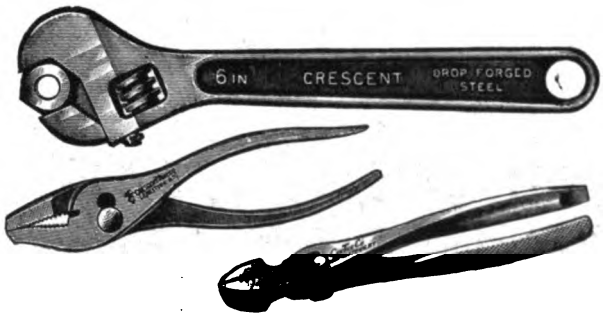
J. J. Kelleher Co., 22 Trescot Street, Boston, Mass. Geo. W. Nock & Co., 126 No. Fourth St., Philadelphia, Pa. National Electrical Supply Co., 1328 New York Ave., West, Washington, D. C. Jos. Woodwell Co., 201 Wood St., Pittsburgh, Pa. Cox & Cummins, 3124 Locust St., St. Louis, Mo. Accessory Sales Co., 708 Oneida Bldg., Minneapolis, Minn. Sieg Iron Works, 302 E. Fifth St., Davenport, Ia.

Pacific Coast:

Weinstock-Nichols Co., San Francisco—Oakland—Los Angeles, California.



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Genuine Crescent Tools

All maintain the same high standard of workmanship and material which has placed the genuine CRESCENT wrench so far above all imitation.

"Each genuine CRESCENT wrench has the name on the handle."

Catalog Upon Request

THE CRESCENT TOOL COMPANY

HARRISON STREET JAMESTOWN, NEW YORK

CRESCENT TOOL CO., Jamestown, N. Y.
Please send me your latest Tool Catalog.

Name.....

Address.....

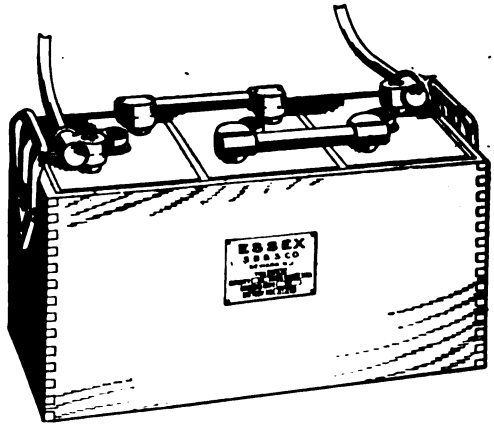
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I Buy Through .....

BATTERIES

OF ANY TYPE

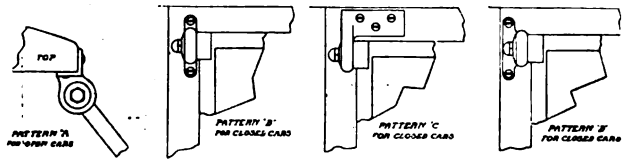
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Write for our Replacement Proposition on your old batteries for new ones, same type and size.

ESSEX STORAGE BATTERY & SUPPLY CO., Inc.

272 Halsey Street Newark, N. J.



Among the quick selling specialties we make is the

"ROAD-VIEW" SHIELD VISOR

This accessory is a great seller because it makes driving safer and more comfortable by modifying light reflections and keeping rain, snow or sleet from cutting off the view of the road. It is made of excellent plate glass with quality mountings, fastens to the front bow of the top and is adjustable to any desired angle—also made for coupes, limousines, winter tops, etc.

8½x39 inches over all . . . $5.00
8½x41 inches over all . . . $5.50

Prompt Deliveries Now *Liberal Discounts*

Yours for the asking! 144 page general catalog on Automobile Hardware

JOSEPH N. SMITH & COMPANY

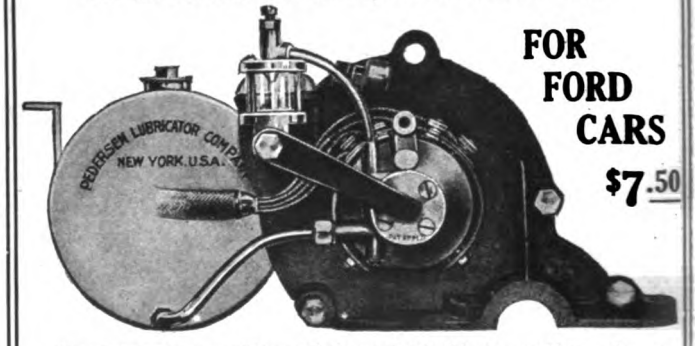
DETROIT, MICHIGAN

A NEW FORD CAR

EQUIPPED WITH A

PEDERSEN LUBRICATOR

WAS RUN OVER 6000 MILES WITHOUT REGULATION.
Fill the Oil Tank and the Lubricator Does the Rest.



FOR FORD CARS

$7.50

This lubricator is positive, entirely mechanical in its working and not depending on gravity and pressure. It has no belts, cams or rods to become deranged, but is attached direct to the engine, *starting and stopping with the motor.*

It insures proper lubrication of the motor, with longer life, smoother running, more power and fewer repair bills. It has a half-gallon oil tank, and allows the car to be driven for hundreds of miles with one filling of the tank.

Applied to the car by anyone in 15 minutes.

THE "UNITED TERMINALS"

as illustrated in above cut are the greatest convenience and trouble saver for Ford users. They bring all the wires on top, easy to get at, preventing them from getting oil soaked, twisted or strained at their connections. Should be on every Ford car.

Easily Applied ***Price 50c.***

Dealers write us, you can make money in handling these goods.

PEDERSEN LUBRICATOR CO.

638 FIRST AVENUE, NEW YORK

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Don't You Care, Dad, Tire-Doh Will Fix It in a Jiffy!



No matter how big the puncture, blow-out, or tear, you can repair it yourself in a jiffy with

TIRE-DOH

TIRE-DOH is the handiest repair made for tube and casing troubles. You can use it anywhere—in the garage or on the road—without heat—without tools—and the cost of repairing the average puncture with TIRE-DOH is only 2 cents.

Tire-Doh Repairs are Permanent Repairs

TIRE-DOH is not only easy to use but it makes repairs that will last as long as the tube itself, because it is made of the highest grade rubber. After setting (which it does in a few minutes), TIRE-DOH becomes as tough and elastic as the best inner tube made.

On account of its plasticity, TIRE-DOH can be worked into repairs that are inaccessible to other repair methods.

TIRE-DOH is wonderful for filling cuts and sand blisters in casings too.

Six years on the market and the fact that more than 250,000 car owners use TIRE-DOH and thousands of dealers sell it, is your best guarantee that it does the work.

TIRE-DOH also repairs other rubber articles—rubber boots, gloves, hot water bags.

WE MAKE
18 Other Tire-Doh Products
All As Good As TIRE-DOH

Silver Quick
Stop That Radiator Leaking
Day Tire Valve
Nomore Rust Rim Paint
Blac-Namel
Sunshine Metal Polish
Everwear Nickel Polish
Metal-Lac
Renew-O Leather Dressing
No-Leak Top Dressing
X-Ray Top Dressing
Nu-Stain Top Lining Dye
Preserv-O Tire Paint
Destroy-O Carbon Remover
Sta-On Engine Paint
See-Kleer
Chemico Blowout Patch
Body Gloss

AT YOUR DEALER'S OR DIRECT FROM US, $1.00

DEALERS—TIRE-DOH is a mighty satisfactory product for you to handle. It does the work—it sells—it repeats—it has become the standard repair—and it is advertised.

ATLAS AUTO SUPPLY CO.

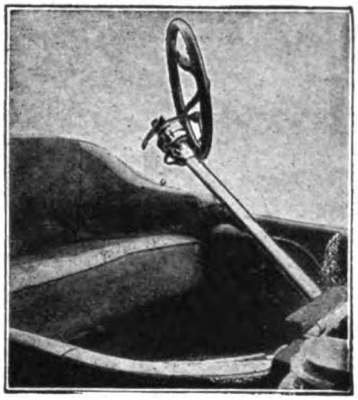
3203 W. Lake St. Chicago, Ill.



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PUT A HALLADAY ADJUSTABLE STEERING WHEEL on your FORD

The greatest convenience yet invented for the *owner* who drives his own Ford. Stout people *must* have it.



Wheel lifts instantly, enabling driver to get out with perfect ease, even with two on the seat. Locks automatically. Beautiful Black Japan finish.

Attached by simply removing nut on end of steering column.

14-inch, Spider only . . .	$3.00
Same with Rim	4.00
16-inch Spider with Rim .	5.00
Corrugated Rim, extra . . .	1.00



Patents Pending

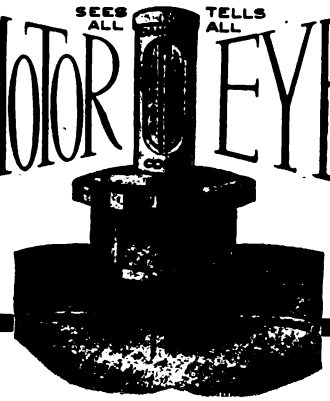
Write for Circular

Manufactured by L. P. HALLADAY CO. (Dept. D), Streator, Ill.

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and Southwest, Gray-Heath Co., Chicago; For New England, Post & Lester Co., Hartford, Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvania, Asch & Co., New York.

SEES ALL TELLS ALL

MOTOR EYE



DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH

$2.50

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

COUPON

W. LEWIS MACK, General Distributor
"Department A." 26 W. Jackson Blvd., Chicago, Illinois

Gentlemen: Enclosed find money order for $2.50 for which kindly send me, postage prepaid, one MOTOR EYE.

Name.....

Address.....

Annular Ball Bearings Reground



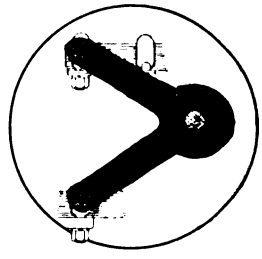
and guaranteed as good as new. We carry a complete stock of Reground Bearings at all our Branches for immediate exchange. Also a Complete Stock of New Annular, Thrust, Radax and Double Row Bearings.

Ahlberg Bearing Co.

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325 West Pico St., Los Angeles

*Hartford
SHOCK ABSORBER

The Hartford Shock Absorber is not a spring, but a spring control. It reduces the sharp oscillation of springs to long waves of motion which are hardly perceptible in the car even on rough country roads.

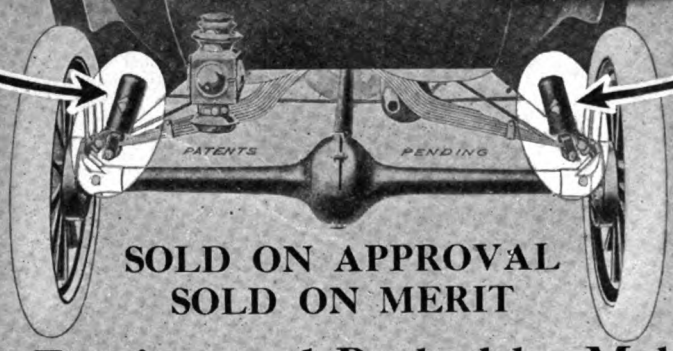


Send for full explanation.

HARTFORD SUSPENSION COMPANY
141 Morgan Street, Jersey City, N. J.
* *Formerly Truffault-Hartford*

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HALLADAY FRICTIONLESS SHOCK ABSORBERS for FORD CARS

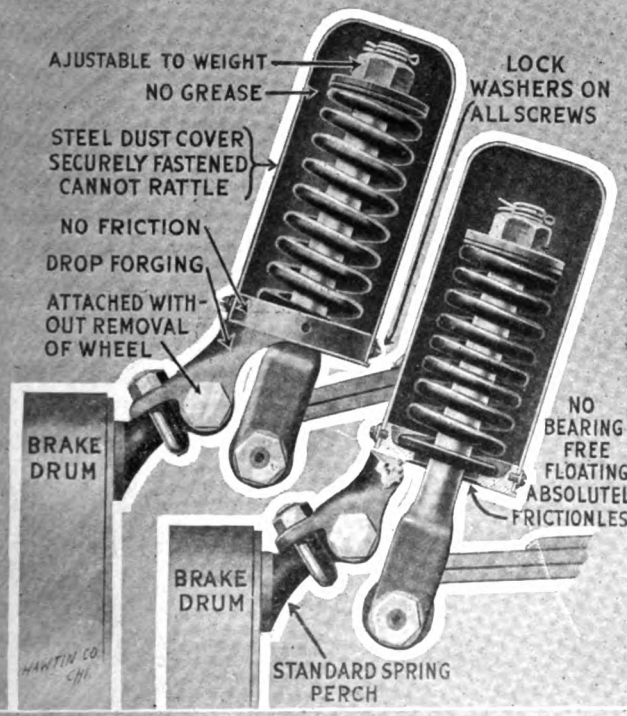


ATTACHED in 20 Minutes without removing WHEELS

SOLD ON APPROVAL SOLD ON MERIT

248,000 Halladay Shock Absorbers Sold in 1914

Made of Drop Forgings and Backed by Maker's Guarantee



Just what Ford owners are looking for—a Shock Absorber that ANYBODY can attach. Requires no machining or drilling; no adjustment, oiling or attention of any kind. Once attached it is on the job for life of car.

The Halladay Shock Absorber is

Absolutely Frictionless

Therefore absolutely noiseless. Note in the illustration the plunger rod is positively FREE floating, the lateral thrust of the springs as well as the vertical drag is compensated in direct line of plunger rod axis.

248,000 Halladay Shock Absorbers
bought by Ford Owners in 1914

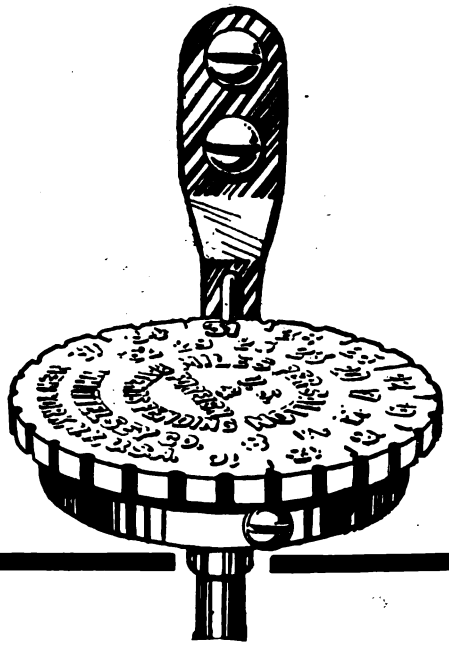
Our New 1915 Improved Model to sell at only - - **$12.00** A SET OF FOUR

WRITE FOR PARTICULARS

L. P. HALLADAY CO.
Dept. D. STREATOR, ILL.

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and South-West, Gray-Heath Co., Chicago; For New England, Post & Lester Co., Hartford, Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvan a, Asch & Co., New York.

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31 MILES

Per Gallon
For Model "T"

FORDS

Most FORD cars are driven on the average 18 miles per gallon; but Ford engineering and manufacture have built a possible 31 miles per gallon and more into these cars—but it takes a

WHITTELSEY
CARBURETOR ADJUSTER

to bring it out.

Also makes a man master of his carburetor and expert on proper adjustment. Easier starting, better running and less carbon.

Circular on request. Special Offer, $2.00.

DEALERS

This is a GUARANTEED article and we want a distributor in every town. Write DEPT. 2 for dealer's proposition.

WHITTELSEY COMPANY
11 BROADWAY, N. Y., U. S. A.

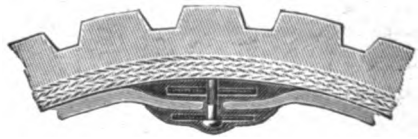
It PLUGS The Hole and It HUGS The Hole

Sampson Puncture Plug



For Automobile Inner Tubes—Quickly and Permanently Repairs the Puncture. Cuts down the cost of repair to a minimum. No cumbersome tools or heating irons necessary—only one small tool and your bare hands.

This cross section view of the working of the SAMPSON REPAIR PLUG shows how thoroughly the tube may be repaired in a few seconds and the way the edge of the plug presses against the shoe, LEAVING NO LUMP.



The strong metallic disks are covered with rubber of the finest quality. The rubber jacket extends beyond the edge of each disk, as here shown.

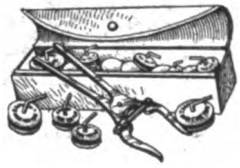
When the two disks are brought together by a wire thumb-screw, which is then broken off, the pressure of rubber against rubber—of the two halves of the plug against the rubber of the tube—makes a complete and permanent repair. This method of drawing the two sections of the plug together making a tight joint with the tube is good tire practice, and universally used by every manufacturer to fasten the valve stem to the inner tube. Good for 30,000 miles if the tube itself holds out.

Positively cannot leak, chafe or wear—will outlast the tube.

No Cement No Cleaning No Waiting

A two-minute repair as permanent as vulcanizing.

Booklet Mailed Free on Application



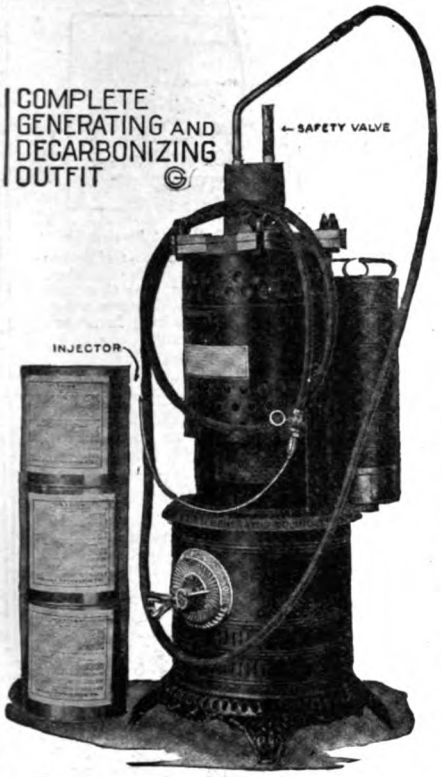
Dealers, Stock up for the season's demands

PRICES:—No. 1 Sampson Repair Kit, Containing 1 Tool and 1 Doz. Assorted Plugs, $2.50. No. 2 Sampson Carton Kit, Containing 2 Tools and ½ Doz. Assorted Plugs, $1.50.

STEVENS & COMPANY, 375 Broadway, New York



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An Oxygen Carbon Remover and Generator

$15.00

Tank Nuisance Eliminated.

Complete in every detail. Thoroughly guaranteed.

Removes Carbon from a cylinder in three minutes without dismantling the motor.

A money saver and maker. Write for Particulars.

Oxygen Generator Co., Inc.

301 River St., TROY, N. Y.

Manufacturers of Stationary and Portable Generators. Decarbonizers, Reducing Valves, Etc.



REPAIRING TIRES

The biggest money making field in the Automobile Industry today is in **repairing tires.** It is an enormous field and growing larger every year. Locations for good tire repair shops are open in every city and town in the country. You can make

$1500 TO $5000 A YEAR

if you learn by our system of instruction. We teach you every phase of **TIRE REPAIRING and TIRE CONSTRUCTION** by practical demonstration, in a school equipped with every necessary appliance. This is not a correspondence course. You get your training by actually using equipment and repair material. That's the only way.

WE TEACH YOU BUSINESS METHODS

Instruct you how to open your shop. How to take care of sales. How to retain your trade. How to make your shop pay.

WHAT OUR STUDENTS SAY

O. E. Bonnell writes, "I did a $15,000 business last season." **A. A. Robinson,** "Have been in business 30 days. More than doubling expenses. Did not know money could be made so easily." **C. E. Kurtz** says, "We are crowded with work." **C. M. Marsh,** "Business coming too strong, and I have not advertised a bit." Hundreds of others tell of similar successes.

SEND FOR OUR FREE BOOKLET C

It tells all about our school, about our methods of teaching, what our students have accomplished. Be first to enter into this big paying business in your town.

CLOUSE TIRE REPAIR SCHOOL

Euclid Avenue and 90th Street, CLEVELAND, OHIO



90% of motor ills are traceable to faulty lubrication. Often an inferior lubricant is directly responsible---a lubricant with an asphaltum base.

HARRIS OILS and GREASES, made of finest Pennsylvania Crude, have a paraffin base. Paraffin is a lubricant—asphaltum is not. Asphaltum means carbon deposit. There is not a trace of it in HARRIS products.

The wiser, more progressive dealers are handling HARRIS OILS and GREASES. Their customers who have tried these pure oils accept no others. Remember,

"A Little Goes a Long Way and Every Drop Counts."

Sold in Bbls., ½ Bbls., 10 Gal., 5 Gal. and 1 Gal. Cans

A. W. HARRIS OIL CO.

326 S. Water Street — Providence, R. I.
Branch: 143 No. Wabash Ave. — Chicago, Ill.

"X" Contains No Cement, Powder or Glue



"X"

The Wonderful

Liquid



RADIATOR MEDICINE

REPAIRS LEAKING RADIATORS AND WATERJACKETS IN 10 MINUTES

When you pour "X" in the radiator it goes straight for the leaks and seals them absolutely by the action of the cold air. An "X" repair will stand 100 pounds pressure in a steam boiler. "X" is used by large concerns in heavy delivery trucks. "X" will work in alcohol. The most wonderful property of "X" is the fact that it

MAKES NEW OR OLD RADIATORS LEAK-PROOF

Because "X" stops automatically leaks due to wear and prevents leaks due to pitting and rust. "X" eliminates scale.

WOULD YOU SWALLOW CEMENT?

If you swallowed cement it would clog your system. Cement and powder radiator compounds will clog your radiator. Use "X" because it is **liquid and cannot clog** the finest honeycomb radiator.

PRICE $1.50 PER CAN

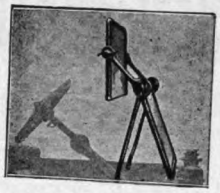
Enough to repair two 5 gallon radiators.

Dealers—Write for Liberal Discounts.

"X" Laboratories, 628 Washington St., Boston

"X" is Sold Under a Money Back Guaranty

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"GEMCO" Ford Ventilating Rain Vision Wind Shield

A substantial high grade Wind Shield made of the best quality of material and workmanship, substantially constructed. Furnished complete or attachments only which can be quickly and easily applied. Price:

Shield complete.....$21.00
Attachments only 4.50

"GEMCO" Ford 17-in. Steering Wheels.

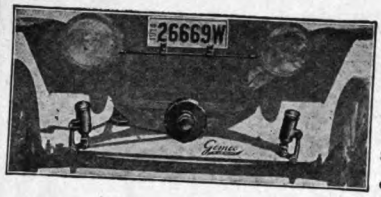
The larger wheel gives greater leverage and makes steering much easier. It is neatly finished in our celebrated Hard Rubber Black Enamel. Price:

Packed in individual Carton

Stationary-Plain Rim.....$3.60
" Corrg'd " 4.50
Tilting-Plain Rim..... 4.50
" Corrd'g " 5.50

"17" Tilting Steering Wheel on Ford Cars





This illustration shows our two leading Ford Specialties, Pneumatic Spring Shock Absorbers and Mechanical Starters together with the F-10 License Clamp and Bar. Prices:

Shock Absorbers, **$15.00** per set.
Mechanical Starter, **$15.00.**
F-10 License Clamp and Bar, **$1.00.**

THE LIVE DEALER'S OPPORTUNITY

Gemco Ford Specialties Will Double Your Business

Here is the line for you to specialize on for 1915. Many new accessories—reduced prices—all live sellers. Leading distributors throughout the country stock and recommend the "Gemco" line.

In addition to the accompanying illustrations we also manufacture SPECIAL FORD EQUIPMENT, as follows: Head and Tail Lamps, Mufflers, Cutout Outfits, Horn Outfits, License Clamps, Jacks, Robe and Foot Rails, Radius Rods, Anti-Rattlers, etc.

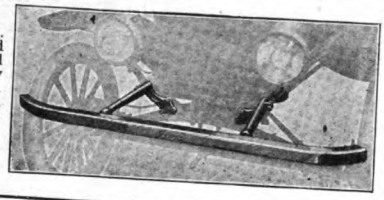
Send for our complete Ford catalog today. Call on us at the Show and get acquainted with this live line.

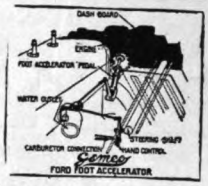
GARAGE EQUIPMENT MFG. CO., 756 So. Pierce St., Milwaukee, Wis.

"GEMCO" Ford Clamp-on Bumper

The new 1¼ in. Channel Bar and 1¼-in. Diamond Bar make especially attractive Bumpers. Also furnished with 1¼-in. Round Bar. Price:

1¼-in. Nickel Channel Bar.....$8.00





"GEMCO" Ford Foot Accelerator

The simplest and most effective Foot Accelerator on the market. It is positive action, easy to attach and is proving a tremendous seller. Directions for attaching furnished with each Accelerator.

Price:

Complete $1.50

"GEMCO" Ford Combination Rear End Tire Holder

The advantages of the combination makes this the most popular Ford Tire Holder on the market. Price:

No. 95 complete with brackets $3.95
No. 98 Hook and Arms only with Straps..... 3.20

Pat. Sept. 8, 1914



Firestone

Accessories

—include the invaluable Firestone "Cure-Cut": just the thing to nip tread troubles in the bud. Prevents the entrance of sand, water, etc., and prolongs life of tire.

There is a long list of Firestone Accessories—and all good dealers are glad to sell them. All are easy to use, sure to work, and mean satisfied trade.

Send for catalog with definite description of the line, which includes:—

Hook-on Boots
Lace-on Boots
Blow-out Patches
Cementless Tube Patches
"Cure-Cut" Cement
Air-Pressure Gauges
Valves and Valve Parts
Tire Tape
Tire Mica
Pumps
Pure Gum Molded Tube Patches
Red Wrapped Tube Patches
Repair Materials in Packages
Repair Kits, Etc.

Firestone Tire & Rubber Co., Akron, O.—Branches and Dealers Everywhere

"America's Largest Exclusive Tire and Rim Makers"

Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Motorcycle Tires, Fire Apparatus Tires, Rims, Tire Accessories, Etc.





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AUTOMOBILE OWNERS---DEALERS SAVE 50%

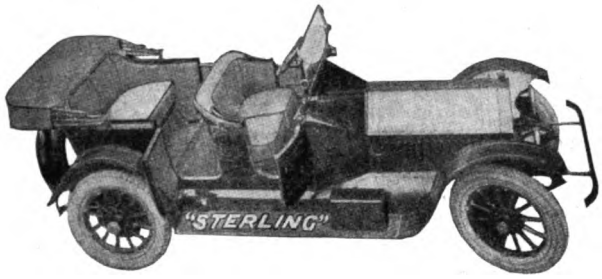
BY RECOMMENDING AND USING

STERLING SEAT COVERS

"THE BETTER KIND"

1915 Prices and Discounts Now Ready

"STERLING" materials *are absolutely* the best obtainable at any price.



Do not be misled by "so-called Lower Priced Seat Covers," made of cheap materials.

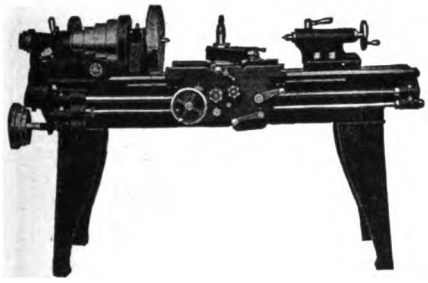
The difference between "*Sterling Seat Covers*" and those made by other concerns is the same as comparing a Genuine Diamond with a piece of Glass—therefore, choose accordingly.

WRITE FOR OUR NEW PRICES AND SAMPLES TODAY

STERLING TOP & EQUIPMENT CO., Inc.

Complete Automobile Outfitters

517-519-521 WEST 57th STREET, NEW YORK



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 6 and prices.

THE MONARCH MACHINE CO.

SIDNEY, OHIO

Get your start with a

THURBER STARTER



A *Real* Starter!
An Air Pump and Tank!
A Tire Inflator!

A simple, powerful and reliable Rotary Air Starter and Inflator, comprising an Air Compressor, Tank, Valve and a Rotar which spins your motor at over 200 revolutions per minute in any kind of weather. Gives a sure start, can be used for almost instantaneous tire inflation, and can be attached to any car at any time. Easy to attach—cheap to keep up—anyone can operate.

Model M for Large Cars	$85.00
Model J for Medium Sizes	70.00
Thurber "Ford Special" for Fords	65.00

F. O. B. Cars Detroit

ASK FOR OUR THURBER BOOKLET

Thousands of Thurbers in Use

NORTHERN ENGINEERING WORKS

No. 12 CHENE STREET DETROIT, MICHIGAN

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MORE POWER
AND A CLEANER MOTOR



Increases Mileage Per Gallon From 40 to 60 Per Cent
Decreases Fuel Cost of Operation In Like Percentage

A money saver for the user.
A money maker for the dealer.

Those who use it come back for more, and so, you Mr. Dealer, can have a steady income from its sale, if you will take up the proposition we have to offer you.

Write for FREE territory selling plans, etc. Also ask for testimonials, letters, or better still order a quart can "GASOLETTE" prepaid (it will treat 64 gallons Gasoline) and convince yourself of its wonderful merits.

Quart Can (will treat 64 gallons Gasoline).....$1.35
Gallon Can (will treat 256 gallons Gasoline)..... 5.00
Never Sold In Bulk

UNITED PRODUCTS MFG. CO.
219 EAST 22nd STREET Dept. A CHICAGO, ILL.

GASOLETTE

Increases the efficiency of Gasoline without injury to motors.

Gives the motor greater pulling power, more speed and 100 per cent flexibility. sparks quicker and helps the engine to almost instantly pick up and to run smoother.

Prevents pre-ignition, pounding and over-heating of engine.

Removes and prevents carbon deposits on spark plugs, pistons, cylinders and valves, and thereby eliminates engine troubles.

Prevents carbon deposits on exhaust valves and seats, thus eliminating cutting and pitting, and consequent loss of power that can be remedied only by grinding valves.

Prevents carbon deposits on intake valves and seats, which deposits cause loss of compression, loss of power and back firing in intake pipe.

Prevents carbon deposits on pistons, gumming and sticking of piston rings, loss of compression, loss of power—and you avoid the trouble and expense of taking down the engine to clean.

Lessens smoke, odor and noise.

Leaves cylinder and valves in an oily condition and therefore adds life to the engine.

50¢ Large Bottle
with canton flannel and cheese cloth.
Send 50¢ by mail to-day.
Finest Automobile Body Polish Made
Your Money Back if You Dont Think So Too
U-Sav-Your Mfg. Co., 19 Perkins St., Warren, Mass. U.S.A.

U-Sav-Your AUTOMOBILE Dressing

Prepare for Spring Business H-S

The Overhauling Season is here—

H-S Repair Parts for Ford Cars

Over 250 Parts

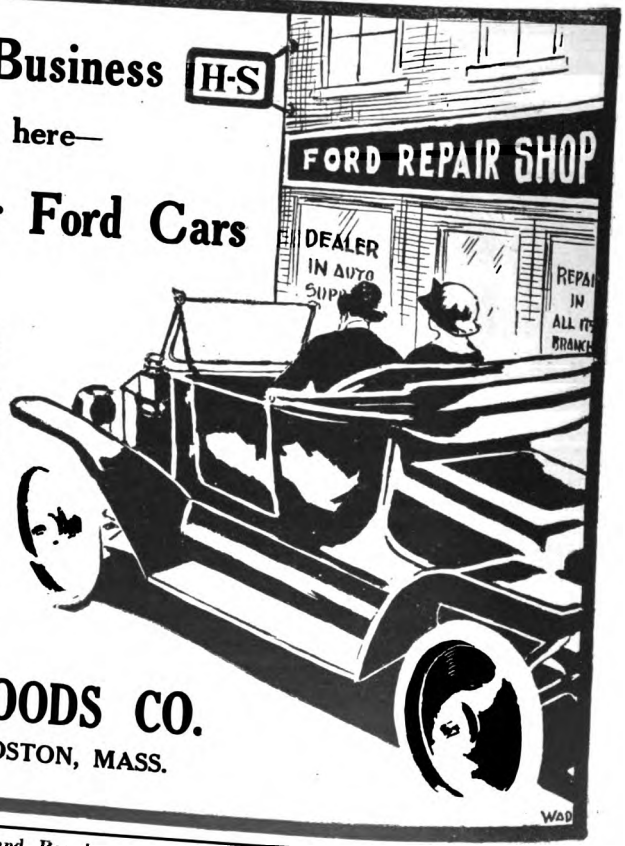
Send for Our Complete List and Prices.

Rear axle parts—front axle parts—wheel parts—gasoline tank parts—motor parts—commutator parts—magneto parts—transmission parts—steering gear parts—body parts—springs—radiator fan parts—muffler—carburetor attachments—special tools and accessories.

50% Discount to Dealers—Regular List Prices

All parts guaranteed as to quality of material, heat treatment, and accuracy of machinery.

Any part found unsatisfactory for any reason may be returned for full credit.



HILL-SMITH METAL GOODS CO.

127 FEDERAL STREET BOSTON, MASS.

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Specialties for FORD Cars

OF APPROVED DESIGN AND MERIT

We make a great variety of accessories, each of which is guaranteed as to quality, finish and durability. They are not just ordinary goods, but possess many advantages and improvements, as the result of exhaustive tests and experiments.

Our catalog contains nearly two hundred illustrations of these various devices and parts, together with complete descriptions wherever necessary. Among the specialties shown therein are the following:—

Ball Joints. Ball Races. Ball Retainers. Ball Sockets, Non-Rattling. Bow Clamps. Bushings. Cock Wrenches. Cones, Adjustable and Stationary. Emergency Brake Rod Supports. Exhaust Deflectors. Fender Braces. Foot Accelerators. Grease Cups. Grease Plugs. Hood Clamps, Non-Rattling. Hose Clamps. Hub Caps. Hub Cap Wrenches. Lamp Glasses. License Brackets. Locking Devices. Muffler Cut-Out. Piston Ring Compressors. Primers. Radiator Caps Rear Axle Trusses. Rebound Check Springs. Repair Parts for Coils. Retainer Clips and Bolts. Robe Rails. Spark Plug Wrenches. Speedometer Brackets. Socket Wrenches. Steel Washers. Tank Brackets and Band. Tire Holders. Prop Nuts. Valves, Plain and Threaded. Valve Adjusters. Valve Grinders. Valve Springs. Valve Pins. Valve Spring Compressors. Wheel Pullers. Windshield Ventilators.

ALL KINDS OF BOLTS AND NUTS. Send for this catalog and discounts.

A. NELSON MANUFACTURING CO.,

Manufacturers for the Jobbing Trade Exclusively

RANDOLPH AND JEFFERSON STREETS, CHICAGO



Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

Hodge & Graves Co.

AMESBURY, MASS.



TIRES NEED AIR

Not too much, nor too little—but just enough to keep the tire inflated to the prescribed pressure. There is only one safe, sure way to do this and that is to use a reliable, accurate tire pressure gauge and test the air pressure in your tires frequently. Under-inflation with its rim cutting loosening of treads, etc., will never bother you if the pressure is tested by the

ALLEN TYROMETER

TIRE PRESSURE GAUGE

This gauge may be used with the valve in any position, and it is guaranteed absolutely accurate. Made of heavily nickeled, specially drawn brass tubing, with sliding band which holds the indication as long as you want it. Only 4½ inches long with clip attached for carrying in the pocket.

Satisfaction Guaranteed or Money Back

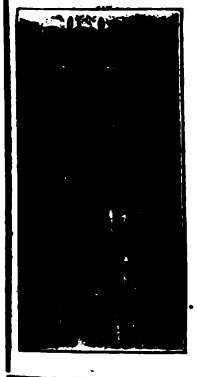
Our new booklet is ready. Write for it today!

Price, $1.00

THE ALLEN AUTO SPECIALTY CO.

Manufacturers, also, of the Famous Allen Tire Case

1926 Broadway NEW YORK 1627 Michigan Ave. CHICAGO



Lourie Manufacturing Co.

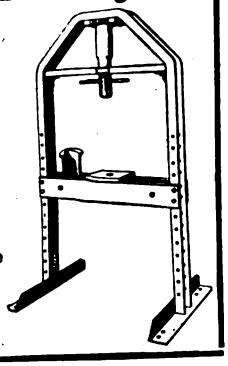
Springfield, Ill.

Make many styles of

Hydraulic and Screw Presses

Specially desirable for Automobile Repair Shops.

Send for Circulars and Prices.



SPECIAL VOLT-AMMETERS



for testing Electric Starting Systems, Storage Batteries, etc.

Write for complete catalog of accurate and inexpensive

VOLTMETERS,
AMMETERS and
VOLT-AMMETERS.

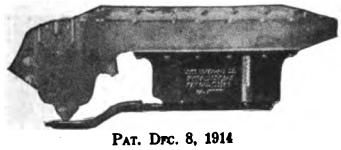
PORTABLE POCKET and SWITCHBOARD MODELS.

L. M. PIGNOLET

78 Cortlandt Street, NEW YORK

BROWN SUB-BASE OILER

FOR FORD CARS



PAT. DEC. 8, 1914

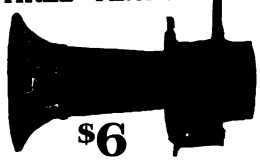
The hit of the shows. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.

GUARANTEED FOR THREE YEARS

The Horn that Speaks For Itself



$6

The Handphone

Efficient, Durable, Powerful—Mechanically Perfect and Easy to operate—the slighest touch of the lever gives an instantaneous, loud, penetrating warning.

Automobile Supply Mfg. Co., 220 TAAFFE PLACE BROOKLYN, N. Y.

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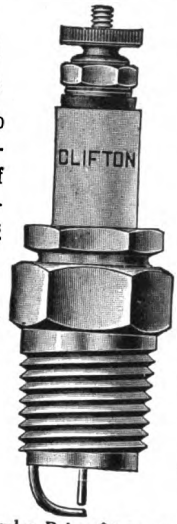
LOOK! READ!

WAR-ON-HIGH-PRICES
$4.00 WORTH FOR $1.00

Four Clifton Spark Plugs will be mailed to you promptly upon receipt of $1.10 which includes boxing and mailing.

Made in all sizes. State size required.

Sizes
½" Standard
⅞-18 A.L.A.M.
Metric



No better Spark Plugs made.

Highest grade materials used.

Once a Clifton user always a Clifton customer.

Buy direct and save dealers' and jobbers' profits.

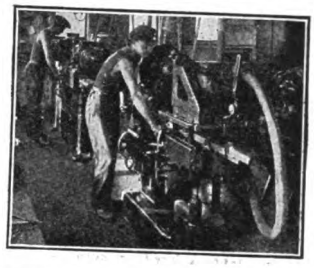
A knock from a dealer is a boost, you know why.

Regular Price $1.00 Each

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CLIFTON MOTOR WORKS, 1878 Broadway, N. Y.

Quick and Satisfactory CYLINDER REGRINDING



Have us restore the compression and power to your motors. We specialize on the most practical and economical method of restoring worn cylinders to efficiency.

We have been regrinding such cylinders and fitting new over-size pistons and rings, to the complete satisfaction of motorists in many states.

The most improved equipment, and skilled workmen experienced in handling it, enable us to give unusually prompt service.

We can refer to hundreds of satisfied customers. Write today for detailed information, advising numbers of cylinders and bore diameters, for our guidance in making quotations.

THE WATERBURY WELDING CO.,
1148C So. Main Street, Waterbury, Conn.

STOLEN CARS

Last year amounted to

$1,000,000.00

By using the Commercial Auto Lock your car cannot be stolen.

THE COMMERCIAL AUTO LOCK

locks the control lever in neutral position, making it impossible to connect the engine with the driving mechanism.



Price $2.00 Complete
Prepaid to any address in the U. S.

Mail your order today with remittance. If it is not satisfactory return the lock within ten days and your money will be gladly refunded.

Dealers and Agents will be interested in the liberal discount.

WRITE TODAY FOR PROPOSITION.

COMMERCIAL MFG. COMPANY
508 Commercial Building CLEVELAND, OHIO

THE "SLIKUP" SALESMAN

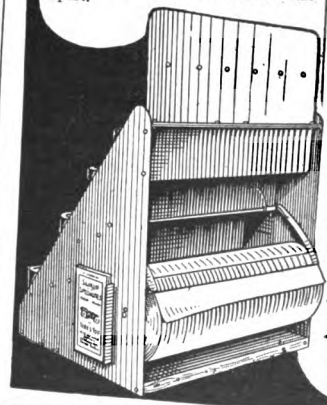


SELLS THE GOODS FOR YOU

With the **SLIKUP SALESMAN** you can give the car owner anything he wants to renovate his car from tires to top. Nothing in any of them to injure the car in any way.

BIG INDUCEMENT for Dealers and Jobbers.

The **SLIKUP SALESMAN** is made entirely of metal. It will not fall apart.



SLIKUP SPECIALTIES

SLIKUP For RUBBER
SLIKUP Aluminum Paint
SLIKUP Engine Enamel
SLIKUP Hard Auto Soap
SLIKUP Hand Cleaner
SLIKUP Cream Polish
SLIKUP Metal Finish
SLIKUP Silver Finish
SLIKUP Enamel Top Dressing
SLIKUP Mohair Top Cleaner
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SLIKUP Leather-Kote
SLIKUP Rim Paint
SLIKUP Body Polish
SLIKUP Auto Varnish
SLIKUP Clear Lacquer

N.B.ARNOLD
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BROOKLYN, N.Y.

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More Power to Yez!

Your motor runs better at night - Why?

Because there is more moisture in the air.

The Hampton Gasoline Economizer makes all time, night time, for driving, and saves 25% to 50% on fuel cost.

More power—less carbon deposit—Sells at $10.00.

LIVE DEALERS WANTED.

Easily and quickly attached and it "stays sold."

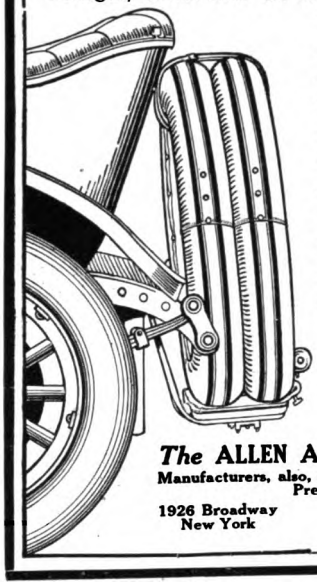
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1876 Broadway
New York

The ALLEN TIRE CASE

has long demonstrated its superiority as a protection for spare shoes. The deteriorating effects of sunlight, water and oil are completely avoided when the Allen Tire Case covers the spare shoe. Perfect in fit, yet easily buttons on, and is made of finest quality enamel duck; colors to suit the individual owner. Made in all sizes and for all style demountable rims and wire wheels.



PRICES, $3.00 and up

Our new booklet is ready. WRITE FOR IT TODAY.

At All Dealers!

***The* ALLEN AUTO SPECIALTY CO.**

Manufacturers, also, of the Allen Tyrometer, Tire Pressure Gauge

1926 Broadway, New York — 1627 Michigan Avenue, Chicago

FORD OWNERS—

Here is an electric starting and lighting system for FORDS at $75. Furthermore, you can secure IMMEDIATE DELIVERY. It is the

DISCO - FORD 12 VOLT, SINGLE UNIT SYSTEM **$75**

It is guaranteed. Weighs less than forty pounds.

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AN EASY SELLER

That's what the dealers want. Easy sellers must have merit behind them.

E. Z. RIDER

SHOCK ABSORBERS FOR FORD CARS

Have that merit—Satisfied users testify to the comfort and pleasure E. Z. Riders have brought them.

WRITE FOR OUR DEALERS' PROPOSITION.

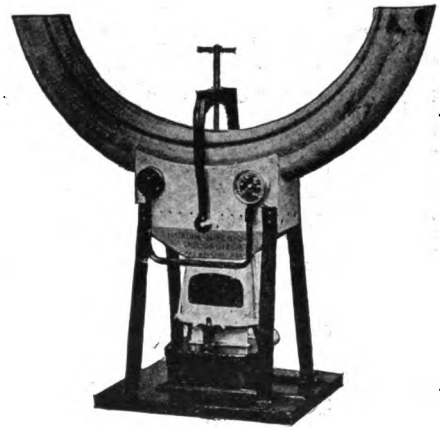
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ARE YOU INTERESTED

In Reducing Your Tire Expenses?

A Superior Vulcanizer will do all your repairs on both casings and tubes, and the saving effected will surprise you.



Write for Full Description and Prices of these Machines.

LEE C. MAPES,

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K-C SAFETY LOCK PATCH



COSTS LESS THAN VULCANIZING!

A vulcanized section costs from $3 to $6. The **K-C Safety Lock Patch** is practically a new section—at one-third the first price and **No Second Cost—No Come Back!**

The **K-C Safety Lock Patch** completely encircles the inner tube. The Lock, formed by edges dove-tailing and secured with a wire key, makes spreading or bulging through the blowout hole an impossibility.



Holds the Largest Blowout!

Made of highest quality Tire Fabric. All sizes to fit every make and style of tire.

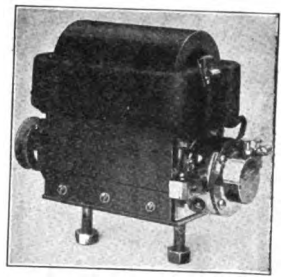
You might cut away a section of casing from bead to bead and this patch, safely locked in, will hold it's own pressure.

Sold by Leading Auto Supply Dealers and Garages Everywhere.

Western Tire & Rubber Co.

"America's Largest Tire Accessory Makers"

KANSAS CITY, MO.



VOLTA ELECTRIC LIGHTING SYSTEM

can be put on any make of car

Best and simplest generator on the market

Special Outfits for FORD Cars

County and State Agents Wanted

IRWIN D. GROAK ENGINEERING CO.

Engineers, Designers, Builders

MONADNOCK BLOCK CHICAGO, ILL.



AUTO CYLINDER BORING BAR

What every garage and repairman should have in his shop. Guaranteed to rebore any single, twin or block of four cylinders, accurately, subject to micrometer test. **Price is within the reach of all.**

Made in two sizes { *A* rebores from 3" dia. to 5½x12" deep. *B* " " 3" dia. to 8x16" deep.

—For information, write—

D. ANDERSON & BRO.

946 Burr Street - - St. Paul, Minn.

IF

—you're an owner
—you're a chauffeur
—you're a mechanic
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DON'T FAIL TO SEND For Our New Catalog OUT MARCH 15th

Increased two-fold with a special department for Ford Accessories and Equipment

Contains 3000 Money Saving Automobile Bargains

Mailed FREE on Request
Write for one—NOW

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World's Largest Dealers

S. W. Corner 56th Street and Broadway, N. Y.
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"AMERICAN" REPAIR STOCKS ACCESSORIES AND CEMENTS

MATERIAL REDUCTION IN PRICES FOR 1915.

The "AMERICAN" lines are unquestionably the highest grade products of their kind on the market.

Will gladly furnish you with working samples, including our wonder "5 Minute Cure Vulcanizing Cement." Manufacturers of "American Indian" Red Inner Tube and American Gray Tube.

ADDRESS ALL INQUIRIES TO FACTORY.

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WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts, Crank Cases, Housings, Frames, Axles, any metals of any shapes or thicknesses, including

ALUMINUM PARTS

All work absolutely GUARANTEED

¶ Write for estimates.

¶ Complete Oxy-Acetylene Welding and Cutting Plants installed.

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At The RIGHT Price, $7.00

The New Era

Master Vibrator

(Guaranteed for Life)

Size 2x2x5 inches long. In black steel case—weight only 2 pounds. Fitted with New Era Indestructible Spark Points. Sold under a 30-day trial guarantee of money back if wanted, and positively guaranteed for life, with no restrictions.

Sent by Parcel Post, free, at $7.00.

Dealers' usual Discounts.

New Era Spring & Specialty Co.
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BUY *BETTER* SPRINGS



GUARANTEED even at the bolt hole—NO restrictions. Graphited (for 2 years' lubrication) between all leaves. At better price than car factories.
Get complete 1915 list of 250 numbers and address of nearest Supply Jobber carrying stock, or wire us for any stock number listed.

Try *Better* Springs.

NEW ERA SPRING & SPECIALTY COMPANY
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Ask for circulars of other low price Ford Specialties

KEROSENE Gas Lamps



Perfect 300 to 1000 Candle Power Light for all purposes from common Coal Oil. Simplest, safest and cheapest light made. Economical. Absolutely reliable. Nothing complicated. Children can light and operate. Write for Particulars.

BRILLIANT GAS LAMP CO., 1009A So. Wabash Ave., Chicago, Ill.

CLEAN YOUR ENGINE REGULARLY WITH A



WAGNER AUTO ENGINE CLEANER

One qt. of kerosene and 6 lbs. air pressure cleans all dirt, grit and grease from any engine. Prevents wear and actually saves half the usual repairs. This cleaner is quick, economical, thorough, easy and cleanly to operate. Cleans everywhere thoroughly. A necessity for repair shops.

WAGNER SPECIALTY CO., 1902 Broadway, New York City



"A Motor Is No Better Than Its Piston Rings"
—Efficiency Ed.

Are You Getting Maximum Power

And Compression and Minimum Carbonization?

Unless You Are There Is Surely a Leakage Somewhere

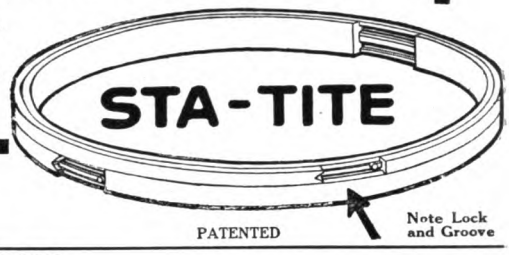
Leakage is a mechanical IMPOSSIBILITY with the STA-TITE PISTON RING. Maximum FLEXIBILITY and RESILIENCY. All joints SEALED CANNOT OVERLAP.

Say STA-TITE to your Dealer. Made in all Sizes.

Efficiency Ed.

Read What Users Say

Sta-Tite Packing Ring Co.
3037 OLIVE STREET
ST. LOUIS



PATENTED

Note Lock and Groove

EVERY FORD OWNER AGREES THAT

"UNIQ" RUNNING BOARDS

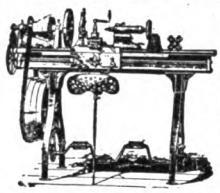
Improve the Ford more than any other accessory



LINOLEUM

Linoleum or aluminum top. Heavy wood base. Aluminum or brass moulding. Write immediately for Special Prices and Discounts. Ask also for circulars of other "UNIQ" Ford Specialties.
Mr. Dealer:—The "UNIQ" Line is *THE* Ford Specialty Line.
It's LIVE—Get ACQUAINTED

THE C. SPIRO MANUFACTURING CO. NEW YORK CITY



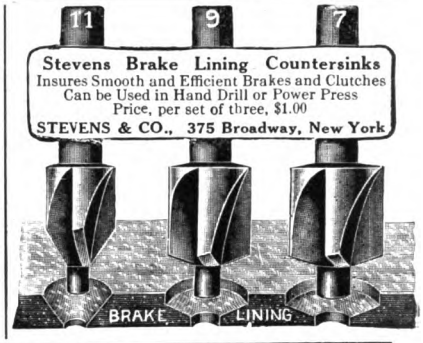
THE BARNES LATHES

9" swing
11" swing
13" swing

For Repair Work our No. 13 Lathe is right; has 13" swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with countershaft or foot-power.

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Stevens Brake Lining Countersinks

Insures Smooth and Efficient Brakes and Clutches
Can be Used in Hand Drill or Power Press
Price, per set of three, $1.00

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Is the New Fox Typewriter Sold in Your City?

IF NOT, WRITE US FOR SPECIAL PROPOSITION



If you cannot procure a *Free Demonstration* of the New Fox Visible Typewriter in your city, please write us direct and we will make you a *Special Introductory Proposition.* This will include a ten days' trial in your own office or home and the privilege of paying for the typewriter, if purchased, either all in cash or small monthly installments just as convenient.

No obligation to purchase, after trial, if the typewriter is not found to be better than any other *regardless of price.*

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The selling of typewriters is a refined, high class, profitable business

If the Fox Visible Typewriter is not sold in your town, write today for our big, new 1915 Selling Proposition. Our Dealership Contract permits the purchase of stock from us either on a cash basis *or on the payment plan.* Write today for catalog, and let us know about how many typewriters you believe you could sell monthly in your section. Mention the Automobile Dealer and Repairer.

Fox Typewriter Company
6603-6613 Front Ave., Grand Rapids, Mich.

FROM THE AUTOMOBILE DEALER AND REPAIRER FOR MARCH

Name .....

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TO FIT ALL AUTOMOBILES.

The Newest, Best and Most Useful Robe Covering for Front Seat Auto Passengers.

This Robe Completely Covers Two Persons and Front of Car on all Sides Keeps the COLD OUT and the ENGINE HEAT IN, keeping the Front Passengers Warm.

It is easily attached or detached and can be used to wrap around like an ordinary Robe when not on Car, as above cut shows.

Made of Plush, and Heavy Cloth Lined, Warm, Comfortable and a Necessity to every Car Owner. A quick, ready Front Seat Auto Robe for all Cars.

Price for Robes to Fit Ford Cars - - **$5.00**
Price for Robes to Fit Larger Cars - - **7.50**
Sent prepaid complete in U. S.

Automobile Apparel Co., - - Port Chester, N. Y.
Dealers—Write for Trade Discounts. ***P. O. Box 466.***

AUTO HEEL REST



Made of
POLISHED ALUMINUM
½, 1, 1½ and 2 in. high.
A heel rest for brake or accelerator pedals.
75c. Post Paid.
LUCAS & SON
10 Fox St., Bridgeport, Ct.

The Standard
Ford Dash-Board Oil Gauge

Insurance Against Burned Out Bearings.

Shows at a glance from your seat, how much oil there is in the engine. Made of best material, all parts are of solid brass, extra heavy glass indicator tube. Extra large cork float. An ornament to the car. Attached in a few minutes.

PRICE, $2.00 COMPLETE
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AXWELL SHOCK ABSORBER

Retail, $25.00
Order a Set for a Try-out at
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AXWELL EQUIPMENT CO.
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35% AUTOMOBILE SUPPLY CO.
YOU SAVE AN AVERAGE OF 35% WHEN YOU BUY FROM US
NEW YORK-CHICAGO
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If you are tired paying the usual high list price for Auto Supplies and Tires write for our 35% catalog.

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AFFA CLEVIS SILENCER For the Ford



Takes up the looseness in the brake-rod, preventing vibration and rattle.
Lasts for the life of the car. Attached in a few minutes. Fits other cars.
50 cts. Set of four
W. S. GRAFFAM & CO.
NORTHAMPTON, MASS.

DEALERS! WE SAVE YOU MONEY



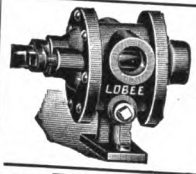
NEW ERA OPTICAL CO. 123 W. MADISON ST.
MFGRS. OF GOGGLES CHICAGO, ILL.

Woodworth Treads.

The Tire Covers That Do Not Chafe
THE LEATHER TIRE GOODS CO.
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If you would have more power use
HUSTLER
Valve Grinding Compound
S. C. LOW & CO.
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For good circulation on Automobile or Motor Boat, use a
Lobee Pump
LOBEE PUMP & MACHINERY CO.
1790 Niagara Street, Buffalo, N. Y.



We manufacture LIFTING JACKS for all purposes. TIRE SAVERS, TIRE IRONS and other Auto Accessories.
Write for Catalog and Prices.
NATIONAL JACK & MFG. CO.
130 South Clinton St., Chicago, Ill.

S M H CHAIN TOOL



Specially designed for the new circular hook. $1.25 at auto supply houses or from
CLARENCE N. PEACOCK & CO.,
DISTRIBUTORS, 1790 Broadway, NEW YORK.

Save 35 to 50%
ON YOUR
AUTO SUPPLIES.
Write for Catalogue.
STANDARD AUTO SUPPLY CO.
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IF YOU BUY A CAR at $1200 or over, you will find the 1915 HUDSON Six-40 at $1550 the best first buy, the cheapest to keep running, the top-rung of motor-car satisfaction—and easily salable when you want to dispose of it.

Ask for information and name of nearest dealer.
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The Kennedy Auto Storage Cover

Made of heavy imported Paper, properly reinforced to prevent tearing and to add to its durability; is the best and cheapest protection for stored cars that can be secured.
Made in standard sizes to fit any car.
The Kennedy Car Liner & Bag Co.
Shelbyville, Ind.

INVINCIBLE INNER TIRES

Make Tires Wear Better

Unless **Invincibles** are used, 9 out of every 10 tires blow out when half worn out.

Half the wear of the tire is lost.

Invincibles save your this extra wear, because a tire equipped with an **Invincible** cannot blow out until worn out.

This saving amounts to over
40% Expense Stopped!

Invincibles are a pliable wall of strength on the **inside** of your tire. No change in tires or tubes needed to use them.

Efficient business men use them in every tire because **it pays.**

General Fire Extinguisher Co. writes:
"We are getting good results from **Invincibles.** We certainly feel they are a good proposition for anyone using pneumatic tires."

Write for their letter in full, new 1915 prices, and other proofs.

Learn why **Invincibles** are superior to all other interliners. Address

INVINCIBLE TIRE CO.
53 Sabin Street Providence

"THE WEAR IS THERE"

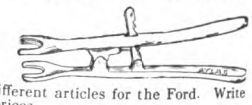
The R. O. C. SUPERHEATER
MAKES
Your Carburetor Form a Vapor,
Your Engine More Powerful,
Your Fuel Bills Less, and Raises the Efficiency of Your Motor to the Nth Power. Send for Motor Efficiency.
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The Neverout RADIATOR AND GARAGE HEATER
PAT. 11-8-04
DIRECT HEATING SYSTEM
Applies heat directly where needed—No Waste
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ROSE MFG. CO., 910 Arch St., PHILADELPHIA

Atlas Valve Lifter—For Ford Cars

Price, 40c.



We make 15 different articles for the Ford. Write for circular and prices.
Atlas Machine Co., 111 West Exchange St., Providence, R. I.

DEALERS AND REPAIRMEN
Write for Exclusive Agency Proposition

NEW INVENTION
Send for Terms and Territory at Once
THE CARBOGAS COMPANY
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M. & R. SOFT HAMMERS—Not common lead but special tough mixture For Machinists, Tool Makers, Die Makers, Garages, Repair Shops, Etc.

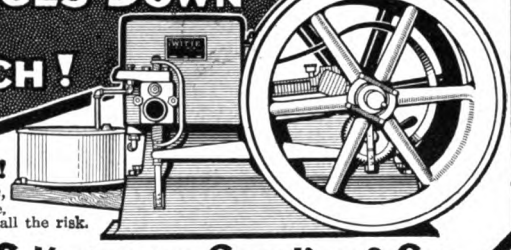


Patent Applied for
Heads Interchangeable
Handle Indestructible
Durable Inexpensive
Mach & Rebele, Inc., 21 Whitehall St., N. Y. City

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ENGINE PRICES DOWN ANOTHER NOTCH!



Look at these Prices!

2 H-P, $34.95; 4 H-P, $69.75; 6 H-P, $97.75; 8 H-P, $139.65; 12 H-P, $219.90.
Other sizes up to 22 H-P, proportionally low.

Direct from Factory to User!

Why pay two prices for any good engine, or take chances on a poor, or an unknown engine, when the "WITTE" costs so little, and saves you all the risk.

WITTE ENGINES, Kerosene, Gasoline & Gas

LET ME send you a "WITTE" engine to earn its own cost while you pay for it. It's cheaper than doing without one. I have proved that to thousands who are now WITTE users.
Ed. H. Witte.

Stationary, Portable and Saw-rig Styles

Liberal 5-Year Guaranty

CASH OR EASY TERMS.

GET your engine from an engine specialist. All my life I have done nothing but make engines. **The success of my customers and nothing else, makes my success.** I've simply got to sell better engines. I can't lose money on an engine and make back the loss on something else. My factory is the only one, that started in the engine business 27 years ago, which has come through successfully under the same management with which it started. Only WITTE engine-quality has made that possible.

It is cheaper and easier to own a "WITTE" engine than to do without one. My New Offer makes it easier to get the work done by machinery than by muscle or brute power. No need now to get along without a "WITTE."

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HOW TO JUDGE AN ENGINE
READ THIS BOOK BEFORE YOU BUY ANY ENGINE IT IS SENT FREE FOR THE ASKING.

ED. H. WITTE, Main Desk, Witte Iron Works Co.
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BREAZNELL CLIPS FOR SPARK PLUGS & TERMINALS AND BATTERY CONNECTORS



Permanently troubleproof, vibration cannot loosen, wires held in Clips without solder. Pat. in U. S. Apr. 1914; in Canada, 1913. 50c. Doz., 30c Half Doz.; coin, stamps or C. O. D., Parcel Post. Special rates to jobbers and dealers. Ask your dealer.

J. H. BREAZNELL,
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"Perfection" Pedal Pads

FOR EVERY MAKE OF CAR

Clamped on in less than one minute. No drilling of holes in pedal or bolts necessary.

AUTO PEDAL PAD CO., Inc.
792 Seventh Ave. NEW YORK



Moore Tire-Saving Jacks

$6.50 Per Set of Four. 20,000 Sets in Use.

MOORE Jacks save tires by relieving them of heavy weight of car. Easy to apply—simply slip padded loop over hub and press down lever. At dealers, or sent prepaid on receipt of $6.50.

WALKER-MOORE MFG. CO.
326 WISCONSIN ST. - RACINE, WIS.



BENTON SPARK PLUGS ARE GUARANTEED FOR LIFE

Insulated by specially wound mica, forced into place under great pressure and made gas tight by metal-to-metal gasketed joint. Bushing and shell case hardened to resist hard knocks. Positively no short circuiting from cracked porcelain or penetration of oil. Cleaned and made good as new by scraping soot off the mica with a penknife. No deterioration.

Price, All Sizes, $1.00 Each.

DEALERS: — Write for our proposition.

L. F. BENTON CO., Vergennes, Vt.

The unique "Porcupine" drive on the

CARLETON GENERATOR

(7 volts, 49 c. p. direct current) solves the lighting problem.

Gives a steady light with or without storage batteries.



Special attaching brackets for Ford, Saxon and Metz cars, but applicable to any car, cycle, boat or miniature stationary plant.

Highest quality and moderate price. Also Automatic Cut-out, Storage Batteries, Governors and Ammeters.

Descriptive Bulletin explains.

Local demonstrating agents wanted where there are no dealers.

The Carleton Company

180 Summer, Boston

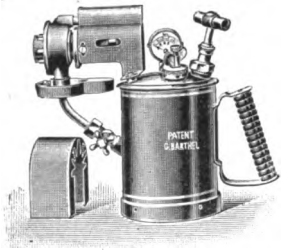
AUTOMOBILE Garage or Repair SHOP

No garage or repair shop is complete without the G. Barthel Apparatus.

Our **Kerosene Brazing Fires** Are Allowed by Insurance Companies

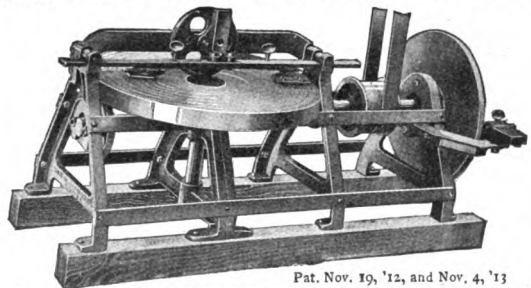
OUR DIAMANTIN (SEE CUT) Using Kerosene Oil

Is indispensable in every garage. Will pay for itself on first application for straightening out a wheel. Larger brazing fires always on hand. Send for catalog showing all apparatus.



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"FAVORITE" POWER CLIPPER GRINDER

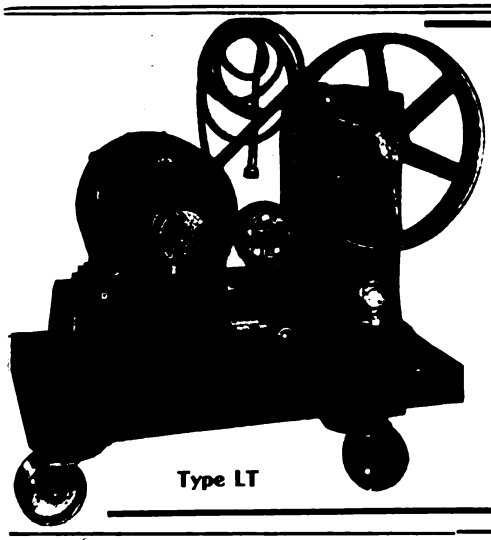


Pat. Nov. 19, '12, and Nov. 4, '13

Designed especially for Repair men. Has patent adjustable holder for holding all styles of sheep, hand, and barber clipper blades. Nothing like it on the market. Will prove to be one of the best money-makers you can have in your shop. Write for catalog and prices.

THE ROOT-HEATH MFG. CO., Plymouth, Ohio

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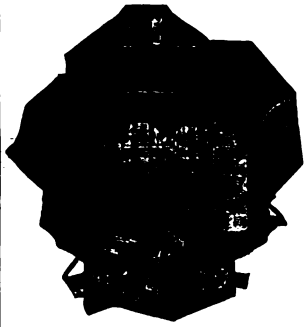
THE APEX TWO CYLINDER ELECTRIC AIR COMPRESSOR

For PRIVATE and PUBLIC GARAGES

Pumps air direct into the tire. No storage tank necessary. Attach to any lamp socket.

MANUFACTURERS OF
The Famous "YANKEE" FOLDING TIRE PUMP
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APEX MULTIPLE-CARTRIDGE ELECTRIC SOLDERING IRONS

APEX ELECTRIC MFG. COMPANY
1410-12 West 59th Street CHICAGO, ILL.



FORD OWNERS

Put Your Car in the $5000 Class
Install ROBERTSON'S PRES-TOE STARTER.

Starts the motor every time, simply press the Toe Pedal. More Reliable than electricity and costs but a fraction of one cent per day. Out of Sight, under the hood. Light, Simple and Durable. Made entirely of Vanadium Steel Hardened Full Ball Bearings.

Factory production 500 Pres-Toe Starters per day. SPECIAL PRICE this month for introduction in new territory.

Write today for full particulars regarding this wonderful necessity and convenience for Ford Cars.

W. ROBERTSON, 32 Greenwood Place, BUFFALO, N. Y.

SAMSON TIGER HAND HORN

The Popular Model For 1915
LOUD – SIMPLE – STRONG – GUARANTEED



$5.00

Operated by simple turn of handle or elbow. Can be mounted so that the handle is on inside of closed car, or when curtains are down.

Liberal proposition to the trade with no arbitrary sale restrictions.

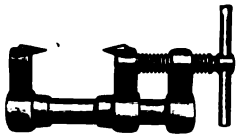
Most Extensive Line of Horns on the Market.

MOTOR–VIBRATOR–HAND HORNS

Styles and Finishes for Any Type of Car.

AMERICAN ELECTRIC COMPANY
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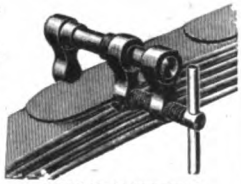
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Highest Grade Drop Forgings. Nickel Plated and Polished.

Gives 100% Easier Riding and STOPS THE SQUEAK

A practical, durable tool for spreading spring leaves for lubricating. Nothing better as a temporary Repair Clamp.



GUARANTEED

One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

Adjustable to any size auto spring.
Sent prepaid anywhere, $1.50.

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"The Weld that's Guaranteed"

ALL kinds of Castings—Machine and Auto parts welded—Worn and Weak parts Reinforced by the oxy-acetylene method of welding.

WE MAKE A SPECIALTY OF WELDING "ALUMINUM" PARTS OF ALL KINDS.

No Job Too Small or Too Large For Us to Handle.

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Anyone Can Reseat Valves

—do the work perfectly—and in one-quarter the time required by hand—with the

FOSNACHT VALVE RESEATER

Nothing to get out of order. Simple to operate—no emery required—no tearing down of engine needed. Enables owner to handle four times the volume of work now cared for. A real business builder for every garage. It brings customers and keeps them.



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JOHNSON Shock Absorbers

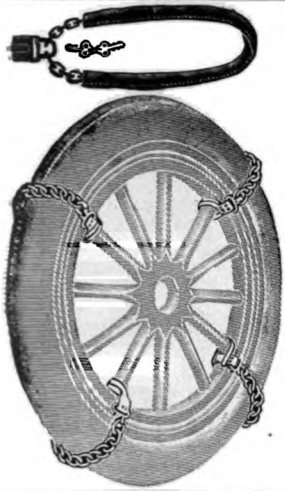


The only Coil Spring Shock Absorber with a positive recoil check.
The only Shock Absorber with an instant adjustment to all road and load conditions.
Is it any wonder they are the fastest selling Shock Absorbers in the world?
Sold on free approval test to motorists.
Interesting proposition to dealers.



Triple Action Spring Co.
(Established 1906) 55-57-59 E. 28th St., Chicago

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TAPCO TIRE LOCK

This lock complete with case-hardened chain and covered with muleskin, postpaid **$0.70**

TAPCO MUD CHAINS

3½ inch.....Each **$0.30**
4 " .....Each **.35**
5 " .....Each **.40**

AUTO PARTS CO.
737-739 Jackson Blvd., CHICAGO



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TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS

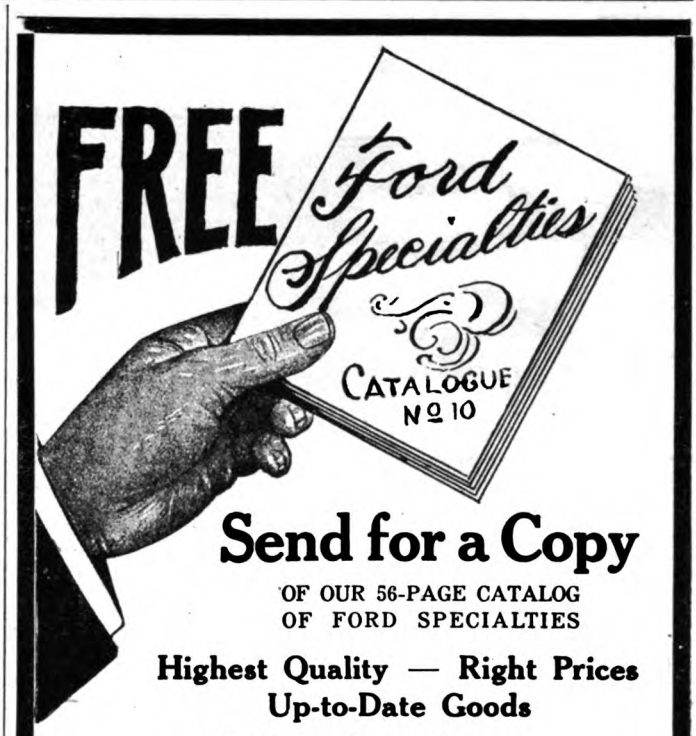
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - $1.00

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! SAVE Your ENGINE !

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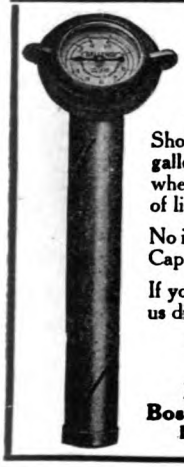
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FOR ANY MAKE OF ENGINE

We are operating our plant day and night, therefore can get out a four or six cylinder crank shaft, ready to assemble, within two weeks.

SEND YOUR BROKEN SHAFT FOR REPLACEMENT

OBENBERGER DROP FORGE CO.
Plant at CUDAHY. MILWAUKEE, WIS.



The "CHALLENGE"

A PERFECT Combination Gasoline Gage and Filler Cap

***For* FORD CARS**

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

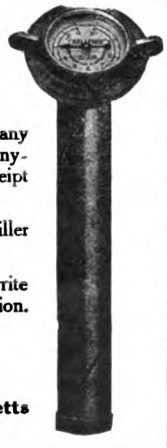
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If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.

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This Book on **Progressive Lubrication**

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The RIGHT SHOCK ABSORBER

At the *RIGHT PRICE*

$15.00 Per Set

The **only twin cylinder** Shock Absorber designed **especially** to meet the requirements of the medium weight car.

More resilient action than any other—More comfort—More saving on car and tires.

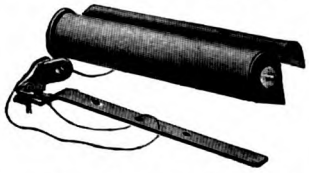
If you own or sell any medium weight car (from 1800 to 3500 lbs.) you want the **Right** Shock Absorber—no other will do the work as well.

Mr. Dealer: Get in line now on this high class necessity. Write us before the rush of the season starts.

RIGHT MOTOR SPECIALTIES COMPANY

1320 Michigan Avenue • Chicago, Ill.

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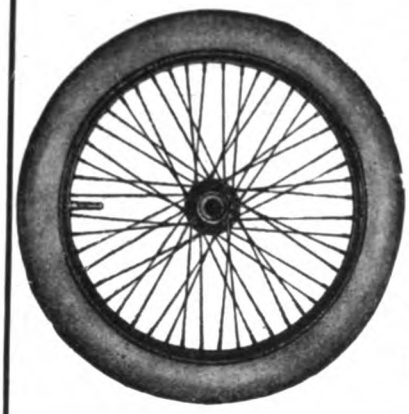
When using Reynolds Safety Light Shade, you can pass cars with glaring lights—with perfect safety. Price, $2.00. Money refunded, if not satisfied.



Positive Protection for the Eyes

Special Offer, $1.50 with This Ad. Until May 1st

REYNOLDS SAFETY LIGHT SHADE CO., Oneida, N. Y.



WIRE WHEELS FOR FORD CARS

$20.00 per set, complete, ready to attach. No machine work necessary.

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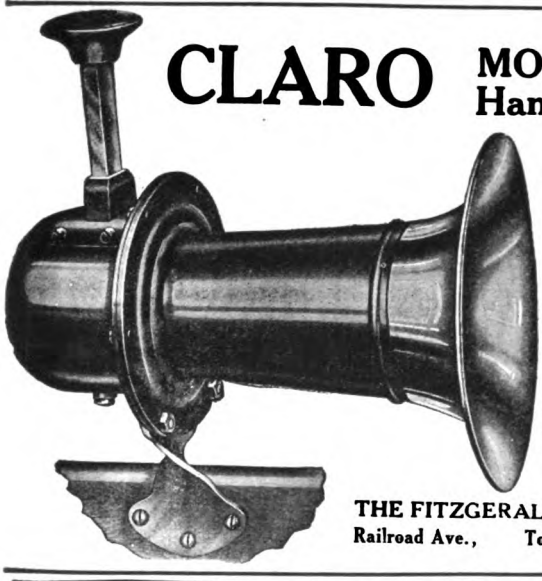
These wheels are backed by a binding guarantee for satisfactory service. Our selling proposition gladly sent on application.

THE

MOTT WHEEL WKS.

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CLARO MODEL A Hand Horn $5.00



Best value for the money.

Write for Manufacturer's Catalog of Copper Asbestos Gaskets, Ford Lighting Outfits, Battery Connectors, Terminals, Shims and Shim Brass, and free sample "Spring Lock" Battery Terminal.

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Railroad Ave., Torrington, Conn.

KEYSTONE SHOCK ABSORBERS

Easy to Ride On — Easy to Buy — Easy to Sell

KEYSTONE ABSORBERS EMBODY BEST FEATURES

Two large springs, heavy hanger bolts and steel body insures resiliency and strength

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Be the One to Get It

$20.00 PAIR

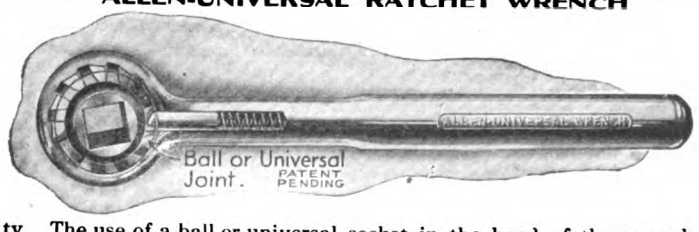


KEYSTONE SHOCK ABSORBER CO.

1216-1218 Liverpool St., PITTSBURGH, PA.

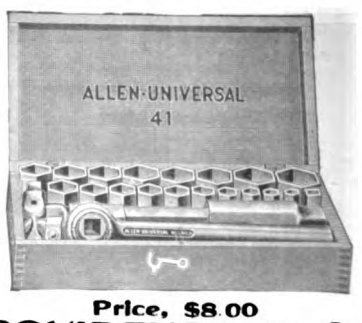
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ALLEN-UNIVERSAL RATCHET WRENCH



PATENT PENDING

This new and improved type of the ratchet wrench is made from the best steel drop-forging, carefully machined and all parts hardened. It has strength, efficiency, durability and simplicity. The use of a ball or universal socket in the head of the wrench permits the use of this wrench handle in many positions—positions which are not obtainable with any other wrench.



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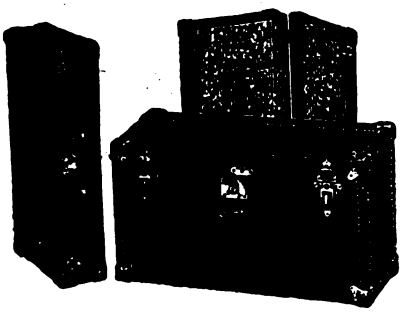
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"ESSEX" ASBESTOS BRAKE LINING
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Empty $11
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The BOSTON STARTER is guaranteed to turn the motor over as certainly as the crank, while the operator is comfortably seated in the car.

The BOSTON STARTER gives the Model "T" FORD CAR the same self-started appearance enjoyed by electrically started cars, at a fraction of the electric starting cost. No batteries, no wiring to require the service of an electrician.

Ford owners – drive right up and ask your dealer or garage man. If he does not happen to know, write our distributor nearest you.

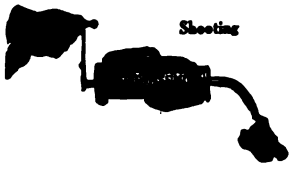
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A pound a minute.

Not a speck should get on your hands.

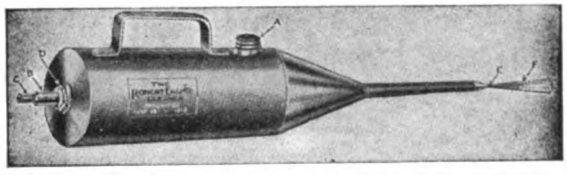
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Cuts perfect circles from 2 to 22 inches in diameter. Two extra genuine hand honed wheels in head. Rod graduated to 16ths of an inch. Absolutely accurate. **Mailed, postpaid, for $1.25.**
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LOCK YOUR FORD CAR.

Thieves are active and FORD cars are their prey. It will pay you to investigate the **Atlantic Positive Motor Lock.** Security is obtained by a new principle—by disabling the ignition system at the timer—the most successful locking method. It is simple to operate—yet very effective.

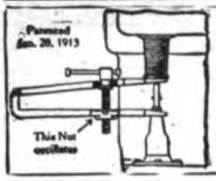
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Auto-Vehicle Washer

Attaches to your garden hose. Can't scratch or streak varnish. Cannot rust. Cataract Stop Cock Handle and Mop $2.00, plain handle and mop $1.50; short handle and mop $1.00; extra mops 50c. each, extension handle, making other handles longer, 50c.
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"C. P." Improved
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Price, $1.00 by mail
It works like a vise and holds like a vise. It holds the spring rigid. Used on any car.
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Will last as long as your moulds.
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SAVE YOUR MOTOR'S LIFE
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Restore your cooling system to its original efficiency, reducing gasoline and oil consumption, increasing power and stopping rapid motor depreciation, by using
YOUNG'S RADIATOR COMPOUND
A scientific chemical compound, guaranteed harmless. Dissolves all scale, rust and mineral deposits in radiator and jackets.
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PERFECT HICKS FOUNTAIN BRUSH
WASHES YOUR CAR IN 15 MINUTES
ATTACHED TO YOUR GARDEN HOSE
FLOWS THE MUD AND SAND AWAY
Warranted Not to Scratch and Guaranteed Longer than Your Car
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Wrenches can be operated where no other wrenches can be used. Ask to be shown.
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Write for "Guide Books" Nos. 1 & 6
GUIDE MOTOR LAMP MFG. COMPANY
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"Easy" "New Easy" Allen-Randall



To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.
H. K. PORTER, EVERETT, MASS.

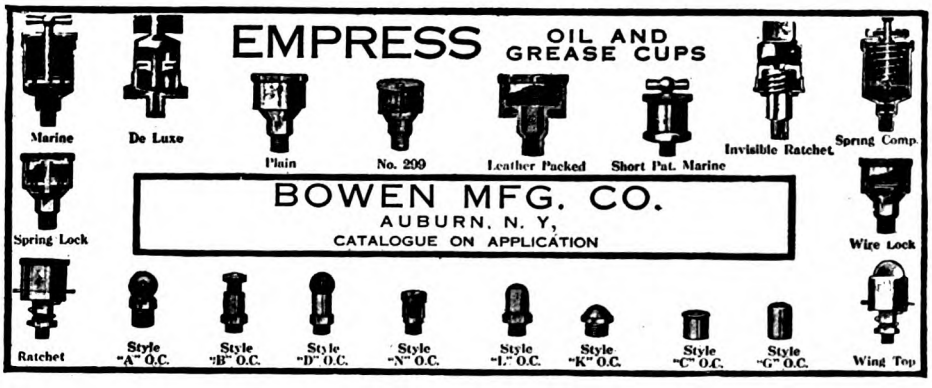
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A Scientific Oil Packing Piston Ring

A RING WITH A REASON

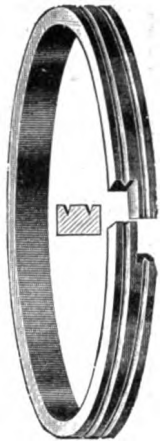
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We absolutely guarantee each ring for QUALITY, ACCURACY, and satisfactory service.



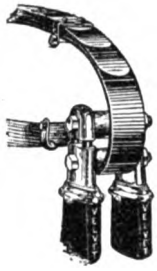
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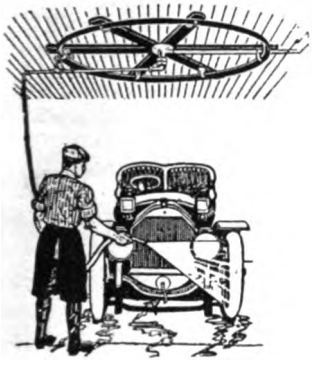
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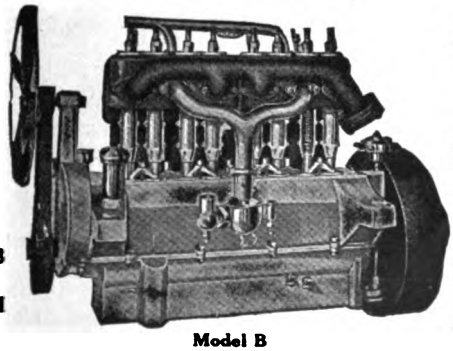
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FOR FORD CARS

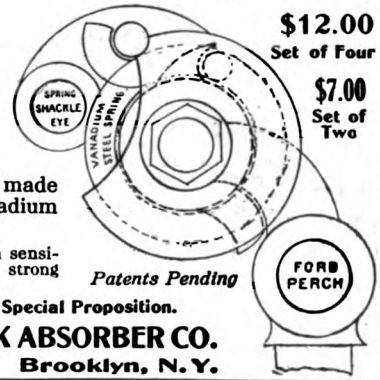
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It gives to the platform type of spring the comforts of the elliptical spring of the higher priced cars.

The case contains two very sensitive coil springs, made from the best grade of vanadium crucible spring steel.

This makes our absorber both sensitive to small vibrations—yet strong and durable, neat and efficient.



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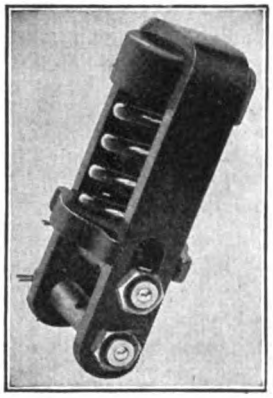
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Simple
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$5.00 Set of 4

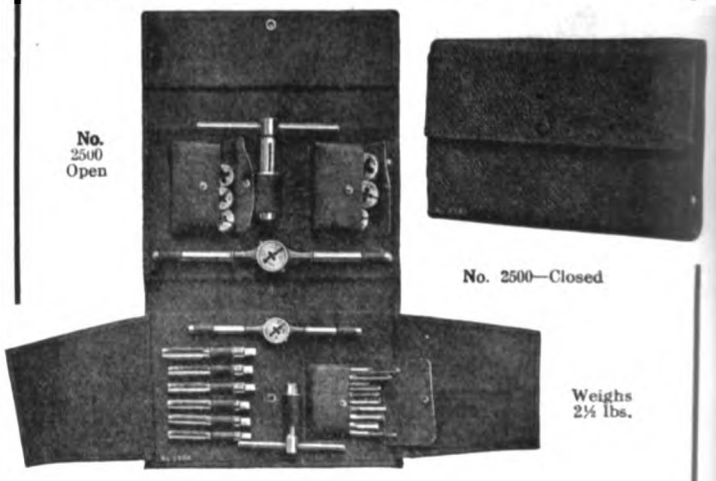
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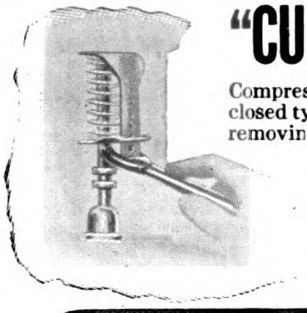
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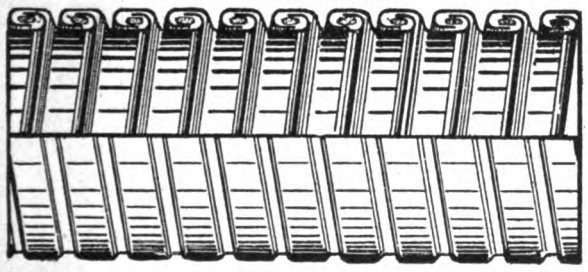
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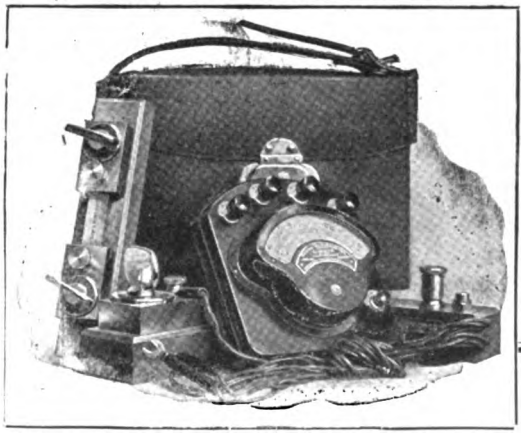
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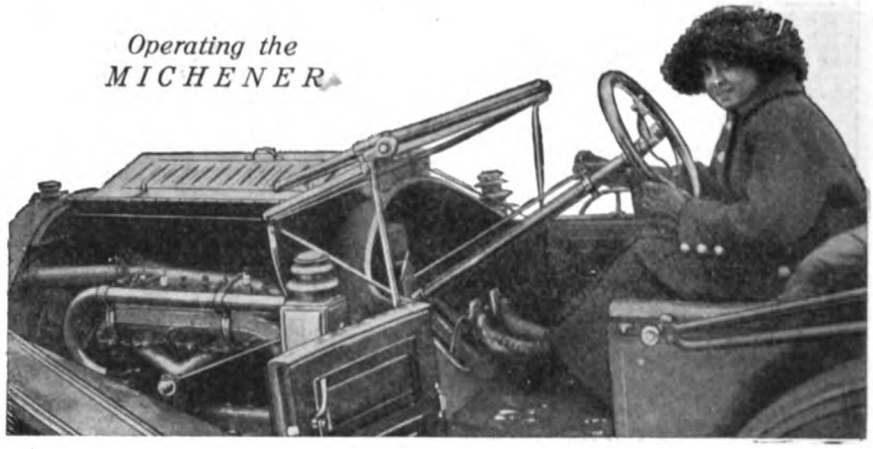
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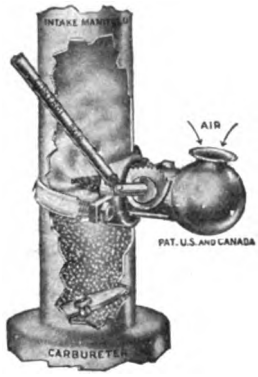
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Why Not Represent Us? We want a reliable man of good standing, in every town where we are not represented, to sell this device. A demonstration of it on your car is all that is necessary to make a sale. Thousands have been sold this way. We ship your orders, prepaid transportation, same day they reach us. Here's your opportunity to make some easy money and to please your friends with an absolutely necessary adjunct to the motor. Sold under 30 days' guarantee. **Let us send you our proposition.**

Quantity production has decreased our cost of manufacture, and the **Michener**—which formerly sold for $6.50 now retails at **$5** Dash Control / Steering Post Control } Insured Post-paid

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Use Michener's Chain Carbon Remover, the "Carbon Chaser."

ADD POWER TO YOUR MOTOR

by grinding valves easily and accurately without removing piping or wires.



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Makes valve grinding a pleasure. Grinds valves the correct way without the weary, dirty, tiring, inefficient results of an effort to use any old grinder. Sturdy—simple. Tight valves mean a cool, quiet and efficient motor. Saves valve-seats, gasoline, time and power. The only scientific ball-bearing grinder, simple and unfailing. Requires only enough pressure to hold valve tightly on seat. Insist on the Just Simplicity Ball-Bearing Grinder.

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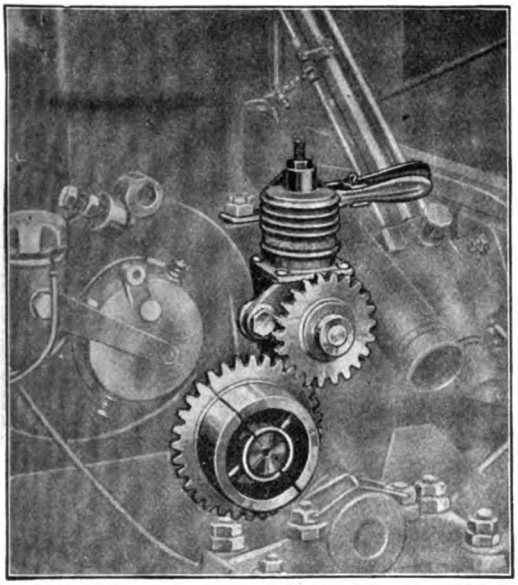
It gives perfect satisfaction because: it is musical; cannot clog; never fails; cannot be tampered with when car is standing; has no up-keep expenses; amply warns but does not frighten; it is easy to put on.



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MANZEL
ENGINE-DRIVEN
TIRE PUMP
FOR FORD CARS

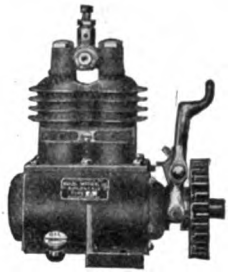
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PRICE, $7.50

Complete with steel gears, 12-ft. hose, and pressure gauge.
Everything ready for immediate attachment.

This Is a Money-Maker For You, Mr. Dealer

Every Ford owner will purchase an engine-driven tire pump at this low price, and you can guarantee the Manzel without the slightest hesitation. Tell your customers in the most unqualified terms that we stand behind the Manzel Ford Pump. Let him install it on his car and try it for 30 days. If at the end of that time he is not satisfied, take back the pump and we will make it good.



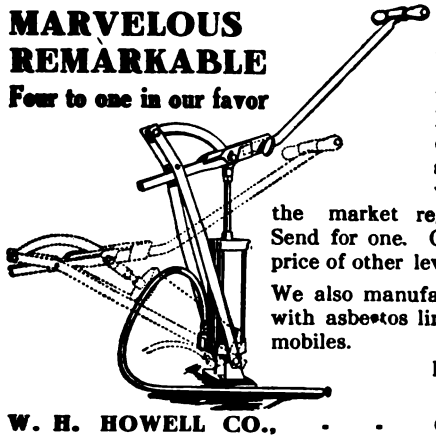
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Our 2-cylinder tire pump which has always sold for $28.00 and $30.00 is now sold for only $20.00, complete with fittings, and we can furnish fittings for over 150 different models of cars.

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MARVELOUS REMARKABLE
Four to one in our favor



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We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

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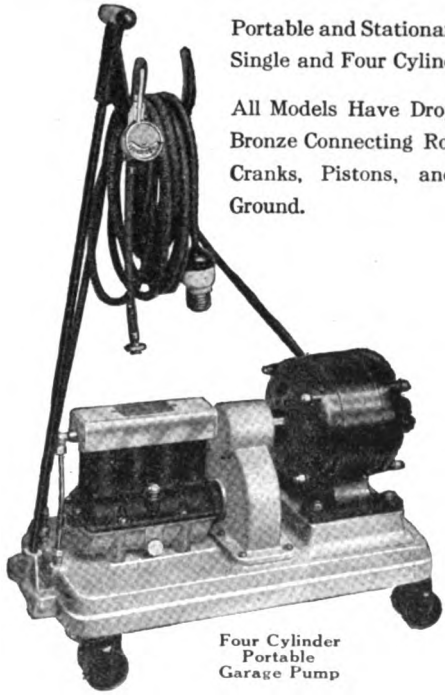
Don't Pension the Fords, Reborn Them. 1,000,000 Fords must be kept useful cars. THE IMPROVED HEISER CYLINDER REBORING TOOL has opened a wonderful field for the repair man. Reboring and fitting oversize pistons is the most important repair that can be given an engine. It restores compression, eliminates that elusive knock, reduces the fuel and oil bill, satisfies the owner, makes your shop popular, and makes the pistons and cylinders just as new as the day they left the Ford factory. This means that the oldest Ford in point of service will claim its place on the world's highways for years to come.

The time required to make the repair will not exceed 80 or 90 minutes. The tool weighs 45 lbs. and is self-centering, it is not used in connection with a lathe, and you do not rotate your cylinders; anyone without experience can do work that is absolutely perfect to one-thousandth of an inch. Oversize pistons, complete with pin, bushings and rings, $1.50 each.

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ALL METAL AIR PUMPS



Four Cylinder Portable Garage Pump

Portable and Stationary Garage Pumps.
Single and Four Cylinder Tire Pumps.

All Models Have Drop Forged Cranks, Bronze Connecting Rods and Bearings; Cranks, Pistons, and Cylinders are Ground.

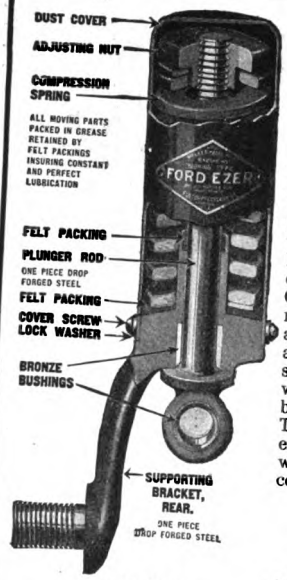
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With Fittings for Leading 1915 Cars
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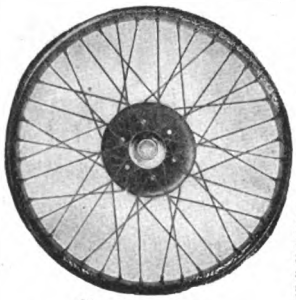
For improved riding qualities for which they are responsible are little short of wonderful. Their rapid action permits them to absorb—soak up—the vibration that makes long continued riding tiresome even over city pavements. On rough roads the improvement is even more noticeable. The springs are given a chance to act natural—the snappy recoil which is even worse than the downward bump, is entirely eliminated. The saving it effects in tire expense and car depreciation will more than repay their cost in a season.

Made To Fit All FORD Models

Either Touring or Roadster. They are easily applied. Their construction is the best of any Shock Absorber on the market—absolutely dust-proof; entire mechanism covered with a one-piece drawn shell cover, press fitted to the base. Once a year oiling is all that is required for average use. They will outsell and outwear any other Shock Absorber because all supporting parts are drop forged steel and all moving parts bushed with bronze bearings. The flat section, Vanadium Steel springs are guaranteed for life.

Price per set of four . . . $12.00

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UNIVERSAL WIRE WHEELS

Constructed of the very best material put together by the highest grade of workmanship.

Hubs are of special steel carefully designed as to weight and contour. They are machined to a perfect fit and may be quickly attached to any Ford hub without filing or cutting and the use of no tool except a wrench. Spokes are finest quality wire spokes—rims of heavy rolled stock, electrically welded and heat treated. Finish is black Japan thoroughly baked on—will not chip or rust.

Price per set, $20.00

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UNIVERSAL WELDING CO.
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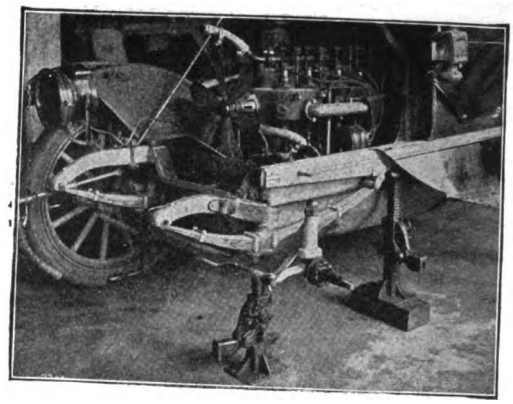
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A typical automobile repair. Fractured frame before welding.

Shop Cost $7.50 to make this repair by Oxy-Acetylene Welding

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Dissolved Acetylene

(Ready-made carbide gas)

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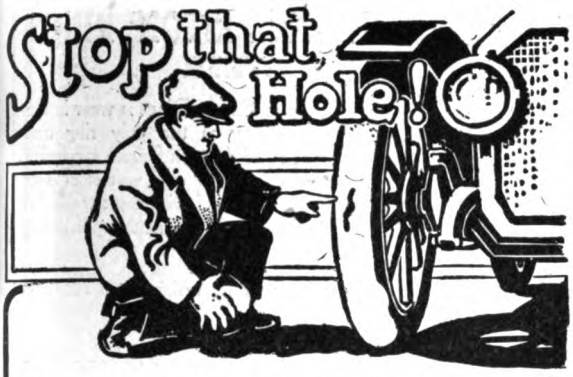
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53 direct factory branches and charging plants in principal industrial centers.

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These little open cuts leave the fabric exposed. *Blow-outs* result, and expensive repairs.

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SHALER Vulcanizer

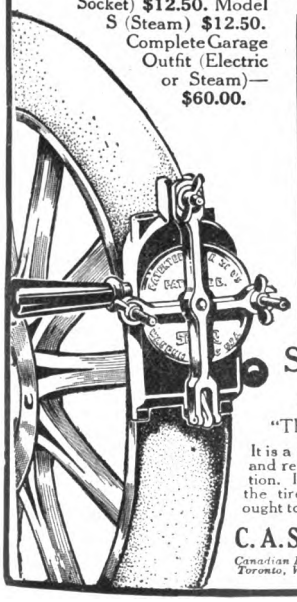
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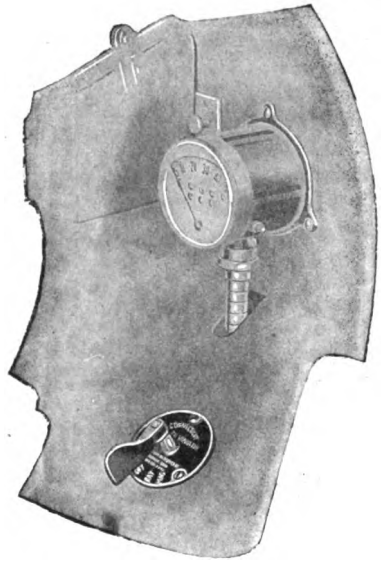
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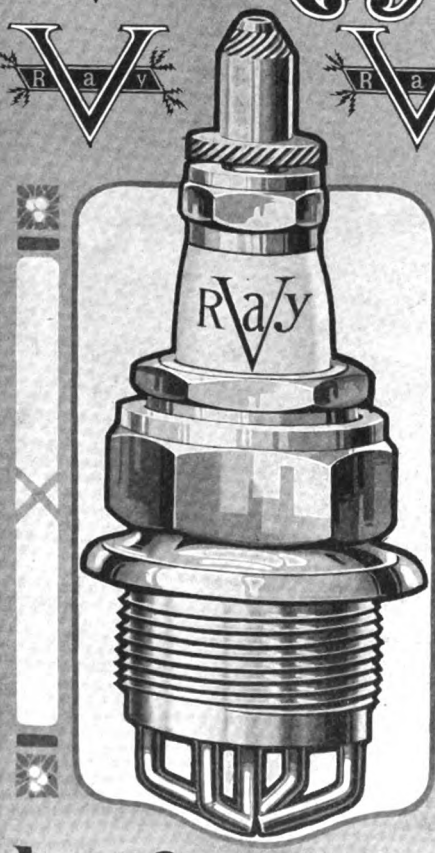
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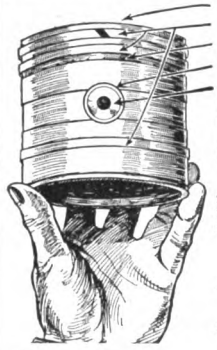
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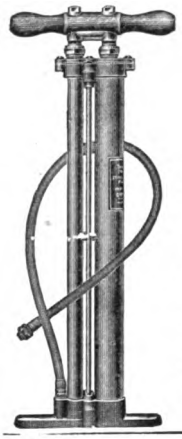
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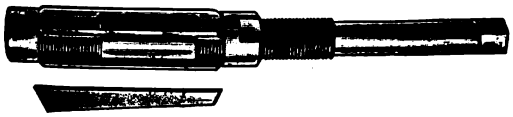
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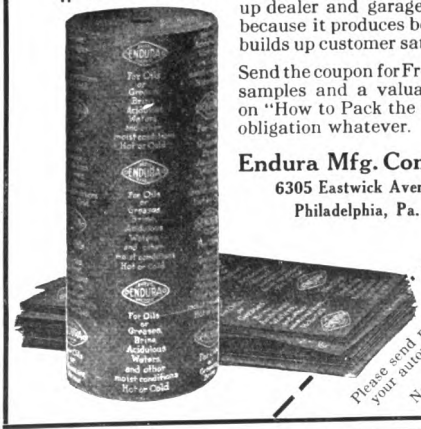
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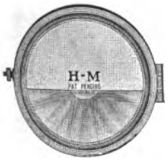
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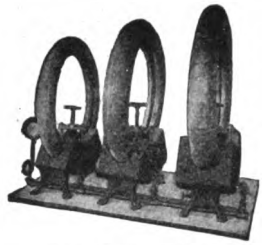
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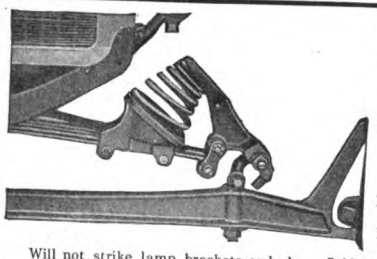


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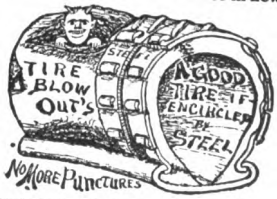
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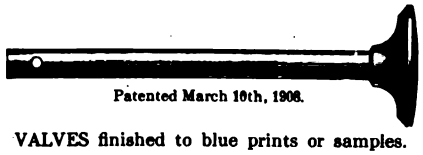
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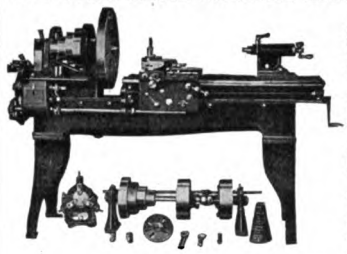
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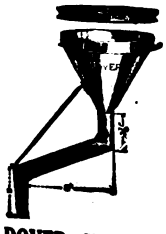
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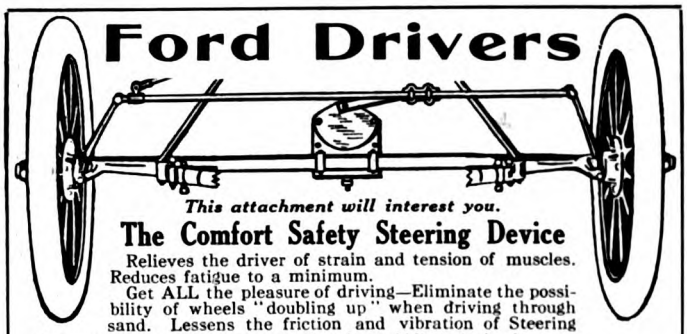
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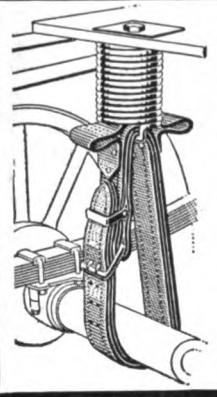
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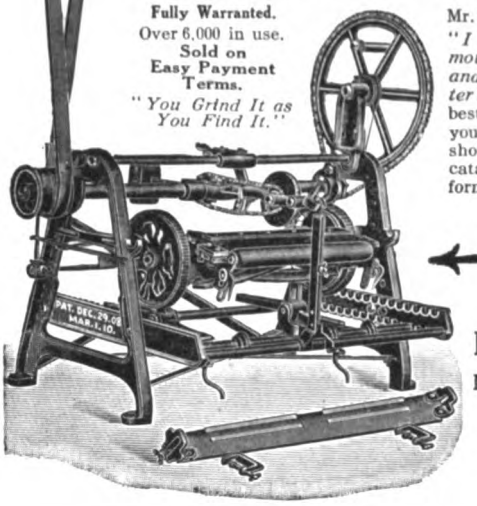
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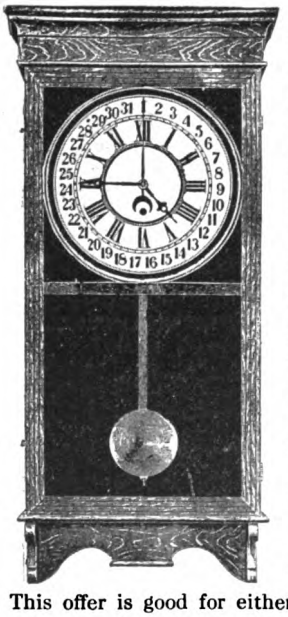


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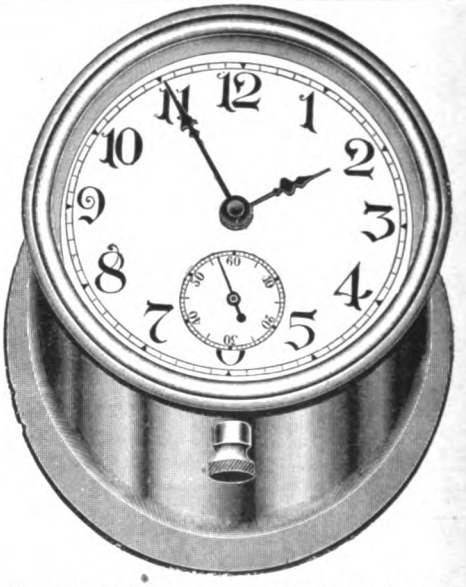
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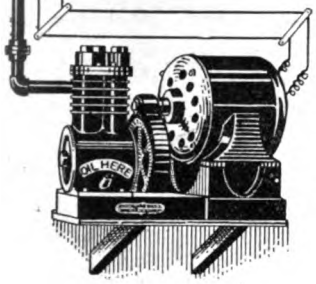
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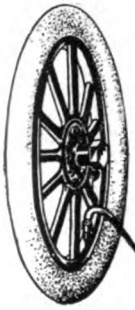
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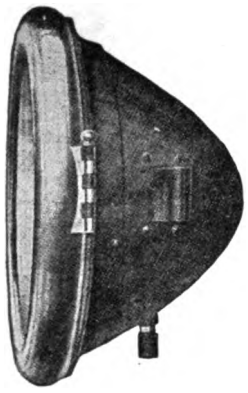


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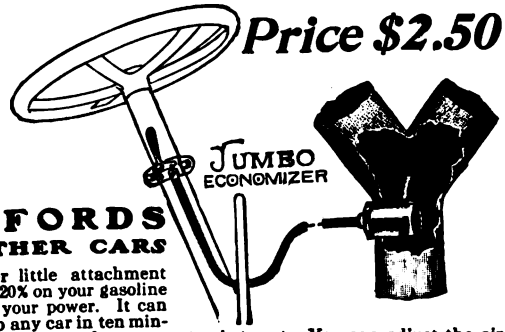
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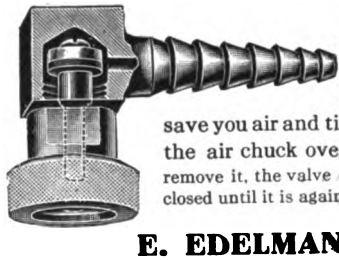
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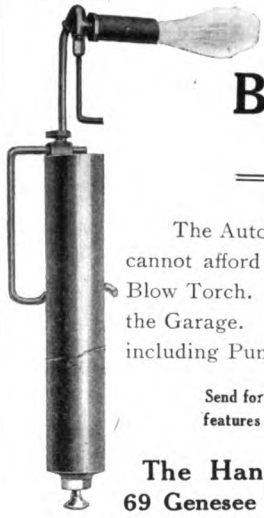
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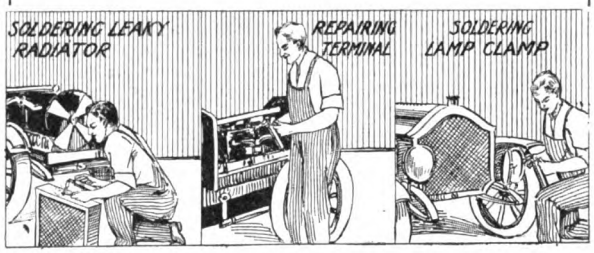
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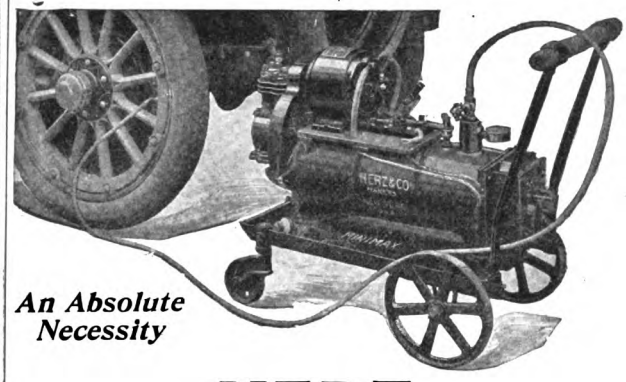
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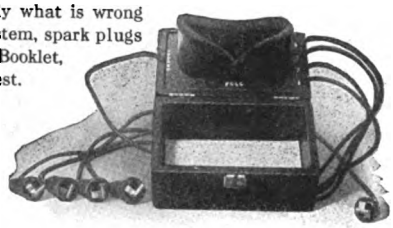
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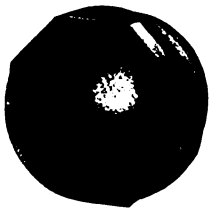
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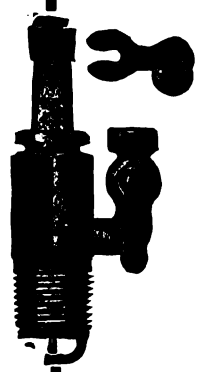
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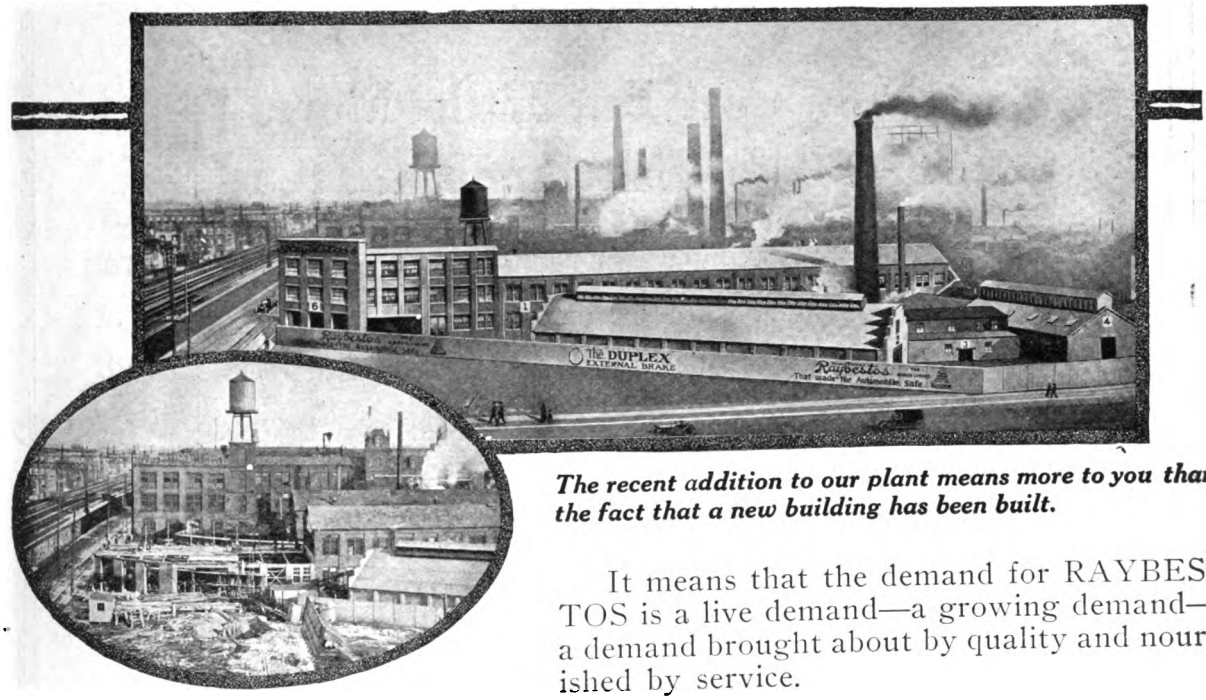
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Factory and Home Office, Chicopee Falls, Mass.

Fisk Branches in All Principal Cities

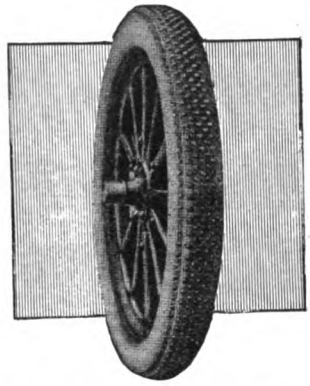
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European Motorists get 10,000 to 15,000 Miles out of their Tires

15,000 Miles

American Motorists 5,000 Miles or Less

5,000 Miles



Don't throw away your half worn tires.

There is no longer any reason why you should be satisfied with from 3,000 to 5,000 miles service from your tires when nearly all European motorists and over 20,000 American car owners are getting from 10,000 to 15,000 miles over all kinds of roads. It is just as unnecessary—just as extravagant to throw away your tires when they become tread worn or rut worn as it is to throw away your shoes when the first sole gets thin, for you can get 5,000 miles more service out of them by doing what European motorists have done for the past three years.

What European Motorists Do

The foremost European engineers for a long time studied the problem of getting more miles for less dollars. With their usual painstaking, scientific thoroughness, they experimented for years with leather tire protectors and steel studded treads.

The result—for over three years European motorists have been "half-soling" their tires with steel studded Treads, just as we "half-sole" our shoes when the original sole gets thin. These European motorists are getting from 10,000 to 15,000 miles out of the ordinary pneumatic tires, while American motorists are getting from 3,000 to 5,000, and—what is just as important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim-cuts!

How Does This Affect You?

Figure this out by the individual—how it affects you—your pocketbook.

Every mile you travel on the bare tire is costing you from 1½¢ to 4¢ in tire wear alone, to say nothing of the lost time and expense for the repair of punctures and blow-outs.

Just step for a moment and consider what it **means to you** to get 10,000, 12,000 or 15,000 miles out of your tires and at the same time drive your car without the constant, nerve-racking dread of tire trouble and skidding.

In round numbers it means a saving of $50.00 to $200.00 each year—a saving sufficient to pay your gas and oil bills each month. Yet this saving is not all—the tire vacation and relief from skidding assured you certainly means a gratification which cannot be estimated in dollars and cents.

No More Skidding

Durable Treads are as sure footed as a burro and they're supremely convenient.

They are studded with sharp-edged steel rivets, which dig right down through the mud and slush and get to earth every time. In London and Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of the steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and—what is more important—you receive perfect non-skid service while your tires are protected instead of injured. They cover the tire completely—extending entirely around from rim to rim. Nothing can work its way in between. They afford a perfect protection—that's why we can guarantee them as we do.

Don't Throw Away Your Old Tires

No matter how cut and worn they are, you can get more mileage from them and the few cents the junk man gives you can be turned into dollars.

The strongest proof of the economy of Durable Treads is their unprecedented record of sales; 40% of our business comes direct from recommendations of users; in eight months the sale of Durable Treads increased over 700% in the United States alone.

Where is there an automobile accessory which has received such instant and country-wide endorsement?

Guaranteed 5,000 Miles Without Puncture

Think of it—a 5,000 mile tire vacation—to be able to FORGET tires!

This is a pretty strong statement unsupported, but it's not merely a claim.

Durable Treads are delivered to you under a signed guarantee for 5,000 miles of wear without puncture.

This guarantee is an iron-clad agreement—as good as a government bond—and holds good whether your tires are new or old, tread worn, rut worn or rim cut.

Special Discount Offer

To motorists in territories where Durable Treads are not as yet represented we offer a special introductory discount for advertising purposes equal to the **full dealer's profit.**

We have made some strong statements in this advertisement. Make us prove them. You have everything to gain and absolutely nothing to lose, for all we ask is the opportunity to give you a demonstration at our own expense and risk.

We have a catalog, sample and copy of written guarantee ready to send and it's yours **free** for the asking.

Don't let the tires on your car run another week in "bare-footed" condition—don't wait until you get your next puncture or blow-out. Fill out and mail the coupon **right now** and you will hear from us within a week; no expense and no obligation to you.

Colorado Tire & Leather Co.

164 Tread Building, Denver, Colo.

404 Goetz Bldg., W. Austin Ave., Chicago, Ill.

654 White House Bldg. New York



COLORADO TIRE & LEATHER CO.
(Send to nearest address)
164 Tread Building, Denver, Colo.
404 Goetz Building, W. Austin Ave., Chicago, Ill.
654 White House Building, New York

Gentlemen:—Please send your free catalog, sample and copy of written guarantee for 5,000 miles without puncture. This request carries no obligation.

Name .....

Address .....

.....

My tire sizes are .....

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Buy from this Case and get—

BETHLEHEM FIVE POINT SPARK PLUGS

Guaranteed for the Life of the Car

ALL over the country, dealers, who are striving to give SERVICE, are offering their customers Bethlehem Plugs, in these Cases.

You will see them in Automobile Supply Stores, Garages and Hardware Stores.

The Bethlehem is a Quality Plug—a Service Plug.

It is specially designed and specially constructed—and has been proven by every sort of test to give more power on less gas.



BUY Bethlehem's and you will be glad—they eliminate Spark Plug troubles. The Display Case contains a right type for every motor. Bethlehem's are $1.25 each—and worth it. Send for illustrated Booklet. It is free.

THE SILVEX COMPANY, Factory: South Bethlehem, Pa. 171 Madison Avenue, New York City

Pacific Coast Branch: Oakland, Cal. W. N. Davidson, Mgr.

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BOSCH for FORDS

A Necessity—Not a Luxury

A SIMPLE SYSTEM OF IGNITION

—

ONLY FOUR SHORT CABLES

—

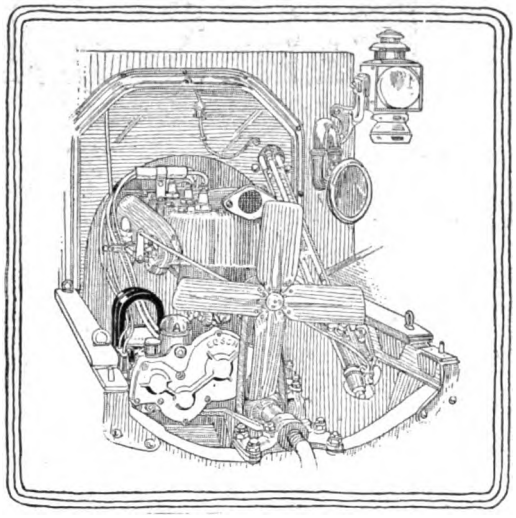
A DROP OF OIL EVERY 1,000 MILES THE ONLY ATTENTION

—

THOROUGHLY RELIABLE

—

EXTRAORDINARILY EFFICIENT



ELIMINATES THE SPARK NUISANCE

—

ELIMINATES BOILING OF RADIATOR

—

ELIMINATES PUZZLING IGNITION TROUBLES

—

ELIMINATES VIBRATION FROM MISFIRING

—

ELIMINATES THE ONE BIG WORRY OF THE FORD CAR

The Bosch-Ford Attachment Installed

MOST Ford accessories now being offered to Ford owners are luxuries—something added for looks or extra comfort; that's why the average Ford owner isn't sold.

The Bosch-Ford Attachment is a NECESSITY for Fords—not a luxury. It is an accessory that becomes the most important part of the car; it is a necessity because it gets out of the car the life that is built into the car—life, in the form of efficient service and without repair and replacement bills. It is an ignition system that employs the simple but efficient Bosch Magneto of world-wide fame.

The Bosch-Ford Attachment provides efficient and reliable ignition. The weak, irregular spark is no more. In its place occurs a big, fat, arc-like spark that not only gets every ounce of power out of the fuel but does so without straining the engine or car. Unlike other ignition systems, the Bosch Magneto creates its sparks so that each cylinder works in absolute time with every other—there are no uneven power strokes—there is no wear or tear, there is no more boiling of the radiator.

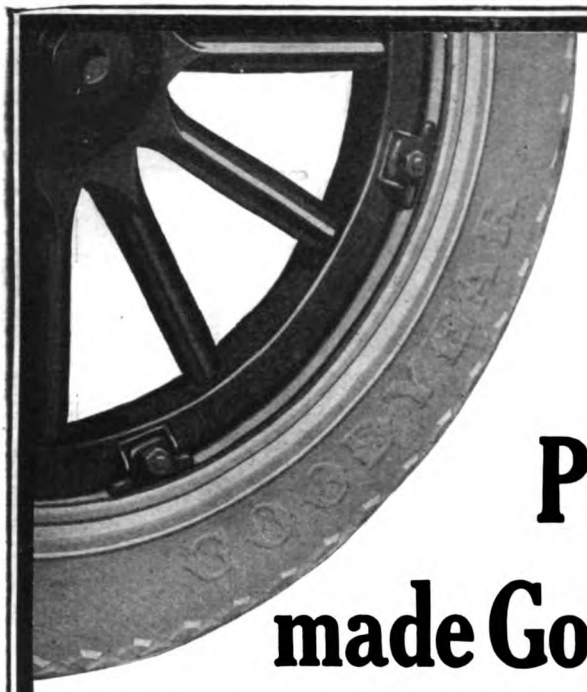
You can have the same ignition system that was used by the winners of the 1915 Vanderbilt Cup and Grand Prize Races, if you fit a Bosch-Ford Attachment. Remember it's a Necessity—Not a Luxury.

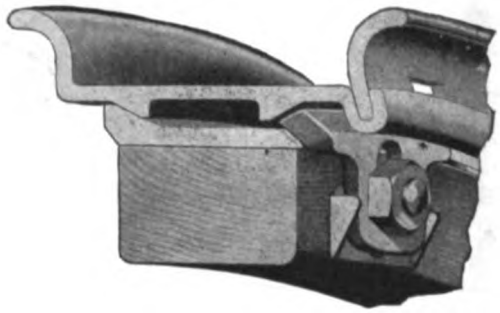
—Write today for "The Key to Ford Efficiency"—

BOSCH MAGNETO COMPANY, 202 West 46th Street, New York

Service and Distributing Stations in Every State

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Plain Simplicity made Goodyear Rim-Success

Evolution in Rim Design

Constant study and experimenting produced this better Goodyear Rim.

Tires themselves are annoying if they happen to go wrong. But it's the "grief" in changing tires that causes trouble.

Now it's done without hard work by the Goodyear Detachable Demountable Rim.

Goodyear Rims can't stick—won't balk when you want to take them off. And you don't have to "pound them to pieces" when you try to put them on.

They slip off and on as easy as the telling. Simplicity is the keynote of Goodyear Rim-Success.

Take the Drudge Out of Tire Replacing

Tires aren't hard to replace when the rim parts are few and *fit*.

Note these Goodyear points of simplicity—that make easy rim operation.

The detachable side ring makes it possible to remove the tire from the rim without first removing the rim from the wheel. This is impossible with any split type demountable rim.

The Goodyear is a *solid base* rim. It is the lightest demountable rim on the market with the detachable feature. It won't pinch the tube or permit squeaking; it won't allow water and dirt to penetrate and attack the tube—all common faults of split base rims.

The wide rim base is a very distinctive feature. This gives you extra air space—the effect of a larger tire.

Manufacturers Specify Goodyear

Manufacturers are steadily adopting Goodyear Rims. Price is not a consideration with them where car owner's comfort is at stake. Ease of Goodyear Rim operation has won them for their cars.

Yet the cost to car owners is no more than for rims of lesser worth.

Dealers Make Added Sales

Many car owners are troubled by complicated and poorly designed rims. This means a great deal of change-over rim business.

Push these Goodyear Rims. They save in time, in tires, in trouble. They give best satisfaction. They win you a customer—that means his business in the future. They mean attractive profits.

GOODYEAR
AKRON, OHIO
Automobile Rims

Write for Facts Today

Dealers—write us for our complete proposition. We help you promote sales in countless ways—window displays, free signs, free show cases, free "Tire Saver" booklets.

No obligation. Write us today.

Address Desk 154 (2190)

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Makers of Goodyear Automobile Tires

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New York Uni-Coil Ignition System for Ford Cars

PRICE $15.00



It gives all the advantages of the best high tension magneto service. The spark is delivered in perfect time to each of the four cylinders. No failure is possible at any speed. Greater power, speed and flexibility is attained by its use.

Operated by the Ford Flywheel Magneto or Battery

It increases the efficiency and perfects the timing of the Ford Magneto to a degree that puts it in a class with the best big-car magnetos. The **vital factors** in **magneto efficiency** are all embodied in its construction—a magneto contact breaker, with but one pair of adjustable contacts—an advanced type of high tension distributor that uses but one of the standard Ford coil units.

The New York Uni-Coil gives the Ford the ignition efficiency of the high-priced cars. It permits unlimited spark advance and assures perfect accuracy in timing at all speeds. It greatly simplifies the Ford ignition apparatus, eliminating the timer and practically all the present wiring. It is readily installed on the car, all necessary fittings and connections being supplied. This equipment includes an **elevating gear bracket which is permanently oil-tight.**

The complete Uni-Coil Ignition System costs $15.00 at retail. Dealers' margin is right—selling terms on request.

NEW YORK COIL COMPANY
338-340 Pearl Street **New York**
WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

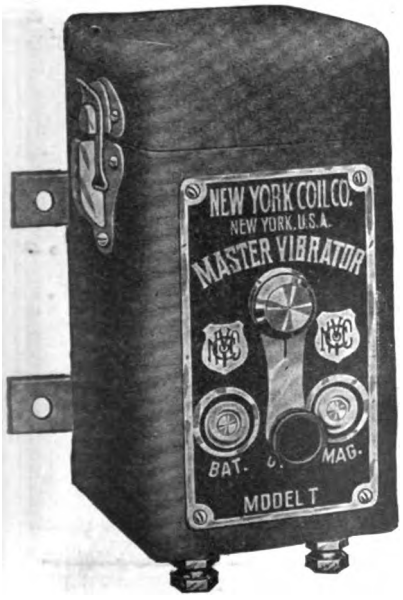
DEALERS!

The 500,000 Ford Owners of This Country Form a BUYING PUBLIC That You Can't Afford to Overlook—Here Are Two Ford Necessities That Will Bring Their Patronage Your Way.

The New York Master Vibrator, $10.00

Successful for Six Years on Ford Cars

READILY INSTALLED ON THE NEW 1915 MODELS



The "New York" has always led—six years ago Ford owners were enthusiastic about its performance—to-day it is giving satisfaction on thousands of cars, old and new. It was first in the field and has since been imitated many times, but never equaled.

DOES NOT STICK

Requires the Minimum of Attention

The **"New York"** demands less in the way of adjustment and correction than any other type of master vibrator. It practically manages itself. Under all conditions of service it insures a hot, powerful spark, smooth performance and easy starting. It practically eliminates carbon deposits in the cylinders by producing cleaner combustion. Many engine troubles are avoided when the "New York" is installed on a Ford Car.

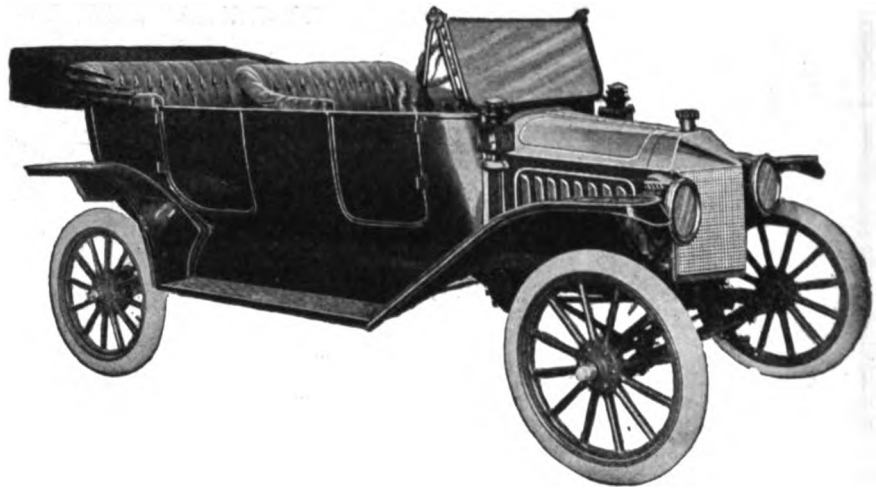
It pays for itself in the saving of coil replacement expense and in gasoline economy. At $10.00 it is the best "buy" you can offer a Ford owner. Used with our contact points it is good for the life of the car. These are supplied in **sealed red envelopes bearing our name**—the guarantee of quality and efficiency.

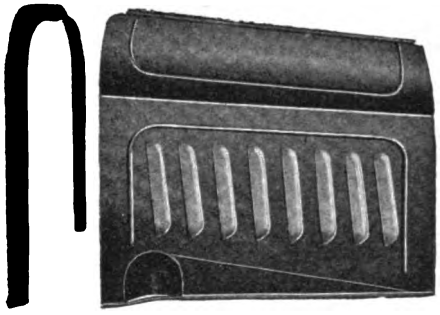
NEW YORK COIL COMPANY
338-340 Pearl Street **New York**
WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

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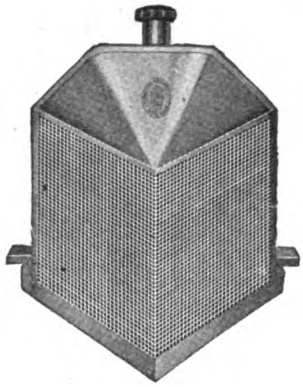


STRAIGHT FRONT
Price $35.00 F. O. B. New York
German Silver Radiators
$5.00 Extra





Price $8.00 F. O. B. New York
Including hood ledge,
ready to install



POINTED FRONT
Price $40.00 F. O. B. New York
Including extended
starting crank

GERMAN SILVER RADIATORS
$5.00 EXTRA

Demand + Quality = Price

Livingston sloping hoods give that long stream line effect so admired in cars of higher cost.
Its sides are ventilated to permit of additional cooling by allowing the heat generated by the motor to escape from under the hood.
We manufacture two types of stream line hoods for Ford cars. One to fit all cars built prior to February, 1915, and one to fit the 1915 model.
With each hood for Ford cars manufactured prior to 1915 a hood ledge for the dash is included.
With the hood for the 1915 Ford a hood lug for the top of the curved dash is furnished.
The hood is waterproof, preventing the water from reaching the motor.
The four hood hooks standard on the Ford car are used without changing their position.
Either stream line hood can be used with Livingston radiators or with the standard Ford radiator, and anyone who can handle a screwdriver can readily change hoods in fifteen minutes.
In black enamel finish only. Can be sent by Parcel Post.

All Livingston honeycomb radiators are guaranteed to cool the Ford motor under all conditions. No matter how warm or how cold the weather conditions, the Livingston will do that which is required of it.
Livingston radiators for Ford cars are not made to compete in price, but rather to give satisfaction long after the price is forgotten.
The Livingston pointed front radiator for a Ford car adds to its style, beauty and individuality.
The construction of the Livingston radiator is entirely different from any other. Livingston tubes are constructed so that the water flows alternately in a horizontal and vertical direction around three sides of each square. This makes the water column exactly twice the height of the water column in any other radiator. Therefore the water is in contact with the air for twice the length of time—hence increased efficiency.
Livingston radiators will not leak due to freezing, as the corrugations on the side of the section give under the expansion of water due to freezing and return into shape when the ice melts.
These are exclusive Livingston features that make for years of satisfied service.

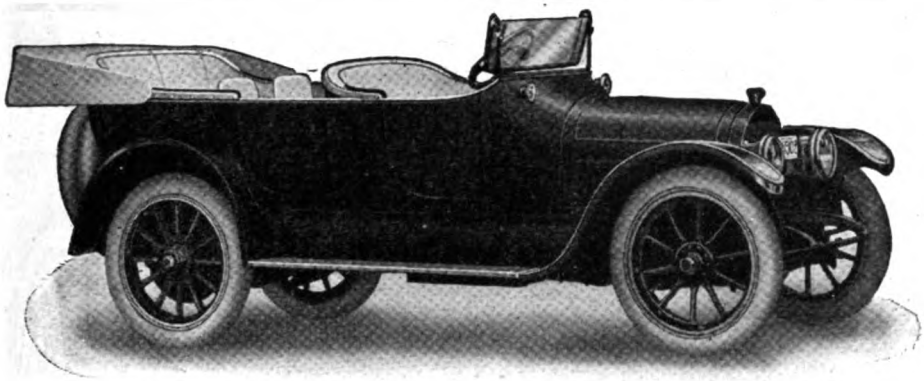
Hundreds of Ford dealers are making added profits by selling Livingston Products. Write for our proposition.

Livingston Radiator Mfg. Co.

303 W. 75th Street - - - NEW YORK, N. Y.

ALL TYPES OF RADIATORS BUILT AND REPAIRED

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"Look for the name Campbell on the buttons"

"Look for the name Campbell on the buttons"

Hundreds of Cadillac Eights are equipped with Campbell Detachable Upholstery

Get the business this spring with Campbell Detachable Upholstery

Take the lead with the Campbell product that is better than seat covers. Sell Detachable Upholstery, the kind that fits like a custom tailored suit and holds its fit.

See the new spring patterns, the beautiful Motor Ducks, Cleanezys, Mohairs, and less expensive Jeans. Note the wide range of colors and weaves to suit the purse and taste of every car owner. And remember that Campbell Detachable Upholstery is the aristocrat of Motordom in fit, finish, and wearing qualities. Reduced prices for 1915.

Hundreds of thousands of motorists join in recommending the Campbell product. Better investigate this today. Write us for our selling plan and Helps for Dealers. If you are interested in Ford cars, we have a special made seat cover at a ridiculously low price in addition to our Detachable Upholstery.

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES



This Fan Belt for Fords outlasts three ordinary belts.

The most popular fan belt on the market. Made of Latigo Leather, impervious to heat, water and oil. Will not stretch or run off the pulley. Write for prices and discounts.

Other Specialties for Fords

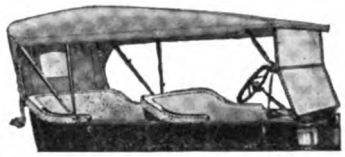
Campbell also makes foot accelerators, wind-shield ventilators, muffler cut-outs, clutch throw-outs, crank boots, steering knuckle boots, shock eliminators, and other accessories for Ford cars.



Cleans tops, covers, upholstery, rugs.

Percama is the magic word for all dirty heavy fabrics. Gets all the dirt, grease and oil without injuring the fabric or harming the waterproofing. Contains no explosive.

Quart 25 cents.



One-Man-One-Hand Top for Light Cars

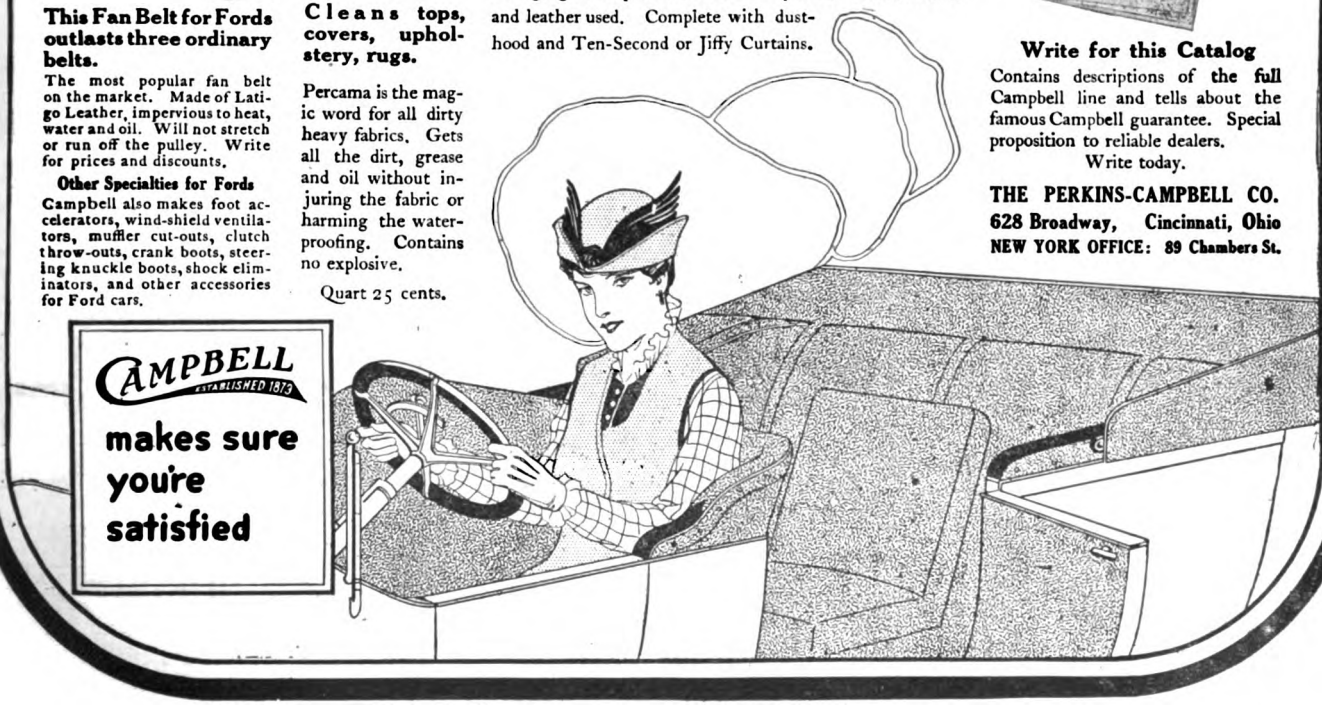
A high grade top that a child can operate. Finest mohair and leather used. Complete with dust-hood and Ten-Second or Jiffy Curtains.



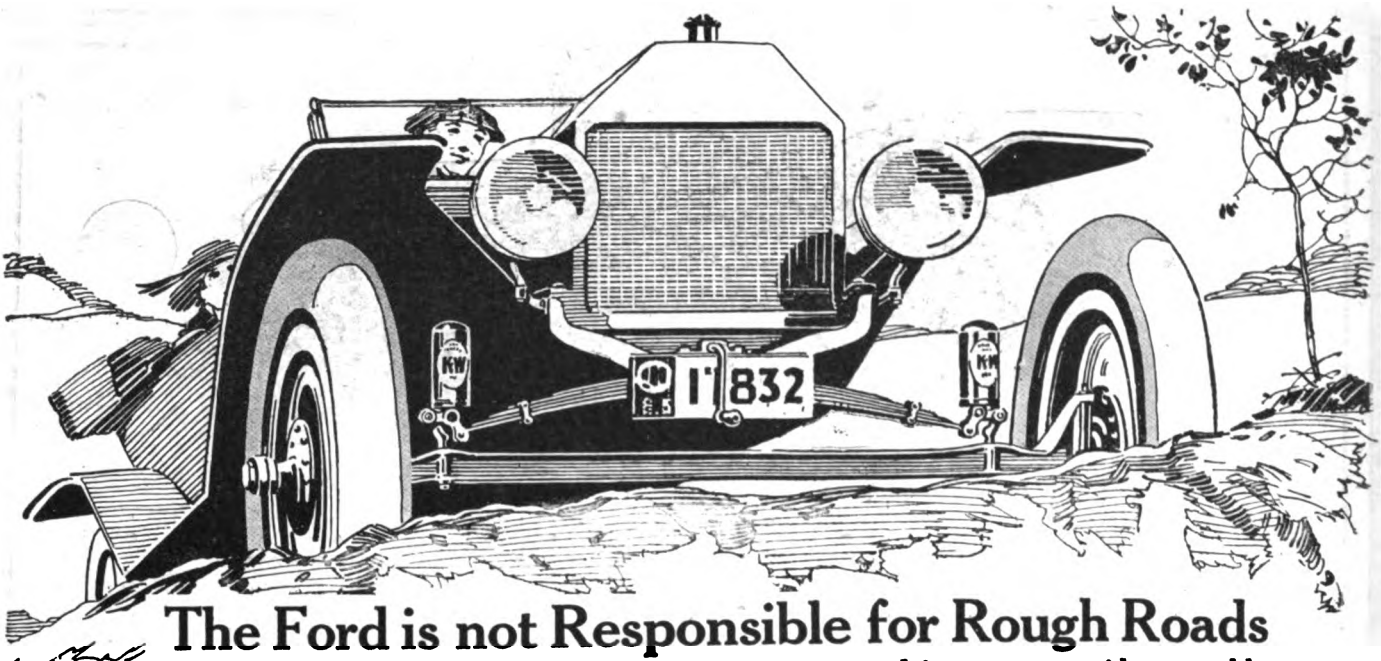
Write for this Catalog

Contains descriptions of the full Campbell line and tells about the famous Campbell guarantee. Special proposition to reliable dealers. Write today.

THE PERKINS-CAMPBELL CO.
628 Broadway, Cincinnati, Ohio
NEW YORK OFFICE: 89 Chambers St.



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The Ford is not Responsible for Rough Roads

But no matter how rough the roads or how fast you drive you can ride smoothly over every inch of the roughest roads when you equip your Ford car with

TRADE K-W MARK REG U.S.PAT OFF **Road Smoothers**

QUICKLY APPLIED TO YOUR FORD CAR

Give you Ford car advantages, with heavy car comfort

In Buying, Here's What You Must Look For in Order to Combine Comfort, Safety and Economy:

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.
4. No frictional wearing surfaces.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost *twice the length of spring action* or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.

$15 SET OF FOUR ONE FOR EACH WHEEL



K-W Bushings

There are no frictional surfaces to wear on K-W Road Smoothers, and all bearings are phosphor bronze throughout. That means long life.

But you can find all of these vital factors only in K-W Road Smoothers.

That is why they lengthen the life of your car, by eliminating shock and vibration. Tire economy is assured, because K-W Road Smoothers enable the wheels (not the whole body of the car) to follow the contour of the road. That means no grinding off the rubber of the tires. K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary, except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your cars' usefulness, and bring you home with "that satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

TRADE THE K-W IGNITION CO. MARK

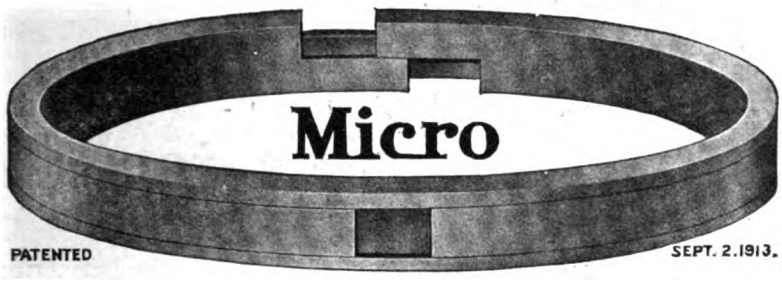
2817 Chester Ave. CLEVELAND, OHIO. U.S.A.

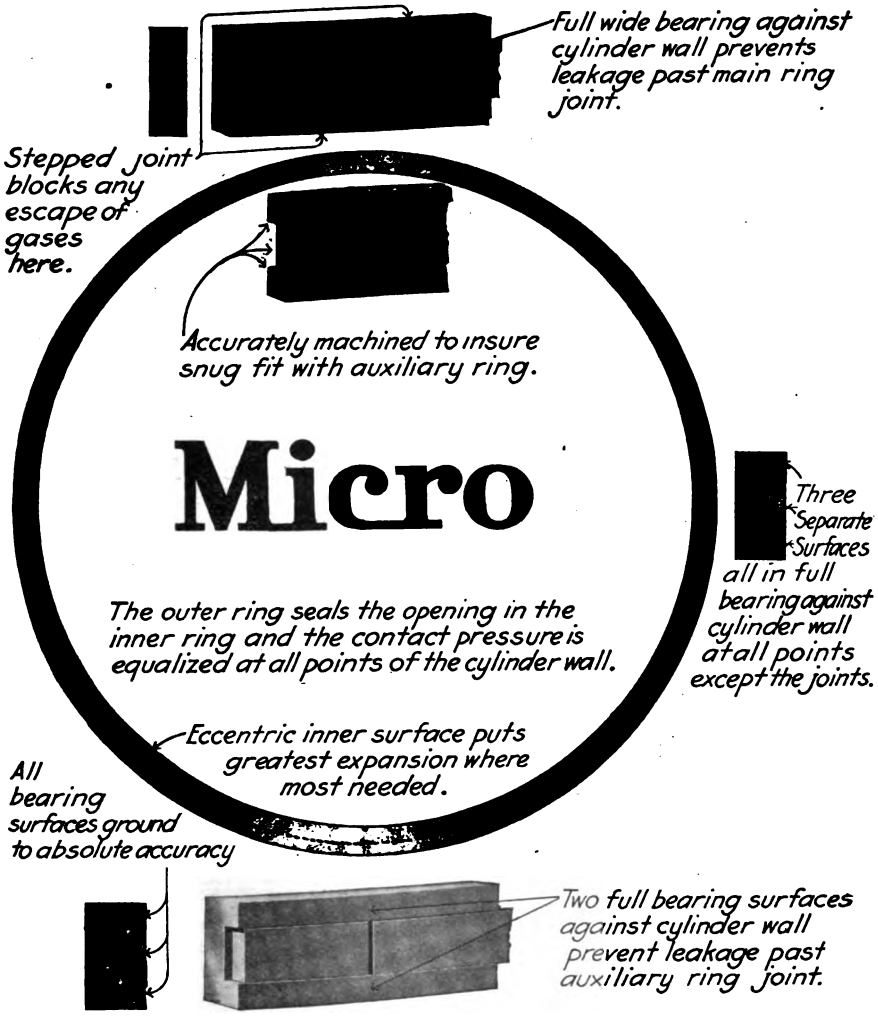
Makers of 125,000 K-W Master Vibrators

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Dealers: Sell Micro Piston Rings

Pleased Customers and Fair Profits





No man will want old style piston rings when you explain the fuel and lubricant waste, the compression and power loss and the maintenance troubles that result from the gradual opening up of plain ring ends as the rings wear in service.

Show your prospect the good points of Micro two-part pressure-tight rings, as indicated in the diagram, explain how permanent the provision for satisfactory service, how easy they are to apply without danger of **strain** or **breakage**, and you will have made a sale that pays good immediate profit, you will have done your customer a real favor, and you will have stimulated the good-will that prompts buying of more goods.

The mechanical excellence and good engineering judgment back of Micro Piston Ring design appeal on sight, and as our representative, you get liberal discounts, a strong protective guarantee and every co-operation.



Micro Piston Rings
The watchdog of a motor's power.

Your judgment in selecting Micro Rings will be more than vindicated on the first installation and you can make the trial at our risk. Business fairness, extensive manufacturing and rigid inspection to micrometer accuracy put backbone in our guarantee.

If your jobber cannot supply Micro Rings don't accept a substitute and be disappointed. Write us direct.

Micro Piston Ring Co.

1960 Broadway - New York

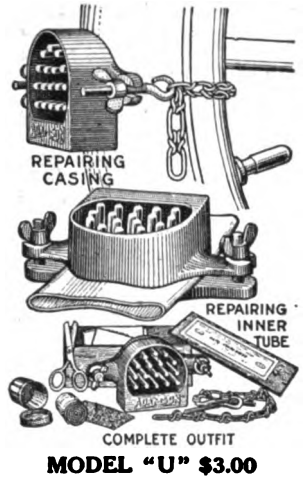
MICRO PISTON RING CO., 1960 Broadway, New York
Please send the booklet and prices on Micro Piston Rings.
NAME.....
ADDRESS.....
6

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Make good money helping us put an

ADAMSON VULCANIZER

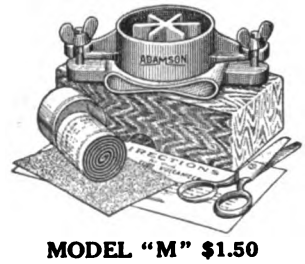
in every touring motorist's tool kit



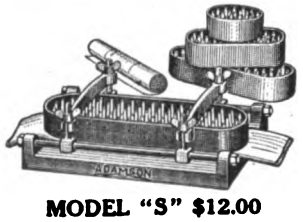
MODEL "U" $3.00



MODEL "T" $2.00



MODEL "M" $1.50



MODEL "S" $12.00

Here's a great chance to make a nice profit – easily, quickly! Touring season is at hand and hundreds of motorists in your territory are planning trips. Every one of them needs a vulcanizer with which he can make tire repairs at any place on the road!

Sell these men Adamson Vulcanizers

As soon as a customer mentions "trip"—that's your cue to sell him an ADAMSON. Show him how compact it is, how easily operated, how it does not use either steam or electricity, how it requires no watching or regulating, how it works automatically, how it won't burn or ruin tires, how he can use it anywhere and make perfect repairs with little work or expense and he'll fairly beg you to sell him one.

Over half a million in use

The ADAMSON is not an experiment but the most extensively used vulcanizer today. Considerably over half a million motorists carry it in their tool kits—and they wouldn't think of starting a trip without it. It is, however, a distinctive vulcanizer—unlike all others and protected by patents. It is so simple, practical, certain in its operation that nothing equals it. And its price! It's so low that a motorist can't find an excuse for not buying it. It's the cheapest tire insurance obtainable.

We are going after this trade hard and you can cash in heavily if you start **now** to get your share. Write for details of our great selling proposition.

ADAMSON MANUFACTURING COMPANY

Hamilton, Ont., Canada **East Palestine, Ohio**

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What's the Answer to the Skid Question?



But To Protect You They Must Be On Your Car!

WHEN your car's geared-to-the-road you can put "skid fear" behind you forever.

To drive with confidence and comfort—to have your car instantly obey your slightest touch at the steering wheel—to secure absolute traction on slippery city streets or on treacherous country roads, *you must have a tire that is built to meet those conditions.*

Miller "Geared-to-the-Road" Tires are scientifically built to gear your car to the road through mud, sand or slush. With Miller tires on your car you're in control. Its tread is an integral part of the tire and retains its safety features until the entire tire is worn out. The greater mileage you get from them, will make your choice of

Miller GEARED TO THE ROAD Tires

An economy, as well as a permanent safeguard.

But Miller Safety Does Not Stop There

Miller mileage and safety on the road are due to exclusive methods of tire building in the Miller factories.

The "Miller Method" retains the natural vegetable wax and oil in the cotton fibre during the process of vulcanization. And this natural lubricant in the cotton means less internal friction and more life and miles in your tires.

Wax and oil carbonize at 240 degrees; the old method requires about 287 degrees to vulcanize a tire.

The Miller Method vulcanizes at a low degree of heat without robbing the fabric of its life-giving wax and oil, and thus saves the fibre from becoming brittle and losing its tensile strength. Your Miller tire has not been "burned o t" during manufacture—all its wear, toughness, endurance and all its mileage are preserved for wear on your car.

There are responsible Miller dealers everywhere—write us if you can't locate yours.

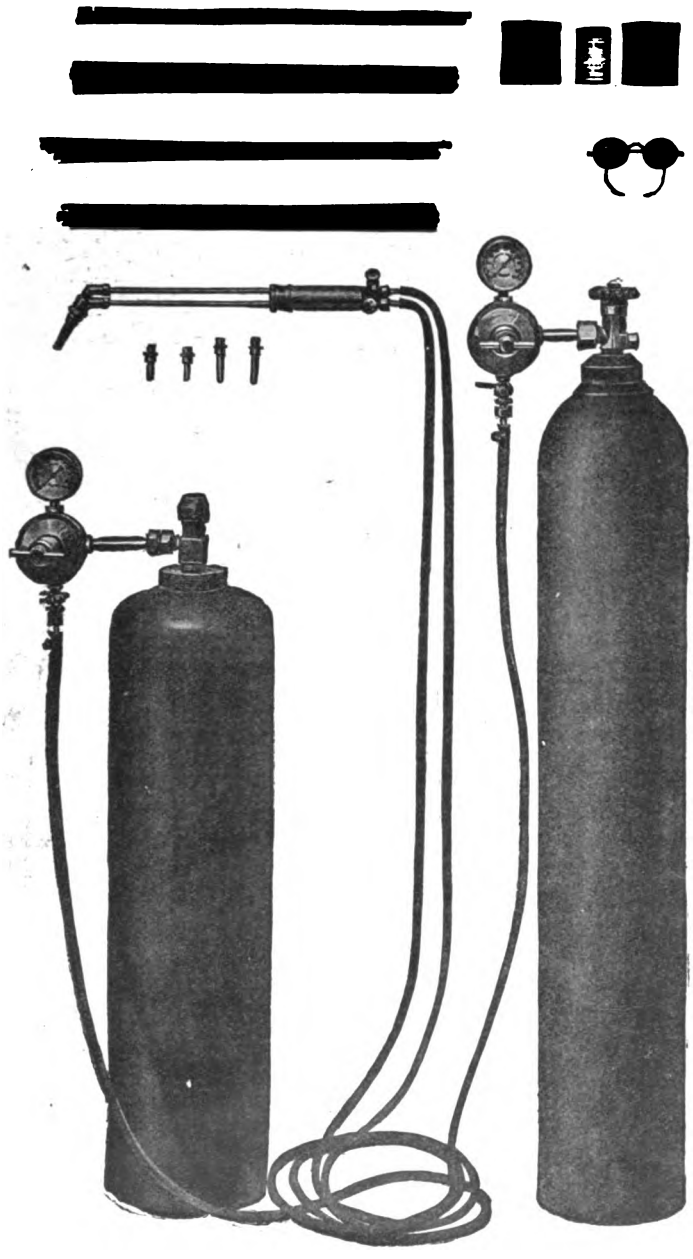
The Miller Rubber Company, Akron, O., U. S. A.

Distributors in the Principal Cities

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A BUSINESS FOR $42

Profits from the Trial Period will pay for it



FREE TRIAL OFFER

If at the end of two weeks' trial in your shop, you decide you do not want the outfit, ship it back to us and we will refund your money IN FULL. No strings to this offer. Not necessary to give any reasons.

COMPLETE WATERHOUSE WELDING OUTFIT $42

Waterhouse Outfit

	Value
1 B Welding Torch with 5 tips	$17.00
1 Oxygen Reducing Valve with 50 lb. line pressure gauge	10.25
1 Acetylene Reducing Valve with 50 lb. line pressure gauge	11.00
1 Set of Special Welding Hose (20 ft.)	3.00
1 Pair of Welding Glasses	.75
1 Carbon Burning Torch	Free
1 Set Instructions	Free
Net Cost Complete - - -	**$42.00**

Rods and Fluxes $4.50

What you get

1 Bottle Aluminum Flux
1 Can Cast Iron Flux
1 Can Copper and Brass Flux
2 Pounds Brass Welding Rods
5 Pounds Cast Iron Welding Rods
2 Pounds Aluminum Welding Rods
2 Pounds of Steel Welding Rods.

With a Waterhouse Welding Outfit, you can do work that no other concern can do unless it has a Waterhouse Welding Outfit. Can be efficiently operated by any intelligent mechanic.

Economy of time, metal, labor and machine and hand work after the welding process.

No aditional space or equipment is required. Needs but a small space to successfully operate on the largest work. Can be placed in a corner or carried anywhere.

Economical because there is no waste of time or fuel—the torch will not flash—it can be used all the time it is needed, absolutely safe.

With every Waterhouse Welding Outfit is given a free carbon-burning torch with which carbon can be removed from the cylinders of any car—an incidental but a substantial source of profit.

If you have a regulator for carbon burning, the oxygen regulator usually sent with the outfit is unnecessary, and a deduction of the price ($10.25) can be made from the price of the outfit quoted.

TERMS: 5% cash discount with order or C. O. D., or $20 cash with order, balance in two payments, first of $12 in 30 days, $10 in 60 days after receipt of outfit by you.

Practical instructions furnished free with every Waterhouse Outfit. These instructions deal with the treatment and repair of all kinds of metal. Be the first owner of a Waterhouse Welding Outfit in your community.

If you do not have at your service a welding shop, we will undertake to make repairs and restoration for prices that will be much less than the cost of new parts.

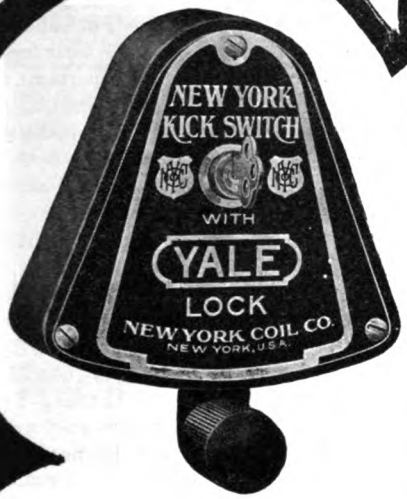
WATERHOUSE WELDING COMPANY

16 PELHAM STREET, BOSTON, MASS.

Established 1908 **Welding and Cutting Equipment Exclusively**

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A REAL PROTECTION AGAINST THEFT



THE NEW YORK KICK SWITCH WITH (YALE) LOCK

PRICE $2.50

Instantly fits the Ford metal or wood coil box. An investment of $2.50 gives you a permanent insurance against loss of your car.

This is a handsomely constructed Kick Switch of liberal proportions, but contains a genuine Yale Lock, which when the key is turned prevents the unauthorized operation of the car regardless of in what position the switch lever is turned. This switch affords the convenience of the conventional kick switch, but possesses the locking feature, which is found in no other type.

Connections are carefully numbered and instructions furnished with every switch are so very plain that not the slightest difficulty will be experienced in installing.

Can you afford to run the daily risk of having your machine stolen when for $2.50 you can leave your car anywheres with a perfect feeling of security and contentment?

At all first-class jobbers or will be sent prepaid upon receipt of price. Subject to return if not pleased.

NEW YORK COIL COMPANY

338 PEARL STREET NEW YORK, N. Y.

WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

THE NEW YORK



Shock Absorber

For Ford Cars

Price $7.00 Per Set of Four

Attached in fifteen minutes without removing the wheels, radius rods, or spring perches. No bearings to wear out or replace, no **tin** covers to rattle loose and become lost, no attention after once installed—which any owner accomplishes in a few minutes by simply removing spring shackles and placing our Absorbers in their places.

Operate in **two** directions and are **perfectly free from all side sway.** They give a luxuriance to the Ford seldom obtainable in the highest priced cars. One very advantageous feature is the fact that the regular fittings supplied on the Ford car are left intact, which is not the case with other **Absorbers.**

Aside from the labor of installing the **ordinary** Shock Absorber the substitution of other parts not furnished by the Ford Company most always results in **throwing the running gear out of line** resulting in **difficult steering and great wear** on the tires, due to improper tracking of wheels—a condition impossible with the NEW YORK. "They are correct in every way or they would not bear our name plate."



For FORD CARS $10.00

NEW YORK Constant Level Lubricator

Supplies fresh, unused, life-giving oil, maintaining a "CONSTANT LEVEL" of oil in crank case without feast or famine. Oiling starts and stops with the operation of the car positively. Prevents the formation of carbon and ignition troubles, and quickly pays for itself in the saving of oil. Doubles the life of engine and transmission bearings, and is without question the MOST PRACTICAL, MOST POSITIVE, MOST NEEDED DEVICE SINCE THE ADVENT OF THE FORD CAR.

Price $10.00 Complete

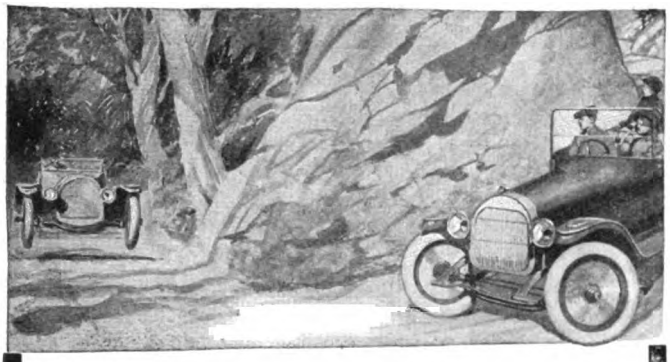
Installed in fifteen minutes by the simple use of a wrench.

Easily installed on 1915 Models.

NEW YORK COIL COMPANY, 338-340 Pearl St., New York

WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

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The Hidden Road

A smash-up hurts the reputation of the car and of the dealer who sold it. No one knows how it happened so they blame the car.

What really caused the trouble in most cases was that brake lining failed to grip.

It failed because the brake lining was inferior or worn out—got hard and dry – became friction-shy.

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%

Brake Lining, to be any good at all, must be 100%—must be honest brake lining all through. Not merely on the thin outside surface—not merely a loose and stringy-woven lining that is friction-shy inside.

Thermoid is forced by hydraulic compression into a solid, single substance of uniform density and friction clear through. It retains its 100% gripping power even until worn paper thin.

Thermoid is trustworthy. Guard your safety with Thermoid.

Watch your brake lining.



Cannot be burned out nor affected by oil, heat, water, gasoline, dirt.

Our Guarantee: Thermoid will make good, or we will.

THERMOID RUBBER CO.
TRENTON, N. J.

National Rubber Tire Filler

THE ONLY GENUINE ALL RUBBER TIRE FILLER



It is made of the best grade of rubber, cut in small particles molded to a pattern, properly vulcanized by a special process, laid inside the tire and put on with the same pressure as required by air. No chemicals, oils, glucose, or gelatine to damage your tires; nothing but high-grade Rubber. No limit to its life and wearing qualities. Can be changed from one tire to another as often as is necessary. A perfect substitute for air. Rides just as easy after 30,000 miles as when new. From both a business and pleasure standpoint it is the greatest economical factor ever produced.

WRITE AT ONCE FOR FULL PARTICULARS AND SAMPLE

National Rubber Filler Company
208 College Street **Midlothian, Texas**



HAVE YOU THIS BOOK?

If not, you should send a postal today for a copy. Every garage owner and automobile repairman should have one of these catalogs, quoting lowest prices on guaranteed lathes for repair work. Contains complete description of our Expert line of Screw Cutting Engine Lathes. Prices, $63.00 and up.

Read what this Colorado garage owner says about our lathe:

Sears, Roebuck and Co., Chicago:

Received my Expert Lathe a few weeks ago and would like to say that it is just what we wanted and needed in the shop. For a medium priced machine it is most complete, and runs smoothly and even. The gears for screw cutting cover the demand very thoroughly and indeed all around we are very much pleased with it.

(Name on request.)

Write today for Catalog No. 57A201.

SEARS, ROEBUCK AND CO., CHICAGO

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TO GARAGE OWNERS

Special Announcement

A new source of big revenue for you is opening up, in the rapidly increasing use of Electrical Starting and Lighting Equipment. With the exception of the very low-priced cars, practically every car now made has this equipment, which includes motor, generator, battery, switches, regulating devices, wiring, lamps.

You must have special knowledge and special equipment to remedy electrical troubles and repair starting and lighting equipment. If you go at it by hit-or-miss methods you will drive away your trade, and it will carry with it the general repair and supply trade of all kinds.

ARE YOU A "LIVE WIRE"?

If so, we will make you a special proposition, the acceptance of which will equip you to handle this big new trade far better than your less enterprising competitor, and will give your business a big jump ahead. If you do not accept it, somebody else will and you will lose.

If you want to control the cream of the high-class trade in your territory, write to us at once. We will "put you next" to something worth while.

We are interested only in those garage owners who are enterprising enough to recognize the golden opportunity we will lay before them.

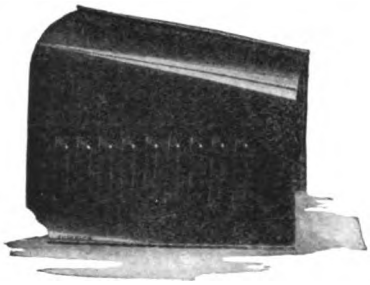
This special offer of ours will be withdrawn very soon, hence we suggest your immediate action.

WESTON ELECTRICAL INSTRUMENT CO.

2 WESTON AVENUE **NEWARK, NEW JERSEY**

Originators of the Art of Electrical Measurement and Manufacturers of Highest-grade Indicating Electrical Instruments in the World.

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"SUPERIOR" No. 2 Hood Fits All 1915 Fords

Stamped out of extra heavy steel, with 14 ventilators—a smooth streamline hood that adds longer lines to the Ford—some beauty!

IMMEDIATE DELIVERY

"Superior" Streamline FORD HOODS

So great has been the demand for "Superior" Streamline Hoods that the increased output has enabled us to announce the new price of **$8.00** Complete

TWO MODELS
No. 1
Fits 1912-13-14 Fords
No. 2
Fits 1915 Fords

Finished in hard, black, baked enamel. Cannot be compared with light metal hoods, which are just merely painted, and chip off easily.

"Superior" Hoods are protected under patent rights pending.

"Superior" Radiator and Hood Combination $42.70 Complete

"Superior" V-Type Honeycomb Radiators

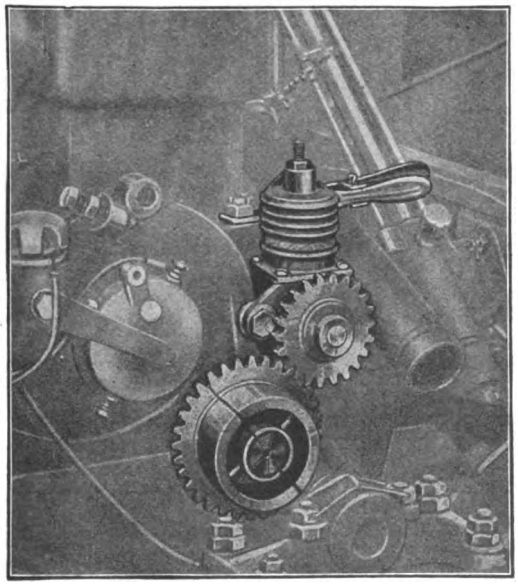
The Only Radiator That Really Cools. Guaranteed One Year For Any Defect.

Price—Brass **$34.70** German Silver **$38.00** Get Our Proposition Write Today!



SUPERIOR LAMP MFG. CO., 136 W. 52d St. NEW YORK, U. S. A.

SEND FOR RADIATOR AND LAMP CATALOGUE No. 3



MANZEL ENGINE-DRIVEN TIRE PUMP FOR FORD CARS

A practical, accurately built, all metal engine-driven tire pump for Ford cars. Will inflate any Ford tire in less than two minutes, and can be installed by anyone. There are no holes to drill or machine work of any kind to be done in making the attachment.

PRICE, $7.50

Complete with steel gears, 12-ft. hose, and pressure gauge. Everything ready for immediate attachment.

This Is a Money-Maker For You, Mr. Dealer

Every Ford owner will purchase an engine-driven tire pump at this low price, and you can guarantee the Manzel without the slightest hesitation. Tell your customers in the most unqualified terms that we stand behind the Manzel Ford Pump. Let him install it on his car and try it for 30 days. If at the end of that time he is not satisfied, take back the pump and we will make it good.

Two-Cylinder Pumps For the Larger Cars

Our 2-cylinder tire pump which has always sold for $28.00 and $30.00 is now sold for only $20.00, complete with fittings, and we can furnish fittings for over 150 different models of cars.

Write Today for Our Liberal Terms on Both Models



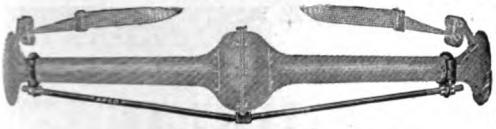
MANZEL BROTHERS COMPANY, 321-323 Babcock St., BUFFALO, N. Y.

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Five New APCO TRADE MARK Specialties

For Sale By All Live Jobbers and Dealers

REAR AXLE TRUSS



The Rear Axle on the 1915 Ford Car has been strengthened about 50% over any previous type, and this is not the first year that improvements have been made on this unit. To strengthen the old cars we offer the APCO Truss which is made from steel rods and semi-steel castings finished in black enamel. The rods are one-half inch in diameter and strong enough to give the axle the stiffness lacking in its original construction. The clamps go around the castings at the extreme end of axle housing, and do not put any strain on the pressed steel parts. The cradle that fits under the center of the housing is fitted with square sockets to accommodate the square heads that are made integral with rods. Bolts for clamps are square headed sunk flush in square sockets to prevent turning and to improve appearance. The whole outfit comes packed in a corrugated box 24" long and weighs 5½ pounds. If your axle housing leaks grease or your rear gears are noisy you need an APCO Truss to remedy the trouble. If not you need the Truss to prevent it. Installation is a matter of ten minutes with no tools but a wrench.

PRICE Complete $1.50

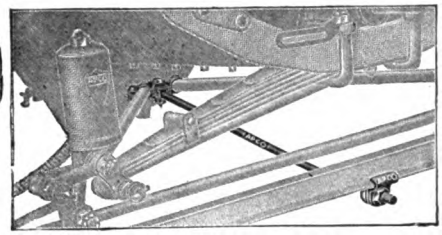
SPRING LEAF LUBRICATORS



One concern selling an oiling or lubricating device for the leaves of automobile springs spent $20,000 advertising their product during last year. Another spring maker makes great claims for his springs because they are self-lubricating. There is no question about the advantages of having the spring well oiled. It's only a question of the means. The APCO Lubricator as shown in the cut consists of a pair of plates with oil reservoirs and felt inserts. These inserts soaked with oil rest against the sides of the spring leaves and give them constant lubrication which increases the riding qualities 100%. They are made from semi-steel, black enameled and are guaranteed to do the work as well as the highest priced article on the market. Set includes four pairs, two pairs for each spring. The only ones on the market that oil both sides of spring.

PRICE Complete $2.00

FRONT AXLE BRACE



The front radius rod on the Ford is made of tubing in which there is more or less spring or give. This give causes the bottom of the front axle to tip or bend back in going over rough roads, causing an unsteadiness in steering. The APCO brace consists of two ingenious clamps and a half-inch steel rod with a square head made integral. One of the clamps is attached to the extreme end of the front axle truss rod with three bolts, all having square heads to prevent turning, and the square head on the rod is held in this clamp. The other clamp is attached to the front axle and is held there by two nuts on the rod which go thru clamp. This device is one of the best accessories we have ever offered and is one that you need. Finished in black enamel. Can be put on the car with a wrench in five minutes. Packed in a corrugated box 23" long, weighs three pounds. There is no need of adding twenty pounds to the weight and five dollars to the cost of your car when ours will do the work. A new radius rod costs $3.00, you will never need a new one if your car is equipped with an APCO brace.

PRICE Complete $1.50

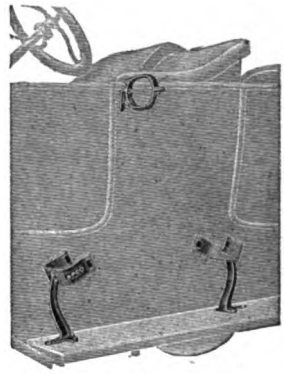
VALVE STEM PACKINGS



When the valve guides on an engine wear it is impossible to get a perfect mixture as air is drawn thru the space between the valve stems and the wall of the guides. This results in a skip that is impossible to find, especially at low engine speeds and full power cannot be obtained from the engine, as part of the suction stroke is wasted by drawing air by the valve stems. The APCO packing consists of a special steel stamping and felt washer which is held in position by valve spring as shown in cut. When in position the felt both prevents air from entering the cylinders and also lubricates the valve stem preventing further wear. They are necessary on the new cars as well as old, and the installation in either case is a matter of a very few minutes without tools of any kind.

Price per set of Eight 50c

SIDE TIRE HOLDERS



There are so many new rear tire holders on the market that the public is inclined to overlook the good points in favor of a side tire carrier. Absolutely the only advantage of having the tires on the back of the car is that of balance, and as a pair of shoes weighs but 20 lbs. this is purely an imaginary one. There are hundreds of reasons, however, why you should use APCO Side Tire Holders, and the following are a few, any one of which is sufficient for you to decide in their favor. 1. They keep the tires clean. 2. They keep the tires away from the hot exhaust. 3. The tires can be removed in five seconds and replaced in same time. 4. They can not be lost off the car. 5. They are much neater in appearance. 6. They can be installed in ten minutes. 7. With them it is possible to carry a trunk at the rear. 8. They make unnecessary the changing of tail light location. 9. They weigh seven pounds less than the lightest rear holder on the market. 10. There are no straps to lose or break. 11. Price is the lowest of any tire holder on the market, irrespective of advantages. 12. Special catch on top bracket locks automatically when closed and lock need not be used unless wanted. 13. Screws that hold bracket to body cannot be removed with tires in place. 14. Lock is solid brass mail type which opens automatically when key is turned. 15. Lock clasp is rubber covered to prevent rattle. Furnished in black enamel only. Packed in corrugated carton 6"x11"x7½" and weighs seven pounds. Complete with bolts, screws and lock. Will fit two 3½" tires or one 3" and one 3½".

PRICE $2.00

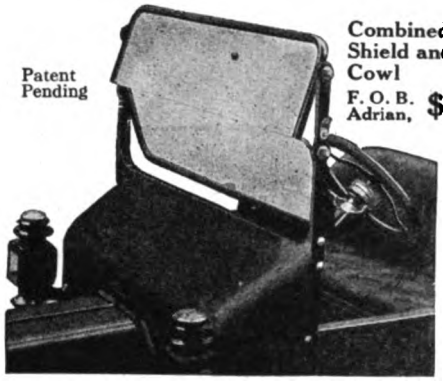
AUTO PARTS CO. - Providence, R. I.

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The Best Selling Ford Accessory

Thousands of Fords Already Equipped in all Parts of the Country



Patent Pending

Combined Shield and Cowl
F. O. B. Adrian, $15

CONOVER
— 1915 —
COWL-WINDSHIELD

Rain Vision **Ventilating** Top and Bottom
Clear View **Automatic**

Can be used on Model T, 1912, 1913, 1914, 1915. Bolts on without fitting. Exactly like shields used on high priced cars. Capacity 300 a day.

ALSO—

Patent Pending

UNIVERSAL

RAIN VISION AND VENTILATING WINDSHIELD
FOR THE
NEW STREAM-LINE FORD



Complete with Brackets, F. O. B. Adrian - - - - $10

Dealers, everywhere, are finding this line easy to sell and very profitable. Self advertising. Send for details.

Page Woven Wire Fence Co. *Windshield Department* **Adrian, Mich.**



A NEW PRINCIPLE IN PISTON RINGS
UNLIKE ANY OTHER

One of the principal causes of leakage in Piston Rings is wear in the Ring grooves. The **Pressure Proof Ring** is the only ring that automatically takes up the side wear in the piston groove and maintains a tight joint at this point at all times, a feature appearing in no other ring. Oversize rings are not necessary. The self-adjusting feature, which consists of a half round, soft steel wire expander, acting on a bevel on the under side of the ring, eliminates the necessity of accurate fitting in the piston groove. All joints in the **Pressure Proof Ring** are permanently sealed, resulting in high compression and efficiency, preventing carbonization and waste of oil and gasoline.

Made in all sizes, for any purpose. Will work in ported cylinders. No danger of breaking or distorting the **Pressure Proof Ring,** as it is not stretched over the piston in applying. For full information—write the

PRESSURE PROOF PISTON RING CO., 3368 Washington St., JAMAICA PLAIN, BOSTON, MASS.

SEBASTIAN LATHES
HIGH QUALITY LOW PRICES

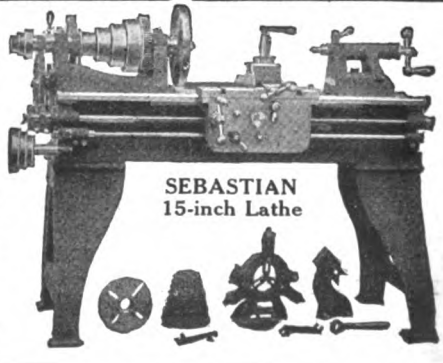
If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.
The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

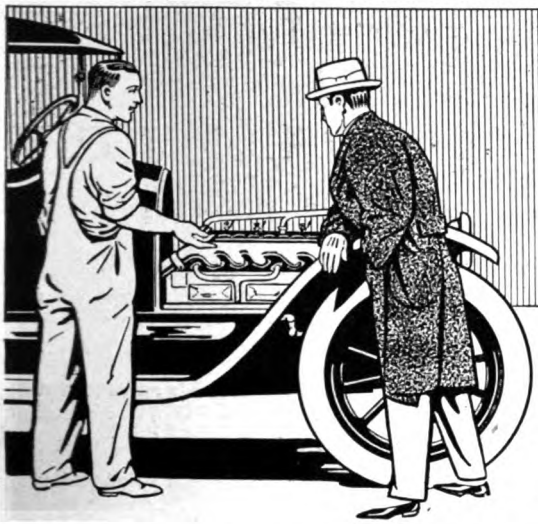
Address (for the catalog)
THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN
15-inch Lathe

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Look for the name LEAK-PROOF stamped on the Ring



The Cost of Carbonization

CARBON deposit is more than merely an annoyance. It is an evil—and an expensive one.

¶ It prevents proper seating of valves and causes piston rings to stick—result, poor compression and wasted power. It causes pre-ignition of the fuel charge and premature explosion that entails severe strain upon the crank shaft bearings. ¶ Carbon deposit is caused by incomplete combustion of the fuel charge and by the burning of surplus lubricating oil in the cylinder head. The only cure for both such conditions is

MADE IN ALL SIZES **LEAK-PROOF** EASILY ADJUSTED

Piston Rings

Made by McQuay-Norris Mfg. Co.

¶ They make full compression certain and prevent all passage of oil, because the mechanical perfection of their design ensures proper and continuous bearing on the cylinder. They have no unsealed openings like the ordinary ring, nor the unequal tension of either the eccentric or concentric one-piece ring, nor the weakness of the multiple-piece ring.

¶ LEAK-PROOF Rings are simple, strong, wonderfully elastic—easy to adjust. Each ring is composed of two concentric "L" shaped sections closely interlocking—this is the patented and individual LEAK-PROOF feature. The perfect fit and finish of every ring ensures the minimum of cylinder wear.

When your car is overhauled have LEAK-PROOF Piston Rings installed.

Send for FREE Book—"To Have and to Hold Power"

It explains the theory and function of piston rings. It tells about the LEAK-PROOF **Ring** and why every motor should be equipped with them. How it will pay you in fuel economy and prolonged motor life. Write for it.

"Ask the User"

In use on Over 300,000 Motors



Angle to angle [] interlocking construction identifies LEAK-PROOF—insist.

Sold by all up-to-date dealers, garages, and repair shops

Manufactured by

McQUAY-NORRIS MANUFACTURING CO., Dep't R, ST. LOUIS, MO.

Canadian Factory—W. H. Banfield & Sons, No. 120 Adelaide Street West, Toronto.

BRANCH OFFICES

New York—1919-29 Broadway, at 64th St.
Pittsburgh—902 Second National Bank Bldg.
Kansas City—513 New Nelson Bldg.
Chicago—Suite 718 Michigan Blvd. Bldg., Michigan Ave. and Washington St.
San Francisco—164 Hansford Bldg.
Los Angeles—224 Central Bldg.
Dallas—1509 Commerce St. 5T

There's no leak proof ring but the LEAK-PROOF Ring — insist

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GIVE your old top a chance. You won't need to buy a new one if you use

"F-S" "Evernew" Auto-Top Dressing

It makes an old top look like new and turn water like rubber. It is pliable and is absolutely non-injurious to fabric. Eight standard colors and special shades to order.

Write for color card and prices

FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 N. Fourth Street - Philadelphia

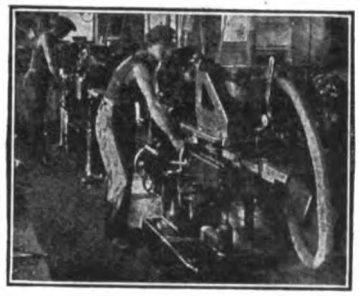


"Evernew" Auto-Top Sizing is necessary as the first coat on unpainted cloth, mohair or canvas.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special shades to order.

SEND US YOUR

Worn or Scored Cylinders



Have us restore the compression and power to your motors. We specialize on the most practical and economical method of restoring worn cylinders to efficiency.

We have been regrinding such cylinders and fitting new over-size pistons and rings, to the complete satisfaction of motorists in many states.

The most improved equipment, and skilled workmen experienced in handling it, enable us to give unusually prompt service.

We can refer to hundreds of satisfied customers. Write today for detailed information, advising numbers of cylinders and bore diameters, for our guidance in making quotations.

WATERBURY WELDING CO.
1148-B South Main St., Waterbury, Conn.

Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

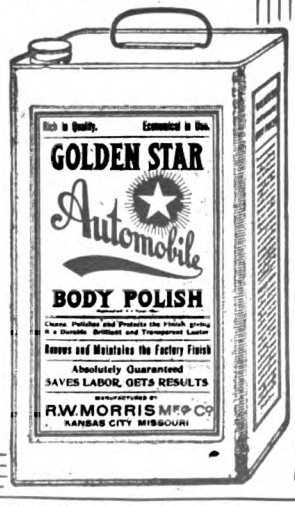
Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish.

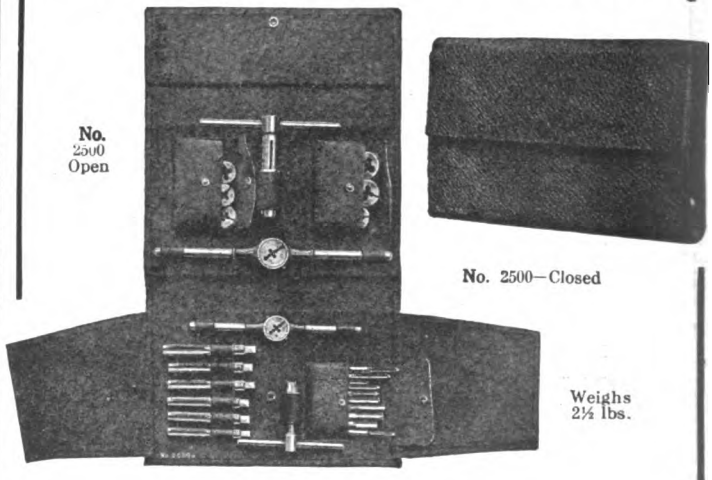
Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri



Great Demand for These



LIGHTNING

AUTOMOBILE REPAIR KIT

For Screw Threads

Designed primarily for the Ford car, this assortment of famous Lightning Taps and Dies is equally useful as a part of the equipment of *any* car or garage.

COMPACT—LIGHT—COMPLETE

Send for the booklet, *"First Aid in the Upkeep of Automobiles."*

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WILEY & RUSSELL MFG. CO., Div.

GREENFIELD TAP & DIE CORPORATION

GREENFIELD, MASS.

New York Philadelphia Chicago

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SAFETY FIRST

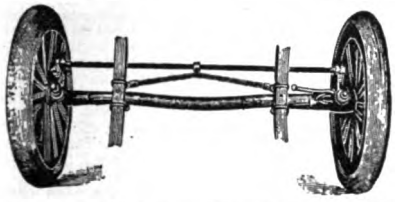
USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D. CHATHAM, N. Y.

TRADE MARK



"SMILES AT MILES"

LEE Tires

PNEUMATIC NON-SKID PUNCTURE-PROOF



Zig-Zag Tread

THESE PNEUMATIC TIRES cost money—because they cost money to make. They yield More Mileage and are

Puncture-Proof—Guaranteed

WRITE FOR TERMS AND BOOKLET "I"

LEE TIRE & RUBBER CO. Manufacturers of Rubber Goods since 1883 CONSHOHOCKEN, PA.

KELLY-FIELD CO. Selling Corporation 1851 BROADWAY, N. Y.



Your Old Car Is Worth Ten New Ones

if you only *know how* to cash in its possibilities in Family benefit.

With your permission we propose to *show you* thru the coupon below:

To many Automobile owners it may sound strange when we state so emphatically that Automobile Tours with parties of men, women and children (of any age), over any desired distance, may be made with far greater Safety, Comfort and Pleasure than is possible when traveling in Pullman parlor trains, but we do mean it and will prove it.



Have a Family Picnic Every Touring Day.

The desirable advantage of exclusiveness, independence and unexcelled sight-seeing possibilities while traveling by Automobile, saying nothing of reaching the far out-of-way places so entirely impossible to the railroad traveler, are the points of advantage universally admitted by everyone and need no mention here.

The detail that is not so generally known, however, is: How to equip a car to eliminate excess baggage and useless expense but still maintain every comfort and pleasure of the boulevard spin for each and all the passengers throughout the entire tour. Many car owners who have had reverse experiences, or, say road disappointments, may be a little skeptical because they failed, but we want every reader to be absolutely assured that all past failures have not been without real reasons.

Our experts are past masters in Touring, and after crossing and re-crossing the continent many times, touring and camping with their wives and children, their experience has eliminated many common errors, and like almost everything else in this life, there is a right and wrong way to start. In Automobile touring the right way happens to be much the easiest and far less expensive. We will be only too glad to help all interested Automobile owners for whom a special number of the SERVICE NEWS will be issued June 1, 1915, and copies promptly mailed to all applicants sending in the coupon request.

Kansas City Automobile Supply Co., Kansas City, Missouri.

THE LARGEST MOTOR TOURING AND CAMPING EQUIPMENT SPECIALISTS IN THE WORLD.

K. C. AUTO SUPPLY CO.
KANSAS CITY, MO.

Dear Sirs:
I have a_____Automobile.
You may send me a free copy of your Touring number. All I agree to do is look it over.

NAME _____

ADDRESS _____

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"AIR-IN-AL"

SEALS PUNCTURES INSTANTLY.

$5.00 Per Car!

Anyone can install *Air-in-al* in fifteen minutes, in all four inner tubes.

We guarantee *Air-in-al* to be non-injurious to rubber, paint, varnish or clothing and can be removed from same with cold water. Use *Air-in-al* and ride on AIR, with no further dread of punctures.

Occupies only 5% of the air space in the tube.

Lasts longer than any similar compound—there's a reason.

Send for Circular Today.

CHOICE TERRITORY OPEN FOR LIVE REPRESENTATIVES.

Woodbridge Chemical Co., Inc.

OFFICES
U. S. Rubber Co. Bldg., New York

LABORATORIES
Woodbridge, N. J.



THE CANVAS TREAD TIRE

With its many layers made of rubber and rubberized canvas impregnated with tread stock in such a way that each layer is woven to the other with rubber and afterwards vulcanized, which makes a stronger and more serviceable tread than the all-rubber tread heretofore used. These layers will not separate, peel off, crack, split, or chunks come out, like the all-rubber tread by the constant vibration. All of these layers are non-skid, but yet a smooth tread, and each layer as they wear off becomes a non-skid and so on until the entire tread is worn out. It takes more than 1,500 miles to wear off one layer. Count the number of non-skid layers and you will see that this tread is good for more than 10,000 miles. It is a tougher tread and more serviceable than heretofore used in other makes of tires. It is the only non-skip tire all the way through ever made, no chains are necessary. It is what is known as a fast tire and takes less engine power and 25 per cent less gasoline. It is free from punctures, stone bruises and never gives any trouble. Try one of these tires with any other tire, which will quickly convince anyone. We only use the most expensive material that goes to make up a tire. If you paid us a $1,000 for a tire, we could not make a better one, because better material is not made. This tire is backed up by the highest percentage of mileage guarantee.

Send for booklet telling many other features and agent's proposition.

THE CANVAS TREAD TIRE COMPANY
69 GENESEE ST., UTICA, N. Y.

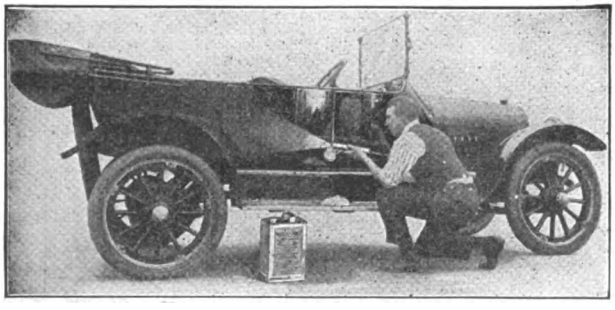
WONDER-MIST

Cleans and Polishes

It removes dust and stains and restores the original lustre to any polished surface.

It contains neither acid, gum nor any other injurious substance.

It preserves and protects the finish.



Applied with sprayer, which deposits the liquid in a fine mist evenly. Then polish with a cheesecloth. It is extensively used in Public Garages and by Automobile Owners. A trial makes a constant user.

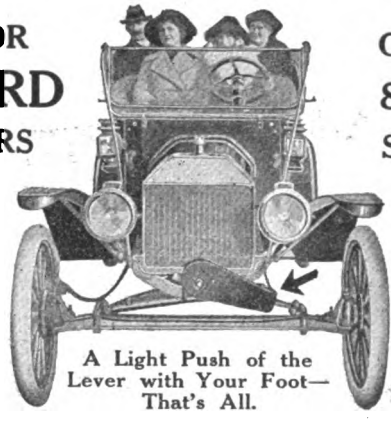
If your dealer cannot supply you, send us his name.

The Wonder-Mist Co., 14 Federal St., Boston, Mass.

Perfection Auto Starter

FOR FORD CARS

OVER 8500 SOLD



Operates From Seat

Engine Starts At Once

A Light Push of the Lever with Your Foot—That's All.

So simple a child can use it. No gas to explode; no batteries to charge; no springs to wind up and no up-keep expense. Neat and out of the way.

INSTALL IT YOURSELF

A Perfection Starter will make your auto pleasures complete. **Catalog and Booklet, with full instructions for installation, sent free upon request.** $25.00, anywhere in the United States.

50% TO AGENTS. SEND $12.50 FOR SAMPLE and get Agency Contract. *WRITE AT ONCE.*

MANUFACTURED BY

PERFECTION AUTO STARTER CO.,
279 16th Street **DENVER, COLO.**

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ÆSOP

describes how two men—one blind, one lame, accomplished a journey by mutual aid; which otherwise would have been impossible.

The blind man carried the lame man who steered the course—

In like manner

We Enable Two Weak Auto Tires

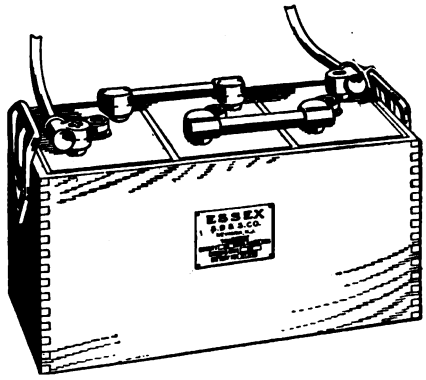
to continue their journey revived and strengthened by causing one to carry the other, which in turn protects its friendly helper from the shocks and thorns of the road.

That UNITY IS STRENGTH

is clearly demonstrated by our Reclaim System, the average mileage being from 2000 to 3000.

COWANS BROTHERS
150 West 55th Street, New York City
BRANCH
815 No. Broad St., Philadelphia, Pa.
Write at once for full particulars.

BATTERIES
OF ANY TYPE
=REPLACED=



Write for our Replacement Proposition on your old batteries for new ones, same type and size.

ESSEX STORAGE BATTERY & SUPPLY CO., Inc.
272 Halsey Street Newark, N. J.

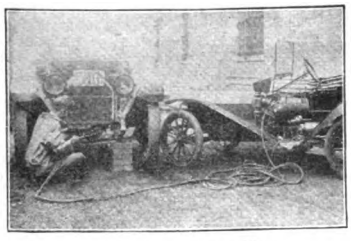
IMPERIAL WELDING AND CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS

QUALITY

Meets Any Emergency!

In the shop or on the road – for welding cracked cylinders, broken aluminum cranks, transmission cases, crank shafts, frames, axles, rear axle housings, steering knuckles and all other automobile parts quicker, more effectively and *considerably cheaper than you ever have done before.* Imperial Equipment pays for itself in one or two operations. Safe, compact, reliable, portable; can be moved anywhere – *always ready.*

You Too, Can Do This!



This picture has money-meaning value to garage men. A broken axle out on the road—five miles from a repair shop. Instead of hauling the car back to the shop this progressive garage owner puts his Imperial Outfit and an oxygen tank in his runabout—drives quickly to the job—hitches it to the acetylene tank used for lighting—and *in a few minutes* the axle is as good as new, *without dismantling car.*

Imperial Equipment is indispensable in the garage.

Write Today!

Ask for prices, catalog and full details. *Prove to yourself* how you can save enormously in time and money with Oxy-acetylene Welding and Cutting Equipment.

Imperial Brass Mfg. Co.
520 S. Racine Ave.
CHICAGO

"NORMA"
BALL BEARINGS



Hundreds of thousands of "NORMA" Ball Bearings are in daily use in the automobile and motor trucks of the country—in the ignition apparatus, lighting generators and starting motors. Would the builders of these machines agree on "NORMA" Bearings, if they were not sure that "NORMA" stood for **service?** Why not follow their example?

"NORMA"
Ball, Roller, Thrust and Combination Bearings

THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK

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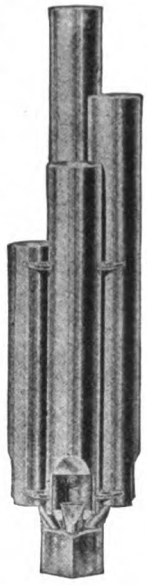
The AERMORE Exhaust Horn

Big Dealer Profits

The AERMORE is listed in probably 90% of the 1915 Jobbers' catalogs. We are advertising in the leading automobile papers. The fast-growing demand for it means many sales and much profit for you.

Put It in Stock

It gives perfect satisfaction because: it is musical; cannot clog; never fails; cannot be tampered with when car is standing; has no up-keep expenses; amply warns but does not frighten; it is easy to put on.



Send for full description and 1915 discounts.

THE FULTON CO.

723-725 National Ave., Milwaukee, Wis.

STOLEN CARS

Last year amounted to

$1,000,000.00

By using the Commercial Auto Lock your car cannot be stolen.

THE COMMERCIAL AUTO LOCK

locks the control lever in neutral position, making it impossible to connect the engine with the driving mechanism.



Price $2.00 Complete

Prepaid to any address in the U. S.

Mail your order today with remittance. If it is not satisfactory return the lock within ten days and your money will be gladly refunded.

Dealers and Agents will be interested in the liberal discount.

WRITE TODAY FOR PROPOSITION.

COMMERCIAL MFG. COMPANY

508 Commercial Building **CLEVELAND, OHIO**

A NEW AND BETTER SHOCK ABSORBER



PATENTED OCT. 2nd, 1914

THIS takes care of spring. Weight is divided in four parts and pulls from four corners.

FOR ANY CAR

This shock absorber will give better service than any other highest priced shock absorber on the market and every part is fully guaranteed.

U. S. SHOCK ABSORBER

FOR FORD CARS

It stands four-square to every car-racking, spring-buckling lurch; not only the straight-away shocks and rebounds but the erratic sways which come in every direction.



$11.00 Per Set of Four

$16.00 Per Set of Two up to 3000 lbs.

$18.00 Per Set of Two from 3000 lbs. and above.

EASILY ATTACHED

NOTE THE PRICES

Dealers, Write for Our Proposition

B. & L. AUTO LAMP CO.

507-509 West 35th St., NEW YORK, N. Y.

For Leaky Cylinders

Superior to All Others



PATENTED AUGUST 6, 1912

A Piston Ring Which Gives Compression in "Out-of-Round" Cylinders as Perfectly as in True Ones



Here is a piston ring that gives 100% efficiency to every type of motor, engine, compressor or pump.

Ideally adapted to use in Automobile and Motorboat engines.

Gives compression when all others fail. No need to rebore worn cylinders—simply install EVER-TIGHT piston rings and the motor is good as new.

EVER-TIGHT piston rings are made up of three individual, interlocking rings, grooved together to give flexibility and reduce friction. This three-part construction is clearly seen in illustrations above. This is the only three-piece piston ring on the market.

If dealers do not carry EVER-TIGHT piston rings, Auto repair men should write us.

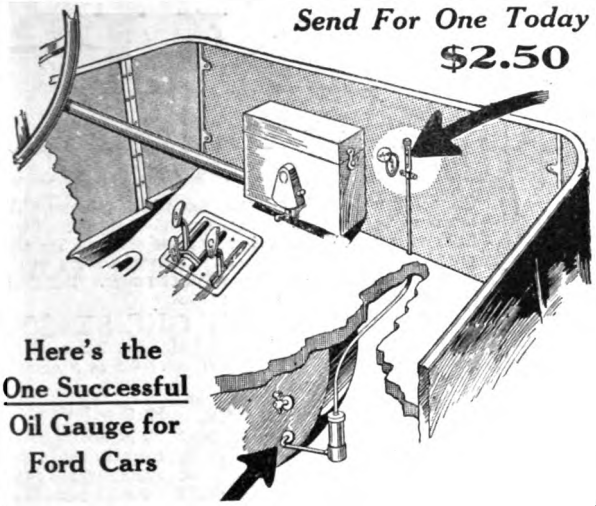
Jobbers and dealers wanted everywhere. *Write for particulars.*

THE EVER-TIGHT PISTON RING CO.

1428 CHESTNUT STREET **ST. LOUIS, MO.**

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Send For One Today
$2.50



Here's the One Successful Oil Gauge for Ford Cars

THE IDEAL OIL GAUGE

Right on Dash in Plain Sight



A positive-acting oil gauge for Ford cars that has won the enthusiastic endorsement of thousands of Ford owners now using it. A demonstrated success. Simple, inexpensive, nothing to break or get out of order. You can attach it yourself, in five minutes' time, it's made to fit exactly.

Good proposition for jobbers and dealers.

Write me today.

A. B. WORTHINGTON, Manufacturer
1220 San Pedro Street Los Angeles, Cal.

Does Your Ford Hold the Road?

"An ounce of prevention is worth a pound of cure."

The L-A Steady Steerer eliminates the side-sway of the body in the spring shackles of a Ford car, thereby preventing the dangers that threaten the Ford owner when traveling at a high rate of speed or driving over rough roads. It is a simple, inconspicuous strut or radius rod which keeps the body and axle in perfect alignment under all driving conditions.

LA Steady Steerer
FOR FORD CARS

Can be installed by anyone in 15 minutes and lasts a lifetime. Makes your Ford steer and hold the road like a Packard.

Type "R" fits any standard Ford car, - Price, $2.00
Type "S" for use with Ford cars equipped with shock absorbers, $2.50

Either of the above types will be sent prepaid with directions for installing if unobtainable at your dealers.



DEALERS:

Write for Prices at once and be prepared to supply an immediate demand.

Every Ford Owner Wants One.

LOCKWOOD-ASH MOTOR CO.,
509 Horton St.,
JACKSON, MICH.

HYATT QUIET SERVICE

HY-FLEX-ROL
TRADE MARK REGISTERED U.S. PATENT OFFICE

Hyatt Quiet Bearings are used in the majority of American made automobiles

Bearings required for motor car repairs may be obtained on short notice at any of the service branches indicated.

HYATT SERVICE STATIONS

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Detroit, Mich.
Los Angeles, Cal.
New York, (Harrison, N. J.)

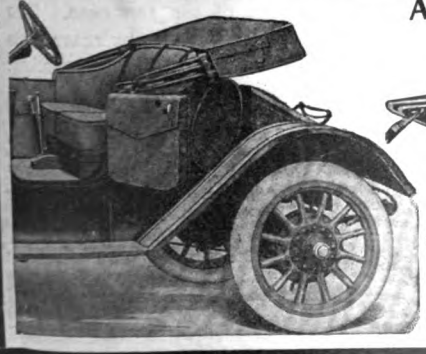
SERVICE AGENTS

High Wycombe, Broom & Wade England

HYATT ROLLER BEARING CO.
DETROIT, NEWARK, N. J. CHICAGO

Save One-Half the Cost of a New Auto Top.

Auto Top Covers Made to fit frames of any make of Car.





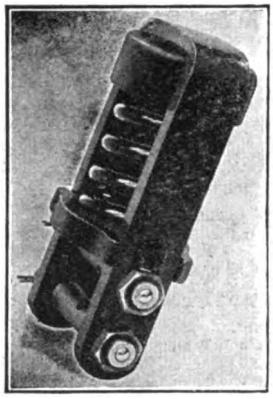
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SEAT AND DUST COVERS FOR OVER 200 DIFFERENT MODELS.

WRITE FOR CATALOGUE. WE CAN SAVE YOU MONEY.

BUOB & SCHEU, 300 E. Court St., CINCINNATI, O.

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LEAVITT
Shock Absorber For Ford Car

Simple
All Steel
Right Price

$5.00 Set of 4

Easiest applied. Every set guaranteed satisfactory or money refunded.

The winter is when you require shock absorbers. Send for catalogue.

Agents Wanted.

LEAVITT MANUFACTURING CO.
40 Sibley Street Detroit, Michigan

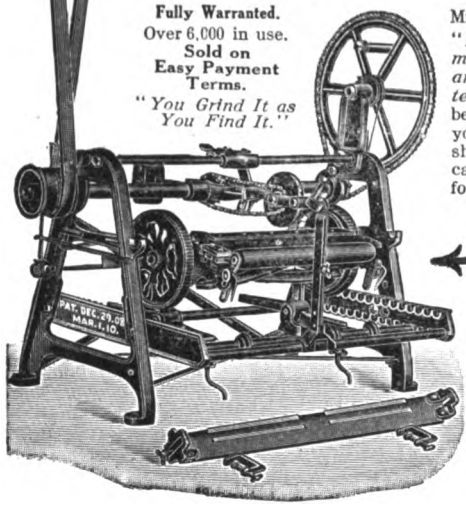
IDEAL
Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Has Skate Sharpener Attachment for sharpening skates. The only practical machine for sharpening Lawn Mowers on the market. Operated by either hand or power. Ball-Bearing Grinding Wheel and Main Shaft.

MAKE $300.00 IN ONE SEASON

Many have done better than that. Mr. Zabst, Mich., writes: *"I have sharpened 2178 mowers in 3 seasons at 75c to $1 50 each."*

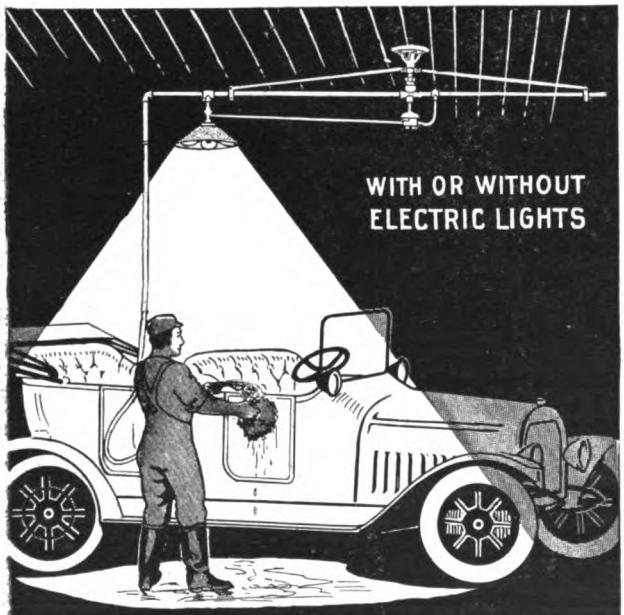
Fully Warranted.
Over 6,000 in use.
Sold on Easy Payment Terms.
"You Grind It as You Find It."



Mr. Stoy, Iowa, writes: *"I ground over 500 mowers this season and expect to do better next pear."* The best money maker you can have in your shop. Write today for catalog and full information.

Write Today. Don't Delay.

THE
ROOT-HEATH
MANUFACTURING
COMPANY
PLYMOUTH
OHIO

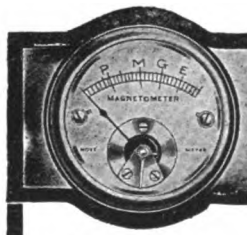


THE RHODES
OVERHEAD VEHICLE WASHER

PATENTED

THE VEHICLE SPECIALTY CO.,
26 STATE ST.,
HARTFORD, CONN., U.S.A.

SEND FOR BOOKLET AND PRICES



To Get the Most Out of a FORD

In order to get the best results out of the Ford engine the magneto must be kept at its original high efficiency.

The whole ignition system depends upon the magneto, and even though the engine will run, the magneto may be so weak that combustion is incomplete, thereby wasting fuel, causing cylinder carbon, and slowing up the engine. The only way to know what the magneto is doing is to use

The Hoyt Magnetometer

This rugged little instrument goes on the dashboard and shows at all times the strength of the magneto. The Ford Magneto may be kept at high efficiency by reasonable care and attention, and should never need replacing. Magnetometer methods will keep it right.

You sell the instrument for $4.00. Send for trade prices and our Booklet No. 2, describing Ford Magneto and ignition troubles and remedies.

Hoyt Elect. Instrument Works
PENACOOK, N. H.

58-16

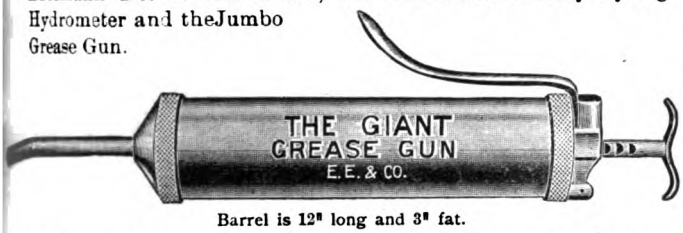
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A NEW ONE AND A GOOD ONE

GIANT GREASE GUN

Fresh from the Workshops of E. EDELMANN & CO.

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Barrel is 12" long and 3" fat.

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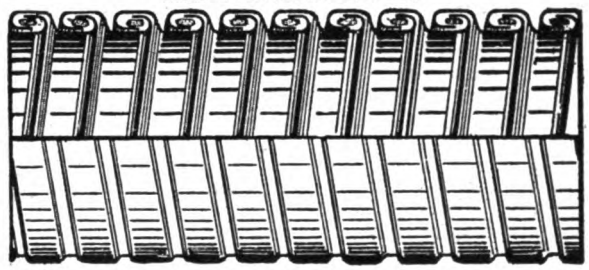
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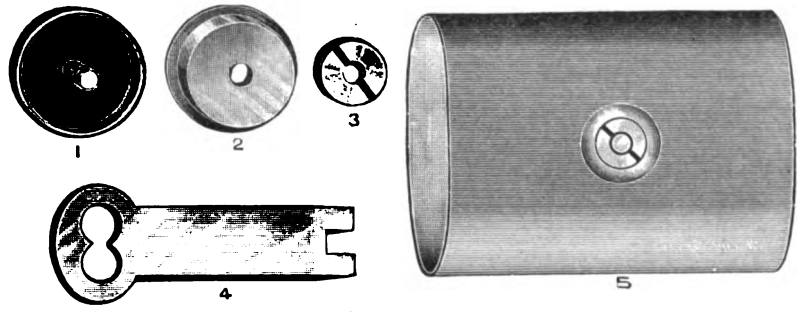
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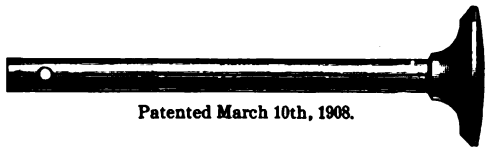
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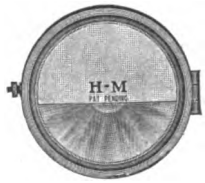
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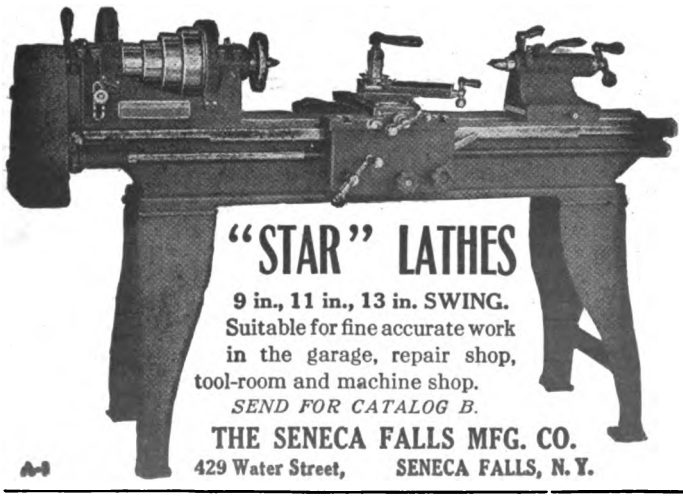
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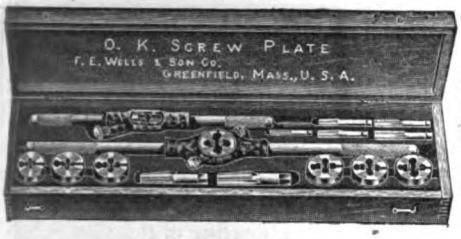
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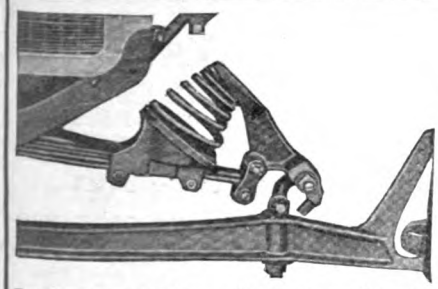
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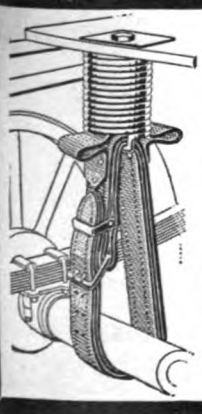
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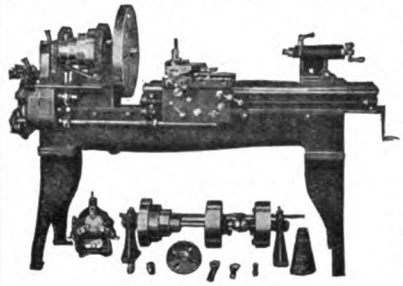
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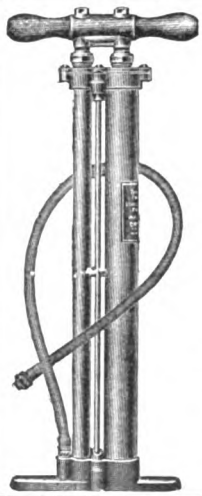
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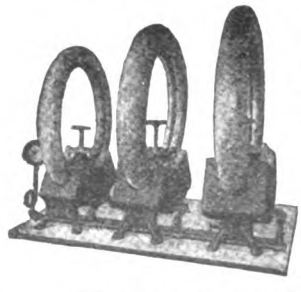
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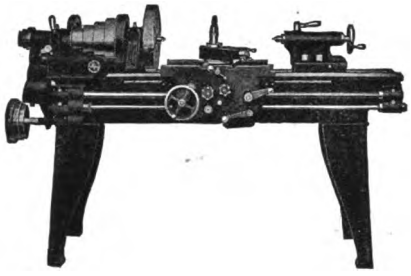


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VOL. XIX, No. 2. NEW YORK, APRIL, 1915. PRICE { 10c PER COPY / $1.00 PER YEAR

AUTOMOBILE LUBRICATION.

Testing for the Flash Point and the Ignition Temperature.

BY SYDNEY F. WALKER, M. E.

There is a difficulty here as to testing the viscosity at higher than normal temperatures. A test at a temperature of say 70° F., everything being kept at that temperature, will be a certain guide; but it is much better to have also a test at higher temperatures, at least up to that of boiling water. The writer suggests that this again would not be difficult. The inclined plane might form the upper surface of a small boiler, as suggested in Fig. 22, and the water might be raised in the boiler, to any temperature desired, up to boiling point; and by adding the equivalent of a small safety valve, so that the pressure could be increased above boiling point, the temperature of the plate could be increased up to 300° F. or so, with perfect safety. Fig. 23 shows a similar apparatus heated by an electric current. The inclined plane in this case would of course be of metal; and the writer suggests that it would probably be best to have the inclined plane in any case of metal, preferably of copper, as its surface is more easily kept in the same condition. By using a copper plate also, a certain range of temperature could be obtained, by fixing a Bunsen burner under the plate, and heating the plate up. Fig. 24 shows this suggestion. Of course the above suggestions are very crude; but they are intended as workship guides. In manufacturing and repairing works, except in the case of very large establishments, there is not room for a separate testing plant; and the prices obtained for the work usually will not allow of the expense. On the other hand, it is of the utmost importance that every manufacturer of an automobile, every dealer in automobiles, and every repairer of automobiles, should have some method of testing oils that are offered to him, and of ascertaining quickly, whether they are suitable for the engines that are going through the works; the engines that a dealer is selling, or the engines, etc., that a repairer is handling. Probably the above suggestions will only be in the light of what Americans so expressively call "pointers," to mechanics and others employed in automobile work. An idea once mooted, is capable of being carried out in a number of different ways. Every manufactory, every dealers' warehouse, and every repairing establishment, has its own features; its own way of doing everything; and once the idea is given, it is probable that it can be worked out by those on the spot, in such a manner as to enable tests to be made quickly and well.

The writer understands that one large firm of motor car builders in France have practically acted upon the lines of his suggestions given above, but with their own laboratory appliances. They tried every lubricant that was offered them, some 300 in all, and then, none of those offered satisfying their requirements, they thrashed the problem out themselves, making their own blend.

As everyone who buys oil knows, travelers in oil are the most persuasive of individuals. In the old country, numerous jokes are made about oil travelers, and numerous tales are told of their persuasiveness, and of their methods of getting hold of the boss. There are so many of them on the road in the United Kingdom, that managers of works who must use oil, but who are necessarily busy men, fight shy of them. Securing orders for oils is by no means an easy matter, owing to the keen competition among oil firms, and particularly among oil travelers; and it has led to the development of what

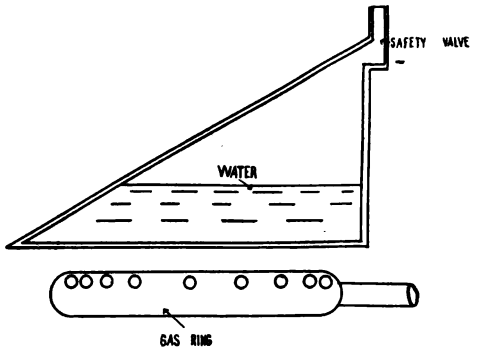


Fig. 22.—Diagram of a metal inclined plane, arranged for testing the viscosity of oils, the inclined plane being heated by a boiler formed under the plate itself, and the boiler being heated by gas.

may be termed a race of oil travelers, whose persuasiveness, and ability for securing interviews, is almost superhuman. Such tales for instance as the following are common in the old country. The principal office of a very large firm of coal owners, was as usual at the shipping port, and their manager, a somewhat fussy individual, and also fairly snobbish, was seated in his room. An oil traveler was the very last man to whom he would have given an interview, but happening to go out of his room for an instant, he found a very venerable looking gentleman, beautifully dressed, with a silk hat polished almost so that you could see your face in it, his coat, boots, tie, etc., of the latest fashion, yet with absolutely nothing of the dude, or man of fashion about him; and with everything about him speaking of the comfortable commercial man, the man who had evidently come to give an order for a good many thousands of tons of coal. Before the snobbish little manager knew what he was about, he had bowed the elderly gentleman into his private sanctum, had shut the door from all intruders, had taken precautions not to be disturbed, and then turned round beaming upon his supposed customer. His surprise and rage may be imagined, when the eminently respectable "buyer" (?) produced samples of oil.

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The writer believes that the snobbish little manager actually gave that man an order.

Another tale that may perhaps be interesting, that was told the present writer by the manager of another large firm of colliery owners in the Midlands. He went one day to visit a brother manager at another colliery. As he passed the manager's office, he saw him sitting at his desk; but when he reached the office, he was assured that the manager was out, and all sorts of proofs were given him that he had gone down the mine some little time back. By a lucky chance, the writer's friend happened to know one of the men in the outer office, and told him who he was. "Oh! Mr. ———, the manager will see you of course; he thought it was one of those oil men; you are very like him."

The Flash Point.

The flash point is usually made a great deal of, and particularly by oil travelers. One of the first things a persuasive oil traveler will state is, that the flash point of his lubricant is a certain figure. He is usually perfectly safe in saying this, as very few users have any means of checking his statement. The actual flash point is a matter too that oil manufacturers, and oil blenders, are very much divided over. Some recommend a lubricant of high flash point for internal combustion engines, including of course motor car engines, while others maintain that with too high a flash point there is a greater tendency to the deposit of carbon than with a lower flash point.

By flash point is meant the temperature at which an oil gives off sufficient vapor to ignite momentarily, on the introduction of some source of heat of sufficiently high temperature. Like so many other qualities, the flash point may be almost any figure, within certain wide limits, unless special precautions are taken to confine the oil that is being subject to test, and to screen it from all outside influences. As readers hardly need reminding, when any oil burns, as it is called, it is not the oil itself, in its liquid state, that enters into combustion, but the vapor which is given off from its surface. Everyone who has used oil lamps, and even candles, is familiar with the fact that it requires a little time before the lamp, or even the candle will ignite, after the flame of a match has been applied to them. The reason of this is, that a certain quantity of heat must be delivered to the fat or oil, in order that a certain portion of it may be converted into vapor; and it is this small quantity which ignites; and its continued burning liberates sufficient heat to keep a certain quantity of vapor constantly coming away.

The flash point must be carefully distinguished from the ignition point, or the temperature of ignition. The flash point is really that temperature at which the lamp, or the candle, would commence burning; but for testing purposes, the quantity of vapor that is present and that is ignited by the flame or the spark, is even less than that which is given off by the oil in the wick of a lamp. When an oil is to be tested for its flash point, heat is applied to it, and the emission of vapor is watched for, and is known by its temporary ignition. It is a flash that is sought for; hence its name; not continuous burning. The object sought for in the test, is the temperature at which vapor commences to be given off.

A little consideration will show, that the surrounding conditions will vary the temperature at which vapor commences to come away, and therefore the temperature at which a flash is obtained. Suppose for instance that a certain quantity of the oil to be tested is exposed in a shallow tin, whose surface is open to the atmosphere; and suppose that it is a very cold day, and the vessel in which the oil is held is in the way of a draught of air. It will easily be understood, that the vapor will have very little chance of accumulating in the form required to give the flash. The liquid will have to be raised to a comparatively high temperature, before the vapor comes away in sufficient quantity to give the

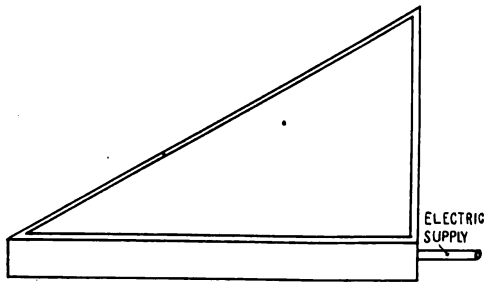


Fig. 23.—Diagram of inclined plane and boiler heated by electric current.

flash test. On the other hand, on a warm day, and if the oil is contained in a comparatively deep vessel, say a tube, the whole thing being in a room where the temperature is fairly high, and where draughts are excluded sufficient vapor will come away very much more quickly, from the same oil, when heat is applied; and therefore at a much lower temperature.

To meet these difficulties in the United Kingdom, various petroleum testers have been introduced. The first one was designed by the late Sir Frederick Abel, who did a good deal of work in the examination of the properties of petroleum. In all of them, the oil to be tested is placed in a vessel, in which a thermometer can be immersed; the vessel containing the oil being enclosed inside another vessel containing water. It is also arranged that a thermometer can be used in the water vessel. It will be evident that the water bath, which is a very old chemical appliance, enables any temperature of the oil to be obtained, that may be desired; and it also enables the temperature to be under control. Great care is necessary in carrying out the test. The apparatus is so arranged, that all draughts are excluded, and the small quantity of vapor first coming away, and forming the flashing test, is caught, so to speak, by the ignition apparatus. One of the best arrangements, in the writer's view, is the invention of an American, and is shown diagrammatically in Fig. 25. In this apparatus there is a metal bath, as shown, standing on feet, and having a cover with a hole in it. In this hole in the cover is placed the oil vessel, which is merely a cup with a lip and a cover. Arrangements are made for inserting thermometers in the water bath and the oil cup. The water bath is raised to 100° F., then the oil cup having the oil in it up to a certain line, is placed in the bath, and the lid closed, the thermometer being exposed outside. The temperature is gradually raised 5° F. at a time, by heating the water bath and the vapor present on the oil cup, if any is given

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off, ignited by a spark passing between two contacts in the vapor space. The tester closes the circuit sharply with a Morse key, and quickly reopens it, each time a test is to be made. It will be remembered that the atmopshere has the property of absorbing vapors; and that its ability to absorb them increases very rapidly with its temperature; but it also depends upon the tension of the vapor already present in the atmosphere. Not a great deal has been done in the way of investigating the ability of the atmosphere to absorb the vapors of oil; but a very great deal has been in connection with the absorption of the vapor of water; and it may be taken that while the quantity of vapor of different oils that can be absorbed varies, and is different from that of water, the same general conditions hold. In addition to the fact that the capacity of the air for absorbing vapors rises rapidly with the temperature, the quantity of vapor already present in the atmosphere, also has an important bearing upon the subject.

The quantity of vapors of all kinds that the atmosphere can absorb at any temperature is fixed; and as that quantity is more and more nearly approached, the ability of the atmosphere to receive vapor from any liquid from whose surface evaporation is taking place, decreases. It is usual to put the matter in this way. The vapor which is issuing from any liquid has a tension of its own, depending upon the temperature to which the liquid is raised. On the other hand the vapor which is present in the atmosphere has also a tension of its own, depending upon the saturation, the percentage of the possible quantity the atmosphere can absorb at that temperature. Of course in matters of this kind, the ability of the atmosphere to absorb vapors is measured by the quantity that a cubic foot of the atmosphere can absorb; the particular cubic foot of course being stationary. As the quantity of vapor present in the atmosphere surrounding the testing apparatus increases, so does the vapor

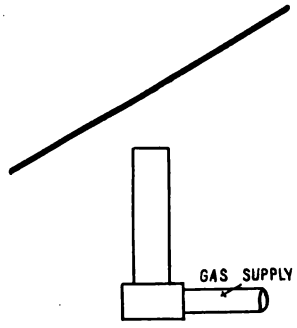


Fig. 24.—Diagram showing a copper plate, as an inclined plane, heated by a Bunsen burner arranged for testing viscosity of oils.

tension; and therefore the ability of the atmosphere to receive vapor, decreases. We are all familiar with the barometer, principally as a guide showing what the weather is likely to be. We say when there is a high barometer, that the weather will probably be fine; while with a low barometer it will probably be wet. The meaning of this is, that with a high barometer, there is very little water vapor present in the atmosphere; while with a low barometer there is a good deal. The vapor of water and the vapor of oils, are usually lighter than air; and so as the quantity of vapor absorbed by the atmosphere increases, so does the barometric pressure decrease. The varying barometric pressure is made use of in correcting the observed flash points of oils.

The test for the flash point is one that can hardly be imitated by any rough and ready apparatus, such as those which have been suggested for other

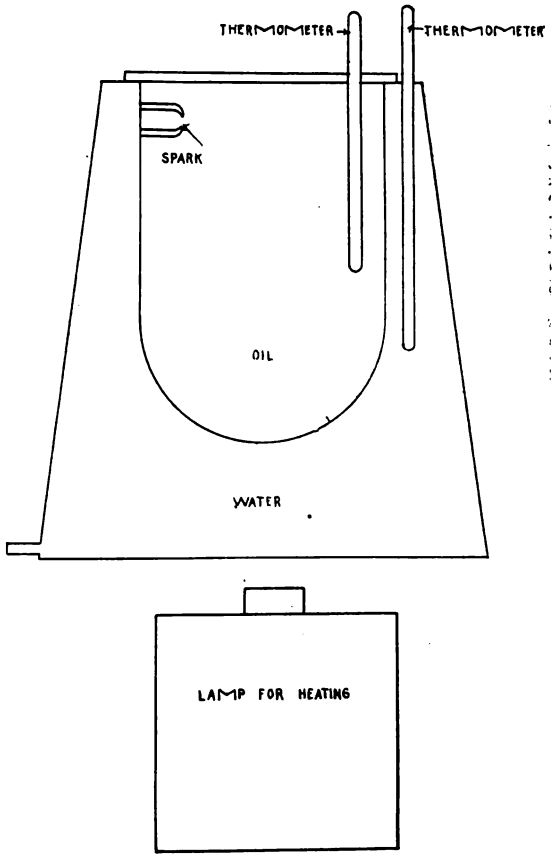


Fig. 25.—Diagram of Saybolt flash point testing apparatus.

tests. It is also very doubtful whether as mentioned above, the flash point is of really any great value, though so much is made of it.

As mentioned above, the flash point must not be confused with the temperature of ignition. The temperature at which an oil ignites under the conditions ruling say in the crank chamber, or in the cylinder, is of great importance. If an oil is employed as a lubricant for instance whose ignition point is below that to which the cylinder walls, or the walls of the crank chamber may be raised, the lubricant will be burnt in place of acting as a lubricant. It should not be forgotten, of course, that all of the substances that are used as lubricants are combustible, and that it is only a question of providing the necessary heat, and the necessary temperature, for them to be burnt up; and for them to leave carbon deposit behind them. It is for this reason that many oil blenders lay such great stress upon the point, that too low a flash point should not be allowed.

By the temperature of ignition is meant of course, the temperature at which the oil will go on burning, just as it does in a lamp.

Again, in the lamp it will be remembered, the

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heat given off by the flame, causes a portion of the oil to be converted into vapor, the oil for this purpose having ascended the capillary spaces in the wick, and being formed into vapor at the outer surface of the wick. In order that the oil shall burn continuously, the temperature must be maintained at a certain figure, and this is known as the temperature of ignition. The temperature of ignition is necessarily higher than the flash point; and it is also subject to the surrounding conditions. The temperature of ignition, or to put it in another way, the amount of heat required to be delivered to the oil, in order to maintain combustion, would be greater, when the oil was exposed to a cold draught for instance, than when enclosed within the comparatively hot crank chamber, and the much higher temperature behind the piston.

(To be continued.)

MAGNETO AND BATTERY.

Some of the Characteristic Qualities of Each and Wherein the Magneto Is Superior.

From A. Henry, Illinois.—Electric lighting and starting equipment as a whole has become so thoroughly developed that its proven reliability, efficiency and self-sustaining qualities make it almost indispensable in the modern automobile.

As a natural result, most car buyers are insisting upon its incorporation in their machines, and the production and marketing of such accessories have become firmly established features of the automobile trade.

The competitive features of such marketing, as also an ill advised attempt to make a short cut through the mazes of initial and final costs, have in some quarters introduced a disregard for the high practical values of certain ignition functions long since proven through costly experience to vitally affect engine efficiency, reliability, consistent operation, and the best all round satisfaction.

In order to add the talking point, "multiplicity of functions," as an aid in the selling of their products, some manufacturers of starting and lighting equipment provide at very little additional cost either battery-transformer or combined battery-and-dynamo-transformer ignition-equipment to their outfit. Also, some automobile manufacturers, forgetful of past experiences, adopt such ignition equipment, but solely as an aid in the frantic scramble to reduce to the lowest possible figure the first cost of their cars.

Superficially, it appears to such manufacturers and to the inexperienced buyer as well, that the slightly higher cost of a thoroughly reliable true high-tension magneto is no longer desirable, seeing that starting and lighting equipment necessarily involves the use of a relatively large capacity storage-battery, this being recharged at all times when the engine is running, and which, with merely nominal operating care, never runs down to a point rendering it unfit for use in connection with a transformer or step-up ignition equipment.

The palpable error of such reasoning, however, may be easily proven by a little investigation of the modern trend of magneto and automobile engine design and construction, as also of the characteristics of the various forms of "transformer" or "step-up" equipment as compared to those of the "true high-tension magneto," these being considered electrically, mechanically, and from the practical operation standpoint.

Engine Characteristics.

The modern trend of automobile engine development, not only in the pleasure car field, but for the majority of trucks as well, is toward the small-bore, multi-cylinder, high-rotative-speed engine; which development is progressively rendering less necessary or desirable any provision for battery ignition, even for starting, in connection with the true high-tension magneto, when such magneto is applied.

It is now entirely feasible and practical to eliminate from the ignition equipment all provision for battery starting, depending entirely upon the "independent" H. T. magneto for starting by hand-cranking four-cylinder engines of four inches bore or under four-cylinder engines of three and five-eights inches bore or under, in the pleasure car field where the ladies often do the cranking; and in

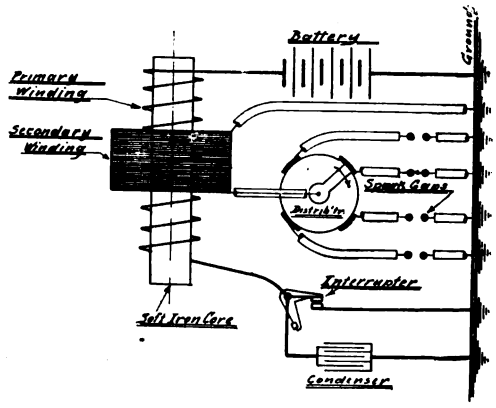


Fig. 1
Battery System.

the motor truck line, four-cylinder engines of four and a quarter inches bore, and six-cylinder engines of three and seven-eighths bore and under.

Modern motor characteristics in fact tend strongly to accentuate rather than to diminish the need for the true high-tension magneto, in reference to any form of the transformer or step-up systems.

Though such starting on the magneto alone by hand-cranking is therefore rendered easy at all times on practically all but the very largest of modern cars, by virtue of the present small-bore trend of engine design and by the adoption of sufficiently high capacity magnetos, the fact that few cars are nowadays produced without an electric motor for starting purposes renders such hand-cranking a practically obsolete performance.

The electric motors provided for starting purposes are as a rule able to spin four-cylinder engines at 150 or more revolutions per minute, and six-cylinders at 110 or more R.P.M. which rotative speeds with four-cylinder engines, on which the magnetos run at crankshaft speed only and with six-cylinder engines on which the magnetos run at one and one-half times crankshaft speed are sufficient to cause the magneto in slightly advanced position to generate an efficient spark for starting on full compression, after which there is no likelihood of experiencing any difficulty, as few automobile engines, once started, can continue to operate

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on their own power at less than 170 revolutions per minute, an efficient magneto speed under heavy throttle conditions.

Owing to the lower resistance of the spark plug gap, sparking conditions are materially aided when starting the motor and when operating at very low speed, as the rarified condition of the throttled charge produces a very low compression pressure for the time being, and the comparatively low voltage magneto current secured at starting speeds is therefore ample to break down the comparatively slight resistance of the spark plug gap.

In practically all motors on which "Independent" magnetos (those not equipped for battery starting) are installed, an advance of from twelve to fifteen degrees or more before upper dead-center when cranking will not cause a back kick at any time for the reason that in order to cause an independent magneto to generate a spark strong enough to ignite the charge, the engine must be turned over at such a speed as will insure the engine's being carried over center against the early spark by reason of the energy stored up in the flywheel at that speed.

In view of the above mentioned circumstances it may readily be understood that the best modern magneto practice prescribes a vastly simpler and less costly ignition equipment than was common two or three years ago.

Though modern motor characteristics have made possible a simpler ignition equipment than that advised three or four years ago, it should by no means be assumed that the true high-tension magneto itself may advisedly be dispensed with in favor of any form of transformer or step-up ignition system, for the reason mainly, that the true high-tension magneto possesses certain qualities affecting efficiency and absolute reliability which cannot possibly be given to the transformer or step-up systems, for constructional reasons.

Battery Systems.

The more common types of battery ignition systems comprise: A timer-distributor, positively driven in a proper relation to the engine crankshaft; a stationary transformer coil containing a soft iron core, a primary winding of relatively few coils of comparatively large diameter copper wire, a secondary winding having thousands of turns of extremely small diameter copper wire; also a condenser made up of many alternate layers of tinfoil and thin insulating material such as mica or waxed paper. (See Fig. 1.)

The battery current usually passes first to ground, then through the "timer," then through the coil primary winding, and back to the battery; the timer cam being of such a length as to permit the battery current to flow long enough to highly magnetize the soft iron core of the coil through the electro-magnetic effect of the primary winding, and the timer (or interrupter) breaking the battery current at the instant when ignition of the cylinder charge is desired; the more rapid the break, the higher the efficiency of the transformer coil as a whole.

The magnetic flux generated in the iron core flows through and between the many turns of fine wire comprising the secondary winding. When the primary (battery) current is interrupted, the magnetic lines of force drop in strength, from maximum to practically zero, and with exceeding rapidity, such drop setting up in the secondary winding an extremely high-voltage, low-amperage current which is passed through a heavily insulated cable to the "distributor," this commutating the high-tension current to the cylinders in the proper rotation.

The condenser serves to take the "kick" of the primary winding when the battery current is interrupted, thus serving directly to prevent excessive sparking at the interrupter platinum points. The magnetic strength of the iron core, and therefore the output of the secondary coil depends, in part, upon the length of time in which the primary current acts; therefore, at high speeds the battery-transformer secondary current is by no means as strong as at low engine speeds.

Combined Battery and Dynamo.

In many of the combined starting, lighting and ignition outfits, the timer-distributor is located on the end of the lighting-and-charging dynamo shaft, or is gear-driven from the same, and arrangements

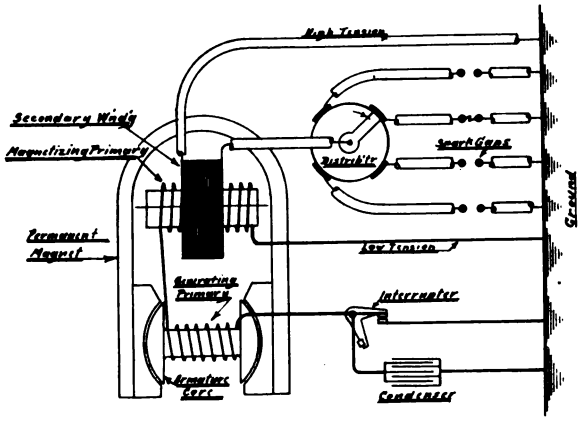


Fig. 2
Step-Up Magneto.

are made to pass automatically or at will, either battery or dynamo current into the stationary transformer-coil primary-winding. In all other particulars such equipment is exactly similar to the above described battery systems.

Transformer Magnetos.

High tension transformer-magnetos are made in many forms, but all of these comprise substantially all of the above described parts, functioning exactly as already indicated, with the exception that, when the engine is running on the magneto, the primary current is not furnished by a battery but is generated in the primary winding, through the action of a soft iron core fashioned into an armature core and rotating between the poles of one or more permanent magnets.

In some forms of transformer magnetos, a "generating-primary" winding is mounted upon the rotating armature core; the secondary winding in such instances being wound over a second primary winding on the soft iron core of a stationary transformer coil. (See Fig. 2.)

In various other forms of transformer magnetos, a single primary winding only, on the stationary transformer coil, is used, the magnetic flux from the

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permanent magnets passing to the central soft iron core of the coil itself through a plain unwound, rotating armature core, which passes the flux on in turn through variously constructed stationary coil core extensions; the transformer or step-up coil being usually located just under the arch of the permanent magnets. (See Fig. 3.)

The transformer or step-up magneto and the combined dynamo-transformer are of course somewhat more preferable to the battery system, as the former types constitute practically inexhaustable sources of current, and as the secondary current from the "step-up" magneto increases rather than diminishes in strength as the engine speed rises.

It may readily be seen, however, that all of the above described outfits comprise nothing more or less than "step-up" ignition systems, and possess substantially the same characteristics as regards the nature of the high tension current produced.

True High-Tension Magneto.

The true high-tension magneto consists preferably of a laminated, soft iron, shuttle-armature core, rotating between the poles of one or more "U" shaped permanent magnets, this armature having wound upon it both the primary and the necessary windings, the secondary forming an extension of the primary, the inner end of the primary being grounded on the armature core, and the outer end of the secondary being led to the brass segment of a "slip ring" mounted upon the armature shaft, and turning with it.

The outer end of the primary besides being joined on to the inner end of the secondary, is also in electrical communication with the insulated side of the mechanically operated interrupter, also to one side of the condenser, the other side of the condenser being grounded to the armature core and to the magneto base. (See Fig. 4.)

The greatest difference in the electrical output of the "true high-tension" magneto and of those of the "step-up" type, is that more than a mere static flow to the spark plugs in the engine cylinders is obtained from the former instrument.

What is termed a "dynamic" flow is generated in the secondary winding by reason of the action of that winding in rotating through the permanent magnet field, this causing a further generation of current (exactly as in a dynamo) which flow is of somewhat lower voltage, but of considerably higher amperage than the static flow.

Though the dynamic flow is not of sufficient voltage to break down of itself the resistance of the spark plug gap, (excepting perhaps at the very high speeds sometimes attained in aero-motors), once the resistance of the gap under compression is broken down by the static discharge, the dynamic flow following immediately after meets with little resistance and also flows across. As the heat of the spark depends upon the amperage passed, that part of the spark caused by the high amperage "dynamic" flow is several times hotter than the spark resulting from a "static" discharge only, and the higher the rotative speed the more powerful the spark, a condition opposite that found in battery equipment.

Electrical Characteristics.

No standard spark plug gap can possibly be prescribed for all automobile engines, as the peculiarities due to differences of compression, location of spark plug, rotative speed, class of ignition accessory used, etc., would render advisable slight differences in that gap in nearly every make of engine.

For average conditions, however, a gap of approximately three-quarters of a millimeter (or about one thirty-second inch) will give good all around results.

The resistance of a gap of three-quarters of a millimeter under about seventy-five pounds compression is about equal to the resistance of an atmospheric gap of from five to six millimeters, depending upon atmospheric conditions.

If a static discharge such as is produced by all types of "step-up" or "transformer" ignition systems be passed across an atmospheric gap of five or six millimeters, an extremely thin white spark only is produced, as in Fig. 5. Should this spark be blown against by a current of air it will bend slightly, but its general appearance will not be changed, as Fig. 6 indicates.

Should the combined static and dynamic discharges of a true high-tension magneto be passed across the same gap, a very different spark is produced, as shown in Fig. 7. In this may be noticed a thin white core, representing the static spark, but this is surrounded by what is termed a "corona," or flame, of great diameter in the middle, decreasing

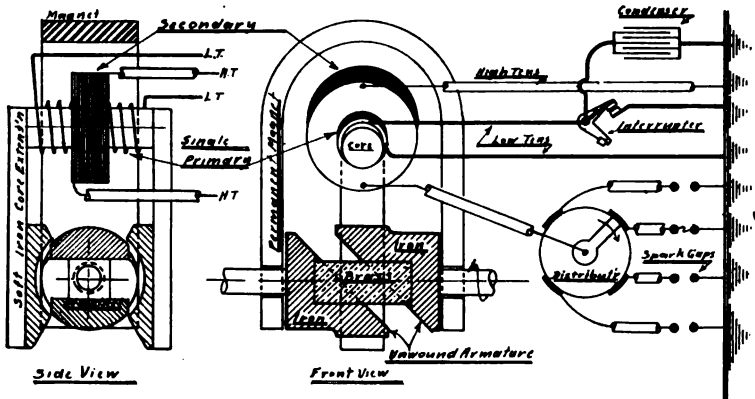


Fig. 3
Step-Up Magneto.

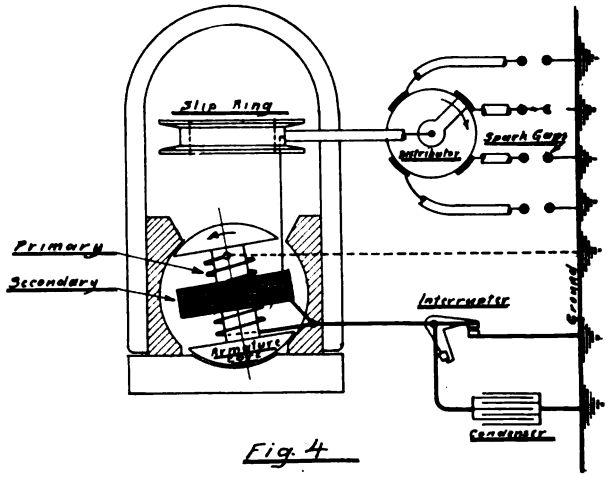


Fig. 4
True-High-Tension Magneto

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to points at the gap terminals. Should this be blown against by a current of air a veritable flag of flame of considerable volume is produced, as in Fig. 8.

The same results are obtained at the terminals of a spark plug gap under compression; and it may readily be seen that the corona type spark will at all times be vastly more voluminous, as well as more productive of heat, than any mere static type spark could be, and at the instant of ignition will ignite a greater number of gas particles than a static spark can ignite. With a greater number of gas particles ignited to start with, a "true high-tension" magneto spark will assure an appreciably more rapid rate of flame propagation in the engine cylinder.

As a result, when compared to engines on which either battery-transformer or "step-up" magnetos are installed, the engine equipped with a true high-tension magneto will necessarily prove to be "snappier," more responsive in traffic, will not require as great a degree of advance under load, will not overheat as easily, and will require less fuel for a definite power output. In traffic or on rough or hilly ground where the rotative speed is liable to great and rapid changes from high to low and vice versa, the carburetor is constantly being more or less upset, giving alternately too rich or too poor a charge, a true high-tension magneto will continue to regularly fire such fluctuating charges when these are absolutely non-ignitable with only the static type spark of the transformer ignition system applied, and the static spark will often missfire even though it is occurring at the spark plug gap with utmost regularity.

Lag.

All battery and dynamo-transformer ignition equipment is subject to a decided "lag" between the

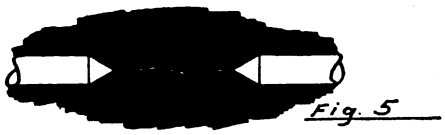


Fig. 5

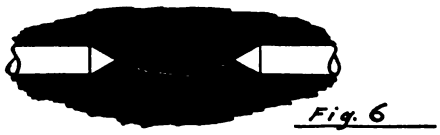


Fig. 6

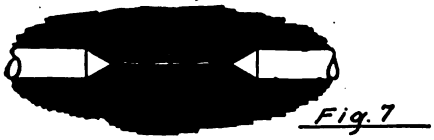


Fig. 7

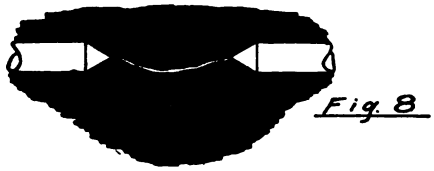


Fig. 8

interruption of the primary current and the occurrence of the static discharge at the plug gap, this lag retarding the spark in the cylinder, and to a much greater extent at high engine speeds than at low, just contrary to what would actually be required.

In some instances this difference of lag at high and low speed in battery and dynamo-transformer systems is found to amount to as much as 12° to 14° when the engine speed is varied from about 300 to 1,800 r.p.m., the timing lever position not being altered meanwhile.

With a true high-tension magneto no lag whatever is possible under any conditions, and with the spark set for a definite degree of advance, that advance will remain the same no matter whether the engine speed is greatly increased or diminished.

Some natural results are that the battery equipped engine, particularly if of the high-speed automobile-type, is by no means as responsive nor as certain in its action, is far more liable to overheating, is not as powerful, is more wasteful of fuel, and requires a great deal more manipulation of the spark-advance lever than is true in a similar engine equipped with a true high-tension magneto.

STORAGE BATTERIES.

Their Construction, Care, Recharging and Why They Often Become Exhausted.

From J. N. Bagley, Nebraska.—Storage batteries have been in use for some time, but many repairmen do not have the slightest idea how they are constructed or how to care for them. A storage battery properly cared for will give good results in nearly every case, and the use of them at the present time is growing so rapidly that it behooves every repairman to get acquainted with them so that he can give them the necessary care when they are left in his care in winter or when they are in constant use. A storage battery will require the same careful attention when not in use that it does when in daily service. In fact possibly more, as when they are in service and supplied with current and with a good generator, about all that is necessary is to keep the connections clean and tight and the liquid at the proper height above the plates. Storage batteries are constructed different ways, but the plan I have laid down in the drawings will make the inside construction plain, as the lines will not vary to any great extent.

We have in Fig. 1, at A, a common form of zinc construction found in the ordinary starting and lighting battery. The zinc plates are made up of thin slabs of zinc A, connected with a continuation of the same metal as shown at D. Then at E, we have a neck of zinc into which a knurled lead screw, F, is screwed to secure the connecting wire to the next part of the battery or to some other part of the machine. On either side of A is a separator B, C, to protect the zincs from coming in contact with each other and causing what is known as a "short." When a battery "shorts" the charge of stored electricity will leak out the same as water would leak out of a bucket if it were pierced with some sharp instrument. The insulating separators are installed as shown at C, across the entire construction. If we place into the spaces another zinc construction we will have the two connected as would two combs if the teeth of each were forced together except that the teeth would be insulated from each other.

In Fig. 2 we have the assembled construction set into a suitable receptacle, generally made of a hard rubber substance or some composition that will not

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be affected by the acid when it is placed inside and around the plates. In the bottom of the reservoir we have at A, a small projection extending an inch above the bottom and holding the zinc construction up from the bottom. The space B acts as a catch for all sediment and scale that will come off the plates, as the battery grows older, and if this allowance were not made the sediment would short the plates and the battery would be worthless until

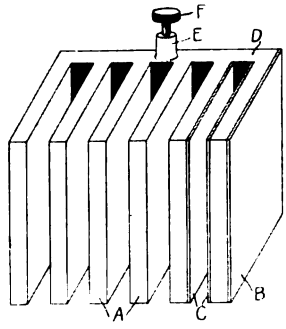


Fig. 1

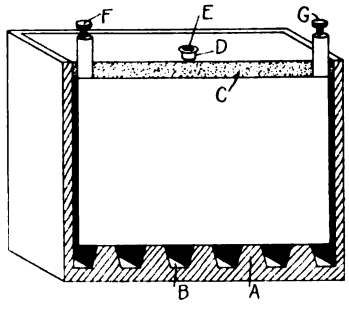


Fig. 2.

it was removed as it would cause a "short" and the battery would lose its charge. Now that the zinc construction is placed and sealed as at C, over the top, we are ready to place the solution of sulphuric acid. The strength of the solution will vary, depending on the battery construction. Before placing the solution, the instructions of the battery manufacturer should be followed very closely. In case the mixture should be too strong it would have a tendency to cause an excessive scale of the plates should not be put in until the plates are entirely covered and should be kept at this level at all times. The filling neck, D, has a small vent hole, E, which should be kept open. The terminals F and G will be the positive and negative poles of the battery and will be known as negative and positive. These should not be confused as on them depend much in charging or repairing the battery.

In Fig. 3 at A, B, C, we have the three cells ready to place in the container which is usually made of

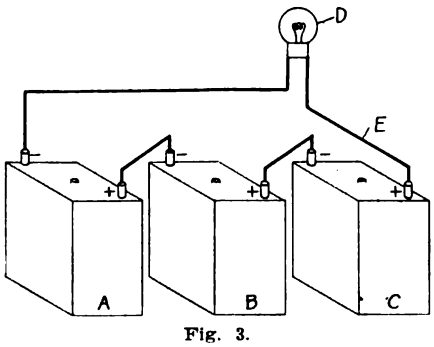


Fig. 3.

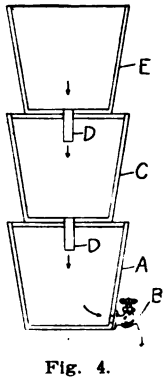


Fig. 4.

soft wood supplied with a couple of handles. After being placed the cells may be united with a sort of wax over and around the top and between the cells, as this prevents their working together or being cracked. The ordinary battery used about the car for starting and lighting is usually a 6 or 7 volt. We will take a six for example, as shown, A, B, C, are 3 cells of 2 volts each connected to give a continuous current to the small incandescent globe D. Now if we place the wire E on the positive post in cell A, we get a dim light with two volts which will have a certain amperage output for a given time. If we take wire E, and place it at positive on cell B, we will have an increased voltage pressure to 4 volts; consequently the size of the lamp can be increased in voltage with the same amperage. Now if we place wire E on the positive of unit C, we have the three cells in series and have increased the voltage to 6 volts, giving still a higher rate of output, as will be better understood by the buckets of water shown in Fig. 4. We have at A a two-gallon bucket of water with a spigot B, which will regulate the discharge of the pail. We will regulate it so that by the time the bucket is empty the first cell A, of two volts, will be discharged. Then we will add another pail C, above with an opening D, into the lower pail A, and this will compare with the second cell B, in Fig. 3. We then add the third pail of water as shown at E, with and opening D, into pail C, making the three in series as in Fig. 3. We thus have 6 gallons of water to discharge through the same opening, which gives a higher pressure with a given output. If the size of the opening B, be larger, the rate of hours in output will be lessened accordingly, and the same will be in case the larger globes are used on the three cells in Fig. 3. We can place globes

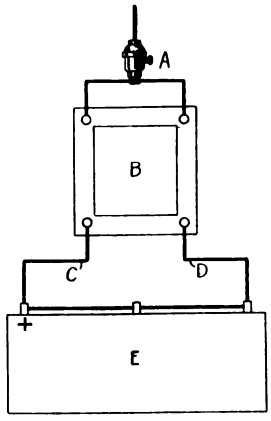


Fig. 5.

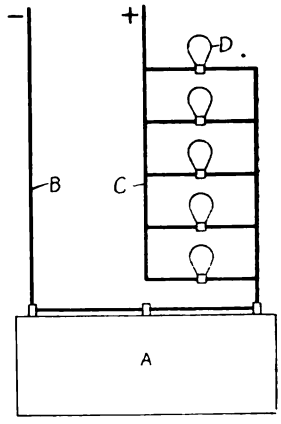


Fig. 6.

to use the current in a very short time or we can place the large spigot to allow the water to flow in the same length of time. After the discharge it will be necessary to charge the battery from an outside source before it will give further service. The pails must also be filled with water again before they have an output. To make plain, this point of recharge will be illustrated in the drawing in Fig. 5. We have at A a common lamp socket in an alternating current. This current cannot be used for charging, as the direct current is required to charge the storage battery, consequently it is necessary to use a rectifier to change the current back, to direct it before reaching the battery. To do this we use what is shown at B, with wires C and D. Place the stripped ends of the wires in a weak solution of sulphuric acid and water and note which of the wires gives off a fine spray of bubbles. This wire is known as the negative and should be attached to the terminal on battery, marked —. The other wire, being the positive and marked +, should be made secure to the post marked so. E represents the complete battery connected to the rectifier for a charge, and the time for the recharge will depend on the make and style of the battery, which will be given by the maker and is usually printed and placed somewhere about the battery.

At A, Fig. 6, we have a battery being charged

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direct from a direct current generator of 110 volts. Now we will take the two wires leading from the generator B and C, and find which is the negative and place it in position. The positive wire will take into its line, as shown at D, a series of incandescent lamps to regulate the amperage before entering the battery. The charging rate will be found stamped on the battery and this should be consulted before making the charge, as it should not be charged other than the rate recommended by the maker.

To tell when the battery had its proper charge, a device known as a hydrometer is used and the same is shown in Fig. 7. It consists of a glass tube A. On one end is a rubber bulb B. Inside the glass tube A, is placed another little tube C, correctly weighted with small shot D, and graduated as at E, to tell the specific gravity of the liquid in the battery. Now by squeezing the bulb tightly and placing the rubber tube F, into the liquid and releasing it, the liquid will be drawn into the tube A, around the inner tube C, floating it, when the density of the liquid over-balances the weight of the inner tube. At the time the inner tube floats, the liquid will hold a line somewhere along the graduated portion E, of the tube C. When the line at which it floats corresponds with the figures on the tube C, the specific gravity will be registered.

At specific gravity 1,120, the battery is practically discharged and will freeze at 20 degrees above zero.

At specific gravity of 1,160, the battery is three-quarters discharged and will freeze at around zero.

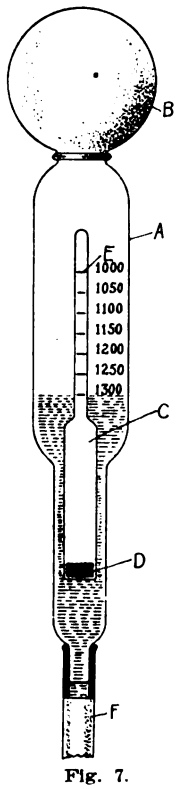


Fig. 7.

At specific gravity 1,210, the battery is one-half discharged and will freeze at about 20 degrees below zero.

At specific gravity of 1,260, the battery is one-fourth discharged and will freeze at 60 degrees below zero.

At specific gravity of 1,300, the battery is considered fully charged and will not freeze in any weather which the battery is subjected to under ordinary conditions.

Many times the battery A, Fig. 3, will show a defect when it looks all right so far as outside appearance is concerned. An internal trouble can be located with a small lamp, B, and a couple of wires, C, D, as shown in Fig. 8. By placing the wires shown in the drawing we will get connection to the one single cell, and if the lamp burns, move the wires over to E and F, and note the condition of it

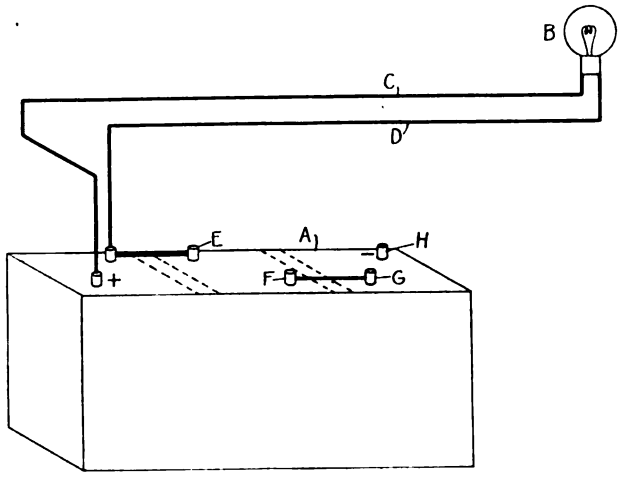


Fig. 8.

as compared to the previous one. If all are the same, move the wires to G and H, and test as before, and if it shows a weakness the trouble is with the last cell tested. If all the cells show a uniform and even light by the means of the lamp, it indicates that the battery A, is in a discharged condition and should be charged at once.

There is a great danger in leaving a battery in a discharged condition for a long period, or if the plates are not entirely covered with the solution, the elements will become sulphated and the capacity greatly reduced. Many times the sulphate can be removed by a prolonged charge at a very low rate, but more frequently destruction of a cell or the entire battery is the result of such neglect and it is best to not run the dangerous chances with the battery.

There are specific causes of battery exhaustion or a partial exhaustion and they can be noticed by the following symptoms, unless some exceptional circumstances are encountered. The lamps will burn brightly for an instant and will sink to a dim red light and remain so, or the starting motor will refuse to turn the engine over. In this case the switch should not be closed, for when the battery is in a discharged condition a slight drain only adds danger of ruin. The starting motor which engaged with the switch separately from the motor will move too slow.

There are a number of battery exhaustion causes which can be laid down as a rule and not as exceptions, and we might mention the following as some of the most common: The dynamo not charging, which might result from a number of causes, such as broken or dirty brushes, open circuit, fuses blown and many other things. The wires may be short circuited or broken, or there may be a short circuit in the battery, which can be found with the test lamp as already described. Drain on the battery by an excessive load which might result from a car standing a great deal on the street after night

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and very little running. The dynamo belt may be slipping in case a belt is used. The clutch may be slipping or the connecting device between the dynamo and driving device from the engine may be broken. An excessive amount of oil placed in the bearings may find its way to the brushed bearing on the commutator and prevent a generation of current, in which case the battery would discharge quite rapidly as no outside source would counterbalance the discharge.

When the car is stored and the battery is not going to be put to service for any length of time, it is a very good plan to disconnect the wires. In case there is a partial short in the wiring, the battery would not suffer for it. The battery should receive a partial if not a whole charge at least once a month when not in use. In case the battery is left in the car and is charged by a small generator driven by the motor, the engine can be started and run a short time at intervals and in so doing the battery will be kept in very good condition; but aside from this, distilled water should be added to keep the plates covered for if they are left uncovered the result will be as already described.

If serious battery trouble develops that cannot be overcome by ordinary treatment it is better to either return the battery to the makers, or at least take the matter up with them, explaining all the details and they will at once advise what to do. A battery should never be torn up by one not entirely competent to handle and make the necessary repair. Never use the ammeter on the battery that is used for testing the ordinary dry cells or there will be use for an additional order for the order book, and there will be a flash inside and a smoke will appear under the dial, and the story is told.

CLUTCH MECHANISMS.

More Points Upon a Most Important Feature of Automobile Construction.

Next to the ignition, the clutch of an automobile gives more trouble than any other part of the car. This is due to the fact that the principle of friction as a locking device is by no means mechanically perfect. Unless used with the rarest skill and judgment, it is bound to get out of order, and when not in good condition it is liable to injure the car. If it is fierce, it is impossible to take up the drive gradually, and great strain is caused to the engine, gear, transmission system and tires. The care of the clutch is an essential factor of good driving. In starting, the clutch should be brought into operation so gradually that the car moves off without the slightest jerk. In gear changing, the clutch action should be sympathetic and should synchronize with the gear-changing effort. There should be no undue hesitation in letting the clutch into operation again, but at the same time this should be effected so that there is no jerk in taking up the drive. In changing up, especially, this is important. If the change is very rapid when changing down, the clutch can as a rule be let right home, for the pace of the car will not be dropped below the speed represented by the gear on to which the driver has dropped. If, however, the driver is unskillful and changes slowly, or if the gears are badly designed or constructed and do not therefore change at once, it is essential that the clutch should let slip slightly so as to take up the drive gradually, otherwise there will be an injurious jerk. On the other hand, if the clutch is slipped too much the car may continue to slow down—in extreme cases to such an extent that the engine will not be able to take the gear without laboring unduly—which may necessitate dropping on to a still lower gear. Also, if the clutch is withdrawn in traffic, so that the pace slows, it should be let in again very gradually. Of if the car is running free downhill, and has attained a greater pace than corresponds with the speed of the particular gear which happened to be in mesh, the same precaution should be observed.

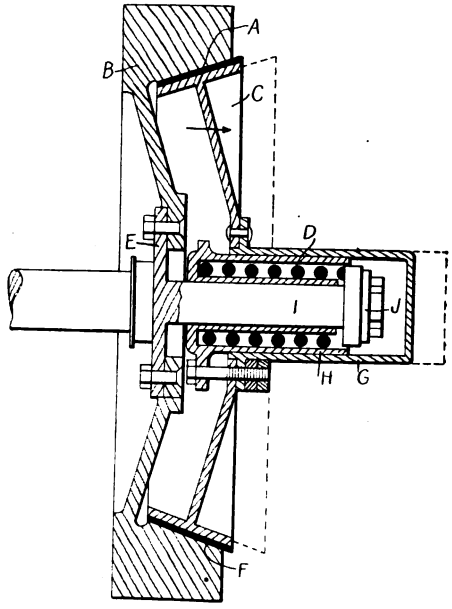


Fig. 1.—Cone Clutch.

Clutch slipping, of course, causes a certain amount of wear on the clutch faces, and consequently should not be unduly resorted to, as when checking the pace in traffic or nursing the car over the crest of a hill in order to avoid the necessity of changing gear. Generally speaking, it is better to change under such circumstances. Properly constructed plate or disk clutches, working in oil, can be slipped to a greater extent without undue wear than cone or expanding clutches. In fact, in the case of some plate-clutches drivers report that they have found it possible by slipping the clutch to run at such a crawling pace on the high gear as would otherwise be impossible without causing the engine to labor, and nevertheless, after a whole season's use, the wear was hardly appreciable.

The multiple disc and the cone clutches are the ones in common use, and there are several forms of each, some of which will be found illustrated and described herewith.

The cone clutch is simple in construction as clutches go, and easily understood. It has but few parts, and there is little liability of its giving any trouble, if used properly and the surface is kept in proper condition. In Figs. 1, 2 and 3 there are shown three types of the cone clutch. These are illustrated to show and make clear to the motorist some important points in the construction of cone

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clutches, and as they are sectional views, one can easily study their operation and the way they are put together. In Fig. 1, we have a cone clutch having a part A, formed integral with the fly wheel B, a corresponding member C, which fits into it. It has a spring D, to give contact between the surfaces. The fly wheel is fastened to a flange E, on the end of the crank shaft. The member C, is of metal, and is faced with leather as shown at F. The part C, is carried by a hub G, which in turn fits over the part H, which bears on the crank shaft extension I. The spring D, presses on the closed end of the part H, and is held by a nut J, on the end of the crank shaft extension. The spring pressure in this case keeps the cone C, seated by pushing it towards the crank shaft. When it is desired to release the clutch, the pedal is operated in such a manner that it moves the cone C, and the part H, away from the fly wheel, and the spring is compressed. Fig. 2 is a cone clutch with its part A, being a separate casting bolted to the fly wheel rim B, which differs from Fig. 1. To operate the cone member C, away from its seat in part A, it travels in the direction of the arrow. In Fig. 1, it is operated in the reverse as shown by the arrow. In Fig. 3 is shown a cone clutch which has friction shoes A, to grip the fly wheel B, before the cone C, is fully engaged, to secure gradual application of power.

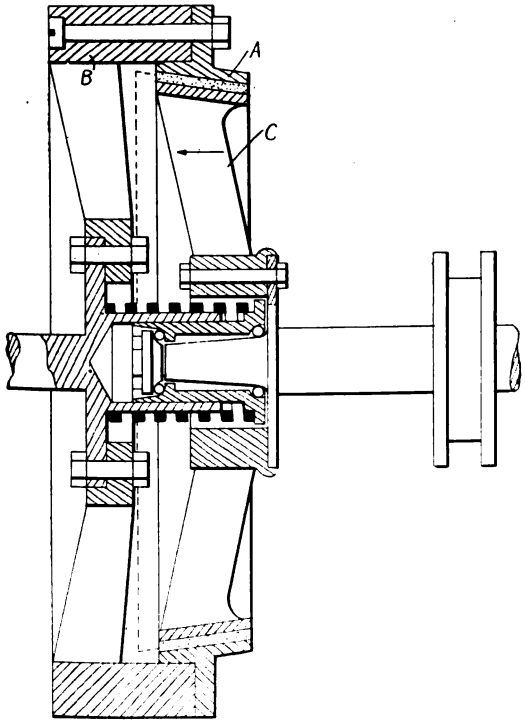


Fig. 2.—Cone Clutch.

There are eight friction shoes used, and spaced as shown in the diagram D. Each shoe extends through an opening in the cone C, and projects slightly above its surface. These shoes are held in place by a spring F. When the clutch is first engaged, the shoes engage the part B, and then when full spring pressure is exerted, it overcomes the resistance of the springs F. When this takes place the shoes will be flush with the surface of the cone member C, which will then take the drive.

A type of multiple disc clutch that is widely employed, consists of a number of soft steel discs which alternate with others of different material as shown at Fig. 4. One set of these discs is carried by a driving drum while the other plates are attached to the fly wheel. Usually the pressure is

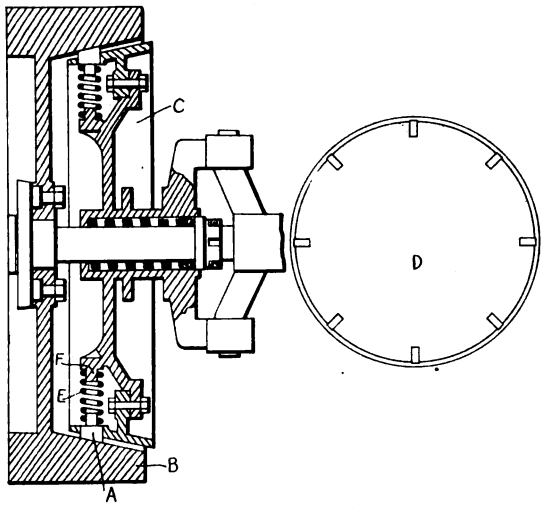


Fig. 3.—Cone Clutch.

obtained by a coil spring. While a multiple disc clutch does not have a tendency to spin, the plates may sometimes refuse to disengage because of a partial vacuum existing between them. This trouble is seldom present unless poor lubricating oil is used between the plates. In the illustration, the clutch case is cast integral with the fly wheel and forms the fly wheel hub. The series of discs marked A, are carried by the driving drum B, and are kept in engagement with those carried by the fly wheel C, by means of pressure derived from the spring D, which is let into a bored out recess at the end of the crank shaft G. The clutch shown is intended to run in oil and a number of the plates are provided with cork inserts. Oftentimes it is necessary to examine the parts marked E, F, as well as the discs A, spring D, etc., for without them the clutch will not work as it ought to and will often be found to be the whole cause of many clutch troubles. The form of clutch shown is in use on Hudson cars, and is simple in construction and operation.

If, when changing speed, the gear misses, depress the clutch pedal again quickly, and the gears will invariably come in at once without causing any jar upon them. When firmly in, the clutch should be let in gently to pick up the momentum that car has lost.

Sometimes when a gear change from a lower to a higher speed has been made, it will be found that the engine commences to thump heavily. This is due to the fact that the change has been made a little too soon and before the speed of the car or the resistance warranted it. The thumping can be instantly stopped by lightly touching the clutch pedal, so that a little slip takes place. The engine then quickly picks up, and the thumping ceases.

Owners of cars with epicycloidal change speed gearing should be particularly careful to change

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their gears gently. As a matter of fact, the amateur driver who is used to sliding gear changing is, for a short time, hopelessly at sea on a car with the type of gear mentioned, for whereas with the sliding gear a quick motion is necessary for gear changing, the other type requires a gradual feeling action for the change. Thus on cars employing epicylic gears, the driver should be careful to apply the brake which changes the gear as gradually as possible, and otherwise the strain on the gear is very considerable, and stripping a by no means distant possibility. Lubrication of the drums is quite permissible, and is usually provided for, but if not, the driver of the car should see that some thin oil is used occasionally to grease the peripheries of the various speed-changing brake drums.

When one has run up to and come to a rest at a point at which it is desired to stop on top speed, a

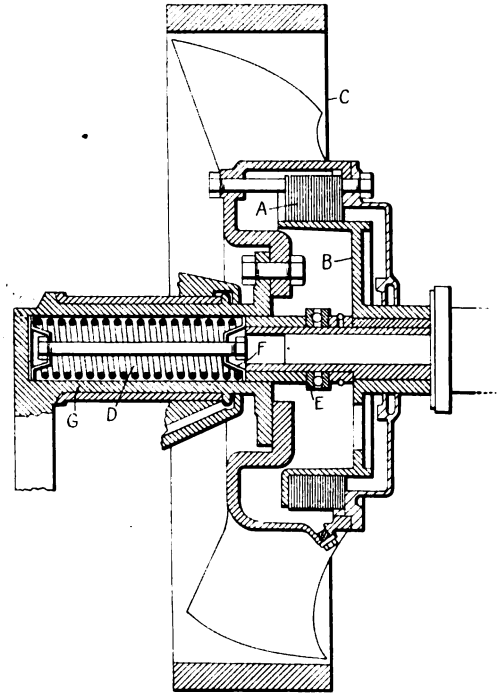


Fig. 4.—Multiple Disc Clutch Assembly.

little difficulty will sometimes be found in returning the change speed lever to the neutral notch in the quadrant. The teeth of the toothed wheels on the sliding sleeve on the clutchshaft do not at the moment exactly coincide with the gaps in the toothed wheels on the gearshaft, and the wheels will not pass each other. Of course, the clutch can be let in slightly, which would alter their position with regard to each other, but not infrequently the teeth still foul. The depression of the brake pedal, however, and consequent grip of the brake bands, or blocks, on the brake drum will, permitted by the slight play in the propeller-shaft, cause the gearshaft to move just enough to permit the passage of the wheels on the sliding sleeve through their fellows, and allow the neutral notch to be at once attained.

This can be done in the garage or anywhere private. Block up the rear axle well and solidly, so that the tires are at least two inches from the ground level, and wedge the front wheels at front and back, with substanial wedges or planks. Start up the engine again, and sit at the steering wheel seat; depress the clutch pedal slightly, and gently work the speed lever to try and bring it into the first speed notch. Probably a grating noise will be heard, and you may fail to get the wheels properly in mesh. Let back the lever to its original position and try again. If the lever goes into the notch, then at once let up the clutch pedal gently, and you will notice the rear wheels will at once commence to revolve. Depress the clutch and they will stop; let it in again and they start. Practice this, and afterward try to get in the next speed higher, first by depressing the clutch, and at the same instant bring the speed lever into the next higher notch, and immediately let the clutch in gently without loss of time. The rear wheels will now revolve faster, and you can then try higher speeds; then practice reducing the gear by doing everything in the same order. While on each of the gears, the engine can be run fast or slow with the throttle and spark levers, as before mentioned. The reverse can then be tried exactly in the same manner, most cars having the reverse and forward speeds actuated by means of one lever. In the exceptions to this rule there is no difficulty in following out the operations to be gone through if the levers are carefully examined and their effect noted when they are operated.

Care of Springs.

Few motorists take the trouble properly to guard the welfare of the springs on their cars. It is, however, a fact that if they do not receive attention occasionally they will not perform their work in anything like the efficient manner that they would otherwise do. The leaves should be oiled every now and then, and about once a year the springs should be taken down and each leaf painted either with graphite or white lead. The coating must not be too thick, but if the springs are properly treated in this way they will not tend to rust, and squeaking will not be apparent; the springs will also perform their work in a much more efficient way if they are properly cared for.

All the steering joints should be properly lubricated, and one should always make a point of testing the steering wheel alignment every month or two so as to ensure that the wheels are not out of track. If they are, considerable extra strain is thrown on the steering gear, and the tires will wear out far more quickly than they would do when running under proper conditions.

Cars in which electrical starting mechanism and a lighting outfit are installed impose extra duty on the driver, and that is the occasional inspection of the wiring to see that there are no loose contacts at terminals or damaged places in the insulation.

Few persons ever think of the ball bearings until some mechanic calls their attention to the injury done by breakage. At least once in six months ball bearings should be inspected, the rough or worn balls replaced with perfect ones, and the ball run filled with graphite grease.

If you will use soft yarn instead of hard-woven thread in mending tears in leather or mohair cloth, the stitches will not tear out quickly.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1574 Misses at High Speed and High Gear.

From M. R. Chappell, Colorado.—I own a Studebaker car, 1912 model, 30 horsepower. I am having some trouble with it on account of it missing or choking when in high gear at high speed, or on a hard pull, or rather a long, steady pull on a hill or steep grade. Also when on the level and I go to speeding up to 20 to 25 miles an hour it will go to missing. I open up the throttle to make it pick up and it will choke or go to missing. I have had new platinum points put in; had the magneto examined and also had the coil examined. Am at a loss to know the cause of this.

Reply.—The fact that your trouble seems to occur only at high engine speed would seem to indicate that the trouble is more likely in the carburetion than ignition, for missing of explosions noted at slow engine speed usually disappears at high speed. It looks to us very much as though you do not preheat the air which is used to atomize the gasoline, the result being that liquid gasoline accumulates in the inlet manifold and valve chests until the mixture becomes too rich. It may be that your carburetor is one of the earlier models without a hot water jacket. In using to-day's heavy gasoline it becomes practically always necessary to use heat to completely atomize it. We think you may find it expedient to use a more modern model of carburetor than the one with which the car was equipped three years ago. There is a possibility, of course, that the exhaust valve springs may be a little weak, rendering their action a trifle sluggish and permitting burned gas to be drawn in with the explosive mixture at high speed. Weak inlet valve springs would reveal themselves by blowing gas back through the carburetor.

1575 Metz Car Troubles.

From W. E. T., Maryland.—1—In a Metz car, 1914 model, with Bosch magneto, and a carburetor bearing the stamp of the Waltham Tool Co., cylinders No. 3 and 4 will fire when the motor is first started, but Nos. 1 and 2 will not fire until the motor is raced, and will stop as soon as the motor slows down. After the motor becomes heated Nos. 1, 2 and 3 will fire pretty well at medium or high speed, and 4 will fire about half the time. All four will fire sometimes on a hard pull until the motor slows down. With a rich mixture Nos. 1 and 2 will sometimes fire on starting. On a lean mixture No. 4 will fire after the motor is warm, but no mixture can be found that will fire all four. The valves have been ground and carbon cleaned out of the cylinder. No. 4 was rather dirty but it was soft. 2.—can you tell me what to do with the Metz friction drive to prevent its slipping. Out of four of these cars here not one clutch can be adjusted so that the drive will start the car up on ordinary grade or out of a "gulf."

Reply.—1—Your trouble is undoubtedly caused by either worn inlet valve stem bushings, poorly fitting piston and rings, or a combination of the two There is little doubt that the piston and rings in the No. 4 cylinder do not fit as they should, judging from the soft carbon accumulation. We do not know this carburetor. Some take a higher vacuum than others to properly vaporize the gasoline, and in such cases they are more susceptible to slight air leaks past the inlet valve stems which do not materially affect a motor's running except the throttle is nearly closed, as when running idle. 2.—A considerably heavier clutch spring might do it, provided it did not cause trouble somewhere else. You could hardly expect us to offer design changes to the manufacturer of a car.

1576 A Missing Cylinder.

From a Reader.—I have a Buick, model B 25, 1913, which has been giving lots of trouble lately. It all seems to be in the back cylinder and spark plug. After cleaning the spark plug it will go only three or four miles and then it misses badly. On removing it I find it very foul. The other three burn nice and clean. The back one sparks fine when first cleaned. I have had the piston taken out and holes drilled in it for the oil to go back through, but it is as bad as ever, worse if anything. The valves and rings are in good shape, the carbon burned out and spark plugs in good shape, and I have cleaned out and put new oil in the crankcase. They claim the wiring is also O. K. It costs a good sized garage bill for them to experiment, but the trouble is still there. There is also a knock in the engine on a hard pull, but they say it is not a carbon knock. Can you give me any suggestions in your next magazine? It has also been tightened up in the crankcase.

Reply.—We do not believe you will be able to remedy the trouble without fitting a new piston and rings to this rear cylinder, and you may find it necessary to have Nos. 3 and 4 cylinders reground and new pistons and rings fitted to both. There are several plants fitted to do this work, the usual charge for this being $10 per cylinder. Regrinding will be necessary if the rear cylinder is badly "scored" or much out of round. The knock may be what is known as a "piston knock."

1577 A Missing Metz Cylinder.

From Bennett S. White, New York.—I have a Metz car, model 1912, 22 H. P., with Bosch high-tension magneto. I have been having trouble and need help as I have tried everything I could think of without perfect results. I will give you the condition of the car and then the troubles. I have just cleaned the cylinder heads, tops of pistons, ground in the valves to good seats, etc. The spark plugs are clean and the porcelains are not cracked. I have had the spark gaps at all distances from .005 inch

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under to .010 inch over 1/32 inch. The distributor brush of the magneto has been reversed, making it like new; the terminal contacts have been cleaned with emery cloth where blacked by arc from the distributor brush; screw No. 2 of the magneto is tight; interrupter parts are clean and freed of oil; platinum contacts meet squarely but are .005 inch further apart than the gauge furnished on the magneto wrench when the lever is resting on cam piece. The cables seem to be O. K.; the gasoline at 60 degrees temperature is 61 to 62 degrees Baume. I use Havoline light and medium oil as advised by the Metz Company. The oil level is only to the indicator cock in the crankcase. The cylinders have about an equal compression of about 25 pounds tangential pull on the crank handle. There is no air leak in the intake manifold; there are new gaskets on the same. In the three seasons of use the car has traveled only three thousand one hundred miles. The valve stems and bushings are only slightly worn, and the carburetor has been tried at all adjustments from ½ to 3 turns. The engine will run with all three cables disconnected from the plugs, but with all plugs connected up, the engine will stop if the two front plugs are short circuited by screw drivers. Short circuiting the two rear plugs in this manner has no effect on the running of the engine. If the front cables are disconnected from the plugs and are not allowed to touch any part of the motor, the two rear cylinders will not fire, but as soon as the front cables are allowed to touch the engine the two rear cylinders will fire. There is a halo around the third plug porcelain, if the engine is all connected up and throttled down. This is a new plug with sound porcelain. All plugs are the extra long Champion, made especially for Metz cars. The fourth or rear plug is always wet and sometimes dripping with oil. The first and third plugs are wholly wet or rather moist with oil but I have never seen any of the plug gaps closed by oil or soot deposit. Oil drips from the muffler occasionally. The exhaust is very smoky, especially when the engine is speeded. When driving the car at 15 miles per hour or more the missing is not noticeable, but when throttled down the car jerks and the engine pounds, due to the irregular firing of one or possibly both of the rear cylinders. When cleaning the engine I notice that there was some soot coating in the intake manifold; also down in the carburetor.

Reply.—Your entire trouble seems primarily due to poorly fitting pistons and rings, with the cylinders, especially Nos. 3 and 4, probably "scored" or worn worse than the front pair. The only remedy would be to have these two cylinders re-ground and fitted with new pistons and rings. Your abuse of the Bosch magneto could well be used by the Bosch Magneto Company as evidence of its strong design and sturdy construction. The use of emery cloth on the distributor plate was bad enough, but when you remove the plug cables and see that the bored ends do not touch any part of the motor, you were indeed taking desperate chances of ruining the secondary armature winding. Short-circuiting the plugs in the front pair of cylinders, resulting in stopping the motor, shows that the rear pair were not developing much power, not enough to compress the gas in the front cylinders, while short-circuiting the rear pair did not make much difference, as the compression, from your account, in these cylinders must be very poor. While a thin or medium oil may have been correct for the engine when new it is manifestly unsuitable now. While you are having the two rear cylinders reground and fitted with new pistons, our advice to you is to have all four attended to in order to get the same lubrication results in all four. The usual cost of this work is about $10 per cylinder.

The carbon deposits in the inlet manifold and carburetor are probably caused by "back fires," a result of too lean a mixture or improper seating of the inlet valves. If there is any leak of air past the inlet valve stems they should be rebushed. The reason the missing of explosions is more noticeable when throttled below fifteen miles per hour is because the throttling causes an increase of vacuum in the cylinders sufficient to draw oil past the ill fitting pistons and rings, and this soots the plugs causing missing of explosions. You must be using a lot of lubricating oil.

1578 Second Cylinder Misses.

From L. H. Bender, Michigan.—I have an Overland car and the second cylinder misses. That is the only one that does. I cannot feel any difference in the compression. It gets a good spark, the valves have been ground and I have changed spark plugs. It cannot be in the carburetor and be the same cylinder all the while can it? Can you help me?

Reply.—In relation to the missing cylinder of your Overland car, if you are sure it is not due to a defective spark plug or valve, then it is probably caused by a disconnected high-tension wire. This is assuming that the missing is regular and at every impulse of the motor. If it is an intermittent missing the cause is usually a loose terminal connection or it may be due to a valve that is not closing tightly.

1579 Certain Inquiries.

From C. E. P., Iowa.—I am a subscriber to your journal and read the Trouble Department with interest, as I am always willing to learn. Will you answer a few questions through your paper? 1—I have a new master vibrator put on my car. It is manufactured by the New York Coil Company. My car is a model T, Ford, 1913. When I hold the vibrator down lightly the car seems to run smoother and at night the lights will give more light as I use the magneto for light and ignition. It seems to me that the contact is too close. It vibrates all right, but what I want to know is—the motor may run idle all right, but if I contrive a washer on the back of the spring to hold it down a little (as it is the straight flat spring type 1914, I believe) when on a hard pull and the cylinder under full compression, would it throw a spark across the spark plug gap? The upper contact point can go no higher. Will a light contact damage the vibrator or wear the points more? 2—My car leaks considerable grease at the rear brake bands. My motor has been taking more lubrication oil than I think it should. I can hardly keep it at the right height. It will idle and consume very little. Is it possible that the lubrication oil, in going up-hill runs back through the drive shaft housing and thins the grease so it runs out at the ends of the axle housing? I think this is the case with many cars. Do you think it would be advisable to install a new Universal ball cap with a new bear-

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ing, No. 3369, as listed in the price list of parts put out by the Ford Motor Company? If this is the case, it would make a tight bearing and keep the oil in the transmission case. 3—When a Holley carburetor leaks and overflows, how is it remedied? 4—How should the gasoline inlet needle be seated; should it be ground with fine valve grinding compound or would a new inlet needle be best?

Reply.—1—The closer the vibrator is adjusted the more current it will take. Your master vibrator should only be adjusted sufficiently close to prevent missing of explosions. Some careful drivers adjust closely for starting and then slack the adjusting screw a little after the engine gets warmed up. Closely adjusted vibrators use up battery current much more rapidly than if economically adjusted, and use up vibrator contacts more rapidly. 2—You may have diagnosed the case correctly. A new cup and bearing, while not expensive, would prove the correctness of your theory. 3—By renewing, or drying out and re-shellacing the float, or regrinding or resetting the needle valve. 4—Regrind with a little ground glass and heavy oil. Be careful not to revolve the valve completely on its seat. A screwdriver in the slotted head should turn the trick. A new valve would have to be ground to its seat.

1580 **Spark Plugs.**

From E. S. Richardson, Illinois.—I have a T head motor with 4 plugs over the intake valves, getting current from a Bosch magneto, type DU 4, model 5A duplex. Can I put 4 Pecco or Su-Dig spark plugs (as advertised in your magazine) over the exhaust valves, connect them up as directed, using my present magneto, and get as hot and efficient a spark on all 8 plugs as I am now getting on my present 4 plugs?

Reply.—The manufacturers of both the spark plugs named are in every way reliable and their claims are no doubt based upon substantial facts. If they tell you that their spark plugs will give as hot and efficient sparks on all 8 plugs as you are now getting on your 4 plugs, you may be sure that they have reason for their claims. We are inclined to think likewise that they are willing to guarantee whatever they state. We don't see how you can ask for anything more.

1581 **A Tight Fit.**

From B. R. Dixon, New Jersey.—I have just finished putting new rings in each piston and closed the bearings. Had my magneto (Splitdorf) overhauled and battery recharged. I cannot crank the engine with all of the spark plugs in and I think I will have to have the car towed before I can get the engine started. When I crank the engine with three plugs out, the gasoline spurts out of the breather tube of the carburetor, not constant, but once or twice for each revolution of the crank handle. My car is a 4 cylinder Buick, 1912. I also had the valves ground by a machinist. The carburetor was O. K. before I put the car away in July. My carburetor is a model L Schebler. I have asked several men who are well informed (or who claim to be) on the construction and operation of auto engines but this is a new one to them.

Reply.—You have probably fitted the rings too closely, leaving an insufficient space at the point of parting, or you may have fitted the bearings so closely that they grip the shaft. The blowing back through the carburetor is due to the inlet valves not seating properly, and may be a result of getting some of the grinding material into the inlet valve stem guides. What you style the "breather tube of the carburetor" is probably the auxiliary air opening.

1582 **Not Generally Known.**

From R. H. Dickson, Washington.—Kindly give me the following desired information: 1—What is the specific gravity of the gasoline in common use to-day? 2—What is the number of heat units per pound of the same gasoline? 3—About how many pounds below atmosphere is the pressure in the intake manifold of such cars as the Cadillac, Buick, Overland and Ford, with throttle wide open? 4—What is the compression pressure in the above mentioned cars? 5—Was it due to having double intake valves, thus giving easy ingress of the gas to the cylinders and thereby increasing the horsepower slightly, that the French cars were able to defeat the American cars last year at Indianapolis? 6—What is the rated horsepower of the starting motors on the cars mentioned in question 3 (except the Ford)?

Reply.—1—Probably from 56 degrees Beaumè, equivalent to a specific gravity of about .753 to 62 degrees Beaumè, correspondent to about .729, depending upon the crude from which the gasoline is distilled and the producer. There is a great variation in gravity, and producers will rarely guarantee any particular standard, except of course the 76-degree, which must show at least 74 degrees Beaumè, about .686 S. G. 2—Approximately 19,000 to 19,500 B. T. U. per pound. The lighter the fuel the less per gallon, consequently a gallon of heavy gasoline would contain more British thermal units than an equal quantity of lighter weight petroleum product. 3—Pressure below atmosphere is recorded in inches of mercury vacuum. Your query is indefinite in that the engine might be stopped, it might be racing, or the clutch might be let in on high gear on a hill, in each case setting up entirely different conditions. Even at that no one should presume to attempt to make reply except he had really made such useless experiments. 4—We have no means of knowing. 5—We do not know. It may have been that these drivers were more proficient, that they had less tire trouble or that they were just lucky. 6—We do not know. The manufacturers of the starting systems would possibly not tell you anything of their actual power, except that they are of the proper capacity to start the cars satisfactorily.

1583 **Just a Few.**

From Howard C. Porter, Kansas.—1—How are tires measured, inside diameter or outside? 2—Will a 32x3½, a 32x4 and a 33x4 tire fit the same rim? 3—Will 32x4 or 33x4 tires register the same distance on the speedometer as the 32x3½? 4—Under a car weighing 2,200 pounds, what air pressure should each carry? 5—Cannot the 32x4 tires carry less pressure under a car of the same weight than the 32x3½ and yet give mileage in proportion to the price? 6—Will the larger tires ride easier? 7—Would you advise using shock absorbers on a car, and will a car equipped with them ride easier

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than one not so equipped? 8—Would you advise using them on the front springs and will such use give greater ease of riding for the passengers? 9—Please tell me how I may ascertain the number of pounds pressure exerted per square inch on the piston head in different length strokes in internal combustion engines. 10—Will not the following give the exact horsepower of an engine when taken in connection with the engine speed: Energy per square inch in the piston head, times square inches of piston head, times square of half stroke (crank leverage) divided by the number of required times to be lifted to make one horsepower? 11—If this will give the actual horsepower, please carry out the formula for a 3x5 engine; also 4x4½ engine. 12—Will not the energy exerted per square inch of piston head be more in proportion in a 6 inch stroke than in a 4 inch stroke engine? 13—What are the advantages and disadvantages of a long stroke motor? 14—A short stroke motor?

Reply.—1—Outside. 2—Usually. 3—Speedometer will register lower on 33-inch tires, if correct for 32-inch. 4—The pressure advised by the manufacturer of the tires used. 5—No economy to run tires under-inflated. 6—They should. 7—If we could afford the luxury, we certainly should, and then select the very best in the market. 8—Front and rear. 9—The maximum pressure is approximately four times the compression, absolute, the gauge reading being 14.7 below absolute. Thus with 80 pounds gauge compression, the absolute would be 94.7, and the absolute maximum approximately 378.8 absolute, or 317.1 gauge. By the succeeding queries we judged that you probably referred to the mean or average effective pressure exerted against the piston during the power impulse. In low or medium speed steam engines this is easily computed by means of a planimeter, from indicator card readings, and from the mean effective pressure thus obtained the indicated horsepower is learned. The brake or developed horsepower should be less than the indicated horsepower. In high speed gas engines the indicated horsepower is rarely considered, such power measurements being expressed as brake or developed horsepower. The mean effective pressure in this case is therefore computed from the brake horsepower; or in other words, the only practical and dependable method of finding this factor follows knowledge of actual horsepower at some fixed number of revolutions per minute. The four factors necessary to compute horsepower are mean effective pressure, length of stroke, area of the piston and number of impulses per minute. If the horsepower is known it is a simple matter to compute the actual net mean effective pressure. In fact if the speed factor is unknown, and the others are known, including the horsepower developed, it would be a simple problem to compute the speed. 10—You have not the correct formula. It should be the mean effective pressure in pounds multiplied by the length of the stroke in feet, multiplied by the area of a cross section of the piston expressed in square inches, and again multiplied by the number of power impulses per minute, this final product to be divided by 33,000. 11—Not knowing the speed, the number of cylinders, whether two—or four-stroke-cycle, and either the horsepower or mean effective pressure, this would be quite impossible. Assuming the mean effective pressure to be 78 pounds per square inch, the engines both four-stroke-cycle of four cylinders and the number of revolutions, 1,500 per minute, the 3 by 5 horsepower computation would be $78\times5/12\times(3\times3\times.7854)\times3{,}000\div33{,}000=20.88+$horsepower, and the 4 by 4½ $78\times5/12\times(4\times4\times.7854)\times3{,}000\div33{,}000=37.12+$horsepower. The above assumes that the bore is respectively 3 and 4 inches and the stroke 5 and 4½. By reversing these it may be noted that the horsepower would be different, thus: $78\times3/12(5\times5\times.7854)\times3{,}000\div33{,}000=34.80$ horsepower, and $78\times4/12\times(4\frac{1}{2}\times4\frac{1}{2}\times.7854)\times3{,}000\div33{,}000=37.59+$horsepower. 12—The average mean effective pressure should be less, theoretically the total energy being the same, dividing the total in the former case by six and in the latter by four. 13—Smaller bore, smaller valves which are less liable to warp, less number of revolutions to get the same piston speed, fuel economy, "sweeter" running, and possibility of greater speed flexibility, are a few of the claimed advantages, while among the disadvantages usually advanced are excessive height, possibly excessive piston speed, shorter life, etc. 15—Just the opposite to the reply in query No. 14.

1584 **Impossible to Say.**

From H. H. Hoover, Colorado.—I was coming home from town one day and my engine wasn't hitting good and so I stopped the car, but not the engine, and was working with the vibrators to see which cylinders were missing, when the engine stopped. I cranked the thing but it wouldn't start and I couldn't get it to start. I telephoned back to town and had some batteries brought out and put them on, but nothing doing; I couldn't get the vibrators to sing. I cranked and turned and looked but it wouldn't go. I finally hitched to another car ahead and started off with it. I threw the clutch in and after we went about 20 rods it started up. I untied it from the other car and went on home. If I have made it plain enough to you for an answer, what was the matter? I had plenty of gas and could get a spark from the magneto into the engine but not through the plugs or the vibrators.

Reply.—We do not know the cause of your trouble. Had you told us what car you were driving, or trying to start under its own power, we might have advanced some possible cause. Clouded queries and insufficient information make unsatisfactory replies, not only to those in trouble but to those who might otherwise profit from your experience and our assistance.

1585 **His Chalmers Four.**

From Seymour H. Howell, Pennsylvania.—I have a Chalmers four, which I have only run about eight or ten hundred miles, and I have experienced considerable difficulty with the second gear slipping out of mesh on hard pulls. 1—How can you prevent the grease from leaking into the brake-drums from the rear axle? I have fitted new felt washers in the same but the trouble still continues. 2—How can I remove the rear axle shafts from a three-quarter floating axle? 3—Will the Leak-Proof piston rings give better satisfaction than the regular one-piece rings?

Reply.—There must be something radically wrong with your transmission if the second gear slips out on a hard pull. You should have this attended to at once else it may result in a serious

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accident to the entire gear set. 1—If the grease is forced out by expansion due to heat, a small hole to relieve the pressure may be drilled into the top of rear axle housing. 2—Write to the manufacturer of the car for full information for disassembling or assembling the axle, and then follow instructions religiously, otherwise you may get into serious trouble. 3—It depends upon various conditions. If the motor is new and the regular one-piece rings are properly fitted and the cylinders are true you probably would not note any difference. In cases where the cylinders are worn Leak-Proof rings have been used very satisfactorily. It is cheaper to put in new Leak-Proof rings than to have the cylinders reground and new pistons and rings fitted and unless one or more cylinders are badly scored their use may obviate necessity of the much more expensive procedure.

1586 **Electric Horn Power.**

From W. B. Oelenschlager, Pennsylvania.—Are there any electric horns made that will operate satisfactorily on Ford cars, using the current from the Ford magneto? As I understand, the current from the Ford magneto is alternating and the voltage output is 12 volts. The standard makes of electric horns are only wound for 6 volts. I have installed a Bosch high tension magneto and I want to use the current from the Ford magneto to operate the horn. Any information that you or any of the readers of this magaizne can give me as to your experience on this matter I will appreciate very much.

Reply.—If you will connect a 6-volt lamp in series with your horn, and you are willing to try the experiment, you can easily find out. We think you would be playing safer to write to the manufacturer of the horn. We have had no experience such as you would like recounted, but know of no reason why a 12-volt alternating current such as the Ford magneto furnishes, would not operate the horn with a 6-volt lamp in the circuit, equally as well as a 6-volt battery of dry cells or accumulators. But you should not forget that this magneto was not designed for such purpose.

1587 **Oxygen for Carbon Cleaning.**

From Newell F. Resseguie, South Dakota.—Has anyone tried cleaning carbon from an engine by running it and feeding in a little oxygen gas at the same time? If this oxygen is explosive enough the engine could be run on it alone and this should clean the whole system without injury, spark plugs, valves and even the muffler, to a certain extent. This has been on my mind for some time but I haven't had the wherewith to try it.

Reply.—We do not know whether just the method you suggest has been employed for the purpose, but oxygen is largely used to-day for burning out carbon. Maybe some of our readers will tell of their experiences.

1588 **Two Cycle Engine Timing.**

From A. P. Fiedler, Illinois.—1—Can you give me, through your journal, the correct timing of the gas distributor on an Elmore 50 horsepower, 4-cylinder, 2-cycle engine, model 37A, built in 1912? This engine does not idle slowly but if two cylinders are short-circuited it runs very slow and steady. 2—Please explain how I can wire a switch from the driver's seat to a K. & W. magneto to short-circuit two cylinders. 3—What makes a 2-cycle engine idle fitfully on a closed throttle when running on four cylinders?

Reply.—1—One of the principal defects of two-stroke-cycle design is inability to idle slowly. When you short-circuit two cylinders you put a load on the two others, as it takes a considerable power to compress the gas in these two idle cylinders, necessitating larger charges in the other two. Therefore while we cannot give you the correct timing of the gas distributor of an engine that is now well nigh forgotten, we believe you must have it approximately correct. 2—If we knew which model of K. W. magneto you are using we might help you, but we think you would have considerable of a task to short-circuit two of the high tension plug cables by means of a switch, or rather a hard proposition to not short-circuit these two cables when you desired to operate all four cylinders. If you have a four-unit coil you could easily short-circuit two of the primary wires leading from the timer to two of the units of the coil, but very few cars outside of Fords to-day use four-unit coils. 3—Want of speed flexibility, due in turn to the fact that approximately one-half the amount of gas is fired twice as often as in a four-stroke-cycle engine, and that insufficient gas is driven into the combustion chamber to rid it of the burned gas. Leak of air into and gas from the primary compression spaces makes an old two-stroke-cycle engine run idle more fitfully than even when new.

1589 **Valve Grinding.**

From A. B. Gentner, Kansas.—I have a Studebaker, which has given me much excellent service, but I undertook to grind the valves myself and didn't get a perfect seat on two of them. I used a Kellogg grinder and a two grade compound, coarse and fine, and I ground them till the pitted appearance was all gone, first using the coarse and then the fine, but I did not get them so they were perfectly air tight. 1—Can you tell me what my trouble is and if I could use anything better than the beforementioned? 2—Is there any way of telling which valve is leaking, the intake or the exhaust, except just listening carefully?

Reply.—1—It is rare that a coarse grinding compound is necessary for grinding in valves. If used at all it should be used carefully and sparingly. The valve should never be rotated a full turn on its seat with valve grinding compound on it. It is best to lift the valve every time the valve is turned back and forth in order to prevent the forming of ridges or scores. If the valve stems are bent even so slightly you can never get a true seat. We make it a practice of never expressing ourselves as to the relative merit of any accessory or tool, consequently this part of your query is unanswered. 2—The experienced person can tell when a valve seats properly by its appearance. It is not infrequently that reground valves will be found to leak worse than before regrinding, as a result, of course, of inexperience and lack of knowledge of the proper method, tool and grinding material.

1590 **A Troublesome Cylinder.**

From E. E. Vorenberg, Florida.—I have a 1914

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model Herreshoff, equipped with Westinghouse starting and lighting system and Stromberg carburetor. I have recently had it overhauled and motor cleaned out. The piston rings are in good shape and the cylinders are not scored, yet it is almost impossible to keep the intake valve in number 4 cylinder free from carbon. I have to grind it on an average of once a week and always find a small piece of hard carbon under it. I am using a light crystal oil in the crankcase. Can you suggest any remedy for this as I have no trouble otherwise?

Reply.—The piston may fit too loosely in the troublesome cylinder. Using a heavier or thicker oil might solve the problem. After a season's use an oil suitable for the engine when new is quite often too thin for best results as the piston, rings and cylinders become slightly worn.

1591 **Setting Bearings.**

From G. J. Blancett, Nevada.—As I haven't seen anything in your valuable journal lately in regard to setting up and scraping bearings, I am taking the liberty to ask you to give us a little space as to the correct way this particular piece of work should be done to insure long life and still be free from knocking. In scraping the bearings I rub Prussian blue on the crankshaft and then bolt on the cap and revolve the crank a time or two. I then remove the cap and keep scraping off the blue till the babbitt shows all blue. 1—Is that the correct way? I have been told I shouldn't scrape the blue but I should scrape the white spots. Now which is right? I seem to have good bearings. 2—Is it a good idea to fit a bearing and use paper shims? Is the paper as durable as the brass liners? Please go into detail as to the correct way this should be done.

Reply.—1—Your method of fitting bearings is the proper one, but only a suspicion of Prussian blue should be used, and the bearings should be relieved at their parting on both sides, so the shaft or journal does not touch for at least one-sixth the circumference or periphery to prevent binding at the side, and fillets, or round corners should never touch the bushing. 2—Brush copper or thin brass is far superior to paper, which is liable to burn out should the bearing heat up any.

1592 **Mathematics Trouble.**

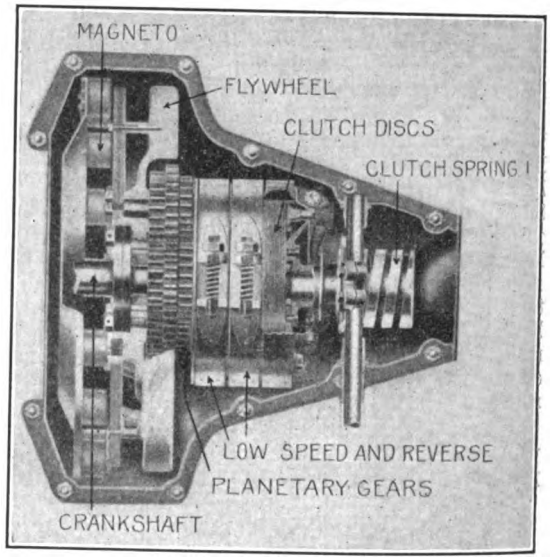
From Max. Rahr, Jr., Wisconsin.—When two cars are running at the same rate of speed in miles per hour which of the two engines has the slower piston speed, the one engine of 4-inch stroke, 4 to 1 gear and 32-inch wheel, or the engine of 4½-inch stroke, 3.75-inch to 1 gear and 34-inch wheel. Kindly also explain the method used in figuring the above.

Reply.—In running one mile, or 5,280 feet, the 32-inch wheel would revolve $5,280\times12\div(32\times3.1416)=630.3$ times; the engine being geared 4 to 1 would revolve $630.3\times4=2,521.2$ times, and the piston travel would be, for one mile, $2,512.2\times4\times2\div12=1680.8$ ft. With the 34-inch wheel, the wheel revolutions would be $5,280\times12\div(34\times3.1416)=593.1$; the engine revolutions $591.1\times3\frac{3}{4}=2,224.2$, and the piston travel for one mile would be $2,224.2\times4\frac{1}{2}\times2\div12=1,668.2$ ft. The piston speed would therefore be slightly less in the 4½-inch stroke engine with the 34-inch wheels.

1593 **Planetary Transmission.**

From John P. Hood, Michigan.—Will you kindly illustrate the operation of the Ford planetary transmission in the next issue of your magazine? I thank you in advance for the favor.

Reply.—The two speed and reverse planetary gear employed on the Ford automobiles can perhaps be best understood by the accompanying illustration. This is an easily operated form of speed gear and is naturally popular on small cars. It provides a positive drive and as the gears are always in mesh they cannot easily be injured by careless shifting. In the Ford transmission the clutch which propels the direct drive is composed



Ford Planetary Transmission.

of steel discs and is kept in permanent contact by means of a heavy coil spring. The low and reverse speeds are obtained by tightening the external contracting clutch bands. They are shown in the illustration between the gearing and the disc clutch. The Ford instruction book will probably give you more complete information and we would advise you to send for it.

1594 **Standardized Parts.**

From S. A. McLean, New York.—During the process of separating my car, I have frequently to remove bolts, etc. If I send to the manufacturer I have to pay the long price besides delay in getting parts. I should like to know where in New York I can buy spring shackle bolts drilled and tipped for grease cups, etc. There are so many of these used nowadays they ought to be standard goods.

Reply.—Spring shackle bolts have never been standardized, either in length or diameter. In the best cars these bolts are case-hardened and ground, consequently expensive to manufacture. Except your car is one of which many are yearly turned out, auto part dealers and manufacturers would hardly stock them. Ordinary bolts, if S. A. E. standard threads, can be purchased from accessory dealers in many cases. If U. S. standard threads, screw machine manufacturers usually carry them in stock. Pratt & Whitney standard bolts have U.

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S. standard threads, and heads and nuts of same size. We do not know whether or not they are regularly stocked.

1595 **High and Low Tension.**

From Harry Stevens, Minnesota.—1—What is the difference in the making of a high tension or low tension magneto? We know the results obtained by using a low and also a high tension, but we want to know what a high tension magneto has or has not that is different from a low tension. 2—Supposing I had a low tension on my car, and also a set of dry cells for starting purpose, and that with my self-starting motor, I am unable to start the engine when the switch is on the magneto, would it be necessary to install a high-tension magneto to make it possible to start on magneto instead of batteries, or would a different starting motor do the business, one that is capable of higher speed? My idea is to find out whether it is necessary to have a differently constructed magneto in order to start on the magneto, or will a higher speed on the same (low tension) one give the same result?

Reply.—1—A true high tension magneto has two windings on the revolving armature, if of the ordinary type, a primary and a secondary, while a low tension magneto has a single low tension or primary armature winding, and uses a jump spark coil to induce the high tension current. Induction types of magnetos use stationary windings with rotors revolving through the fields. If they have low tension windings only they are low tension and if they have both low and high tension windings they are high tension magnetos. 2—Practically all self-starting systems are so designed and wired that starting shall be on the battery and not on the magneto. In some systems the starting circuit cannot be closed with the switch in magneto position. As we understand it, this provision is made to conserve battery energy, for the reason that an engine will start on the battery more easily than on the magneto, and in case of a possible short circuit in the starting system wiring it might possibly demagnetize the magneto magnets if the magneto ignition circuit were open, but as the magneto circuit is short circuited when the magneto is switched off, no such harm can then occur. Our advice is to let well enough alone, to continue to start on the battery and not to attempt the impossible or impracticable.

1596 **Wiring for an Ammeter.**

From Harold G. Stanley, Missouri.—Please explain by diagram in the columns of your magazine how to wire up an ammeter on the Delco system used on 1914 model Buick.

Reply.—Your query is just a little indefinite, in that you do not tell us in which circuit you desire to install the ammeter, the magneto or battery, nor do you tell us the type of the device, whether an ordinary model or one showing whether the battery is being charged or supplying current. We do not wish you to get into trouble by attempting to follow what would have to be indefinite instructions, or which you might not fully comprehend or understand, and it would be absolutely useless to you to have us tell you a lot that you do not wish to know. For these reasons we suggest that you take the matter up directly with the Dayton Electrical Laboratories Co., Dayton, Ohio, who we are quite sure will be able to furnish just the instrument you require, and will be glad to send you a lot of valuable information as to the Delco system used in 1914 Buicks.

1597 **Efficiency Gas.**

From Ray Schroeter, Missouri.—Kindly publish in your next month's issue your opinion of the so-called Efficiency Gas, which you undoubtedly know or have heard of. The people that put this article on the market claim it will increase the mileage of your car 25 per cent. How this can be done by putting one ounce of the Efficiency Gas in your car to every five gallons of gasoline is a problem to me. Kindly let me have your expert's opinion on this. I will watch for it in your next month's issue.

Reply.—We have never heard of Efficiency Gas, which is not used to any extent, if at all, in this locality. As a rule we rather doubt the effectiveness of anything of this sort, but "the proof of the pudding is in the eating," and about the best way to test it is to give it a trial. It should always be remembered that no more power can be got out of anything than there is in it. To increase the combustion power of gasoline by the addition of some other chemical cannot be very easy, because gasoline in itself has an extremely high combustion power.

1598 **Automobile Life.**

From G. W. M., M. D., New York.—I am thinking this spring of purchasing a new car. I have driven a Model T Ford runabout for three years for the purposes of my business. Previous to that for three years I drove a Maxwell. When I disposed of the Maxwell at the expiration of three years, and now in the case of the Ford at the end of a like period the engines, so far as I know, are exactly as good and as powerful as when I began with them. I read recently in one of your answers to correspondents that as the man asking the question which you answered had used his car four years that therefore he could not expect very much of the motor, or in other words, you seemed to imply that four years was about the average life of a motor. Somewhere I have read, and if I do not mistake, in your own publication, the statement that with careful usage there was no reason why an engine should be worn out in a few years and that if properly used, and especially properly lubricated an engine should be all right after ten or fifteen or more years of proper usage. This last statement I have always believed and it has seemed to harmonize with my own personal experience.

My Ford motor is as good to-day, if not better, than when I began to drive it. I am thinking to change to a better and more expensive car, one that in a sense I could make permanent. I would not care at all to do this if I may only look for three or four years as the average life of the engine and if then I must begin to repair and have troubles. Why can I not have a car that will make me a permanent possession? Which of the statements I have quoted is the true one? I do not know whether it is a fair comparison but will say that for seventeen years I wrote upon a Hammond typewriter and it was in perfect alignment when this year I exchanged it for the latest up-to-date Multiplex Model Hammond and I expect to use this machine for the coming seventeen years.

Now that is the kind of service I want in an au-

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tomobile. Why not? If an automobile engine is only good for three or four years I may as well go right on driving my Ford and stick to the cheaper machines. If, however, I can get a better and more expensive machine and have some permanence about it I would like to do so. I would feel more like spending a lot of money if I could feel the confidence in the automobile that I do in the Hammond typewriter. I should have had some such feeling, as I am a careful driver. But your recent statement which seemed to imply that one need not expect much from an automobile motor at the end of three or four years has rather disconcerted me.

Please let the light of your experience and knowledge of this piece of machinery shine in upon my benightened mind and let me know why I can't have a permanent automobile as well as a permanent typewriter provided I do not make a mistake and succeed in getting a good one this trip.

Reply.—In relation to the period of usefulness of a motor, quite likely the statement referred to, that four years is about its average life, was made with the thought that this is the duration that may be expected before there is a necessity for making repairs, like reboring the cylinders, or fitting new piston rings, and thus the expression might have been misleading. But our correspondent is undoubtedly right in his idea that automobiles would be far longer lived if they received intelligent use and care. We have often marveled that automobile manufacturers themselves seem so willing to minimize the duration of a life of an automobile. We can see no reason for it whatever, unless they have in mind "the other fellow's car," and expect that when a change is made it will be for one of their own make—and of course, the sooner the better. Yet a little reflection will show that the comparison made of a Hammond typewriter machine and an automobile is hardly a fair one. Even when used carefully no other machine in existence has necessarily such destructive uses as an automobile. But there are automobiles and automobiles, just as there are uses and uses, and typewriters and typewriters. The Hammond typewriter machine in its early years was about the most durable one ever made and with hard use it ought to be about five times as durable as an automobile. On the other hand, few drivers of cars have any idea of the tremendous strain put upon them on rough roads, and likewise few pay the attention they should to lubrication and to other important matters connected with them. In many cases a good deal of damage is done to a car when it is first put on the road. Few owners thoroughly understand it, and in many instances it is damaged from pure ignorance or carelessness.

1599 **Engine Trouble.**

From G. W. Martin, Arkansas.—I have model 51 Overland, equipped with Remy low tension magneto and Air-Friction carburetor. Am having trouble with cylinder No. 1 missing when the motor is running idle. The engine fired perfectly up to a few weeks ago, only it did not develop as much power as I desired, so took the motor down and equipped it with a full set of new piston rings. I now have fine compression in each cylinder, and the motor works perfectly so long as on a pull; it never misses a shot on hard pulls up grade, but as soon as I disengage the clutch or start down grade where but little power is required, the first cylinder stops firing and it is impossible to get a single shot from it while idling. I had no trouble of this kind until I put in new rings. I have tested and exchanged the plugs and am positive that the trouble is not there. My carburetor has given perfect satisfaction for a season, and now works perfectly with the other three cylinders. The valves are ground and seated properly. I don't think there is any excessive leaking around the stem of the inlet valve on this cylinder. The caps are all screwed down tight and there is a new gasket in the manifold connection. Wiring is new and in good condition. I can't understand why all the cylinders work perfectly under load but will not while idling.

Reply.—Our reply to W. E. T., Maryland, in this issue, may interest you. If the pistons are too small the fitting of new rings will not always prevent oil working past the rings, as in your No. 1 cylinder, to interfere with proper ignition, but it is more probable that the air leak past the inlet valve stem impoverishes the mixture to such an extent that it will not ignite. The Air-Friction carburetor operates at a much less vacuum than many others, however. You did not say whether this condition was present with the original carburetor, or why you made the change. It would have been interesting to us, as well as our readers, to have had your experience and reasons for changing carburetors.

1600 **Garage Bookkeeping.**

From N. A. C., Mississippi.—I would like to know if you have any system of bookkeeping for a garage. I have trouble in getting all the material charged on the different jobs. I work two men and am out of the shop quite a good deal and I have trouble in keeping up with everything and I thought maybe you knew of some system that I could adopt.

Reply.—Something appeared on page 71 of the March issue that may be of use to the above inquirer. Any reader who has what he considers a convenient, successful and simple way of bookkeeping for a garage will confer a favor by sending a brief description for publication. Failing to receive anything of the sort, we will try and get the desired information from some other source.

1601 **Difficult Starting.**

From J. A. Mandel, South Dakota.—I am a reader of your Automobile Dealer and Repairer and would like to ask a few questions. 1—I have a Ford car and would like to know what make of generator is the most dependable and best for a Ford car? 2—I also have a storage battery and would like to use it for lights on my car. Which is the easiest way to wire it, and would wiring from a storage battery be right, by having it wired in the same manner as for the Ford magneto, to furnish light? 3—I also have an Atwater-Kent ignition system on my car and am having a little trouble. First, starting is difficult. The engine makes a few explosions and stops. Batteries and wiring are all new and well protected from being short-circuited. I have tried all different adjustments on contact points, but this doesn't seem to help any, and after starting the engine when throttling down for idle speed, the motor runs for a few seconds and then dies down to a stop. I have been trying a few different makes

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of carburetors. I now have a 1914 Holley. Regarding the carburetor will say that when suddenly opening the throttle, the motor seems to load and runs uneven until it is up to a very high speed. There are no air leaks. I had the motor at the Ford factory this winter for repairs. Of course they tried the motor out with their own make of ignition system. I did not send the Atwater-Kent system along, and after receiving the motor and putting it back in the car I put all new wires on and when I wanted to start the motor up I had a very hard time to do it. After I got the motor started it missed and ran very uneven. I cannot locate the trouble in my motor, so please try and help me to locate all these troubles.

Reply.—1—We do not know which generator would be best for your Ford car. Possibly there may be no "best," using that term in the sense of one single generator being better than others. 2—The current generated by the Ford magneto is approximately 12 volts. Wiring for the magneto system may use two 12-volt bulbs in parallel, or two 6-volt bulbs in series. If you are using 12-volt bulbs the wiring must necessarily be in parallel. Your storage battery is probably 6 volts, although you do not so state. If you are to use the same wiring for the storage battery circuit that you do for the magneto, the bulbs would have to be just one-half the voltage. For this reason if you use both circuits it would be necessary to change the bulbs every time you change the circuit. 3—It is our candid opinion that the Atwater-Kent system is not at fault, for the system gives absolutely the same spark at low as at high speed. The fault is more likely due to worn inlet valve stems, causing air leaks to impoverish the mixture, or heavy and hard-to-vaporize gasoline, or to poor carburetor adjustment. Of course there is a possibility that the circuit breaker may not be just right. You should be mechanic enough to put it in proper shape, clean it, etc.

1602 **Ignition Trouble.**

From Geo. E. Knapp, Connecticut.—I am writing you concerning my model 1-3 Maxwell car, made in 1911 or 1912. Some time ago I had new platinum points put on the breaker bar on the magneto and since then have been unable to start it. The breaker bar has the proper adjustment of 1/32 of an inch. The ignition seems to be in time and the valves are in proper time. The engine turns over very hard, but after I have given it a few turns and turned on the switch and gas, I can't get an explosion, only a snap through the carburetor, like a spring slipping over a cog, and a little smoke comes out of the carburetor. Sometimes I get a hotter spark at the breaker bar than I do at others. I have examined the carburetor and find it O. K. The switch and coil seem to be all right and so is the wiring. Will you kindly tell me, if possible, what the trouble is?

Reply.—Your saying that you get "a hotter spark at the breaker bar" seems to settle the matter conclusively—the condenser in the coil is perforated. One mission of the condenser is to prevent arcing or sparking as the current is broken at the breaker bar, in order to prevent fusing or burning of the contact points. If the condenser is in proper shape there will be no sparking at the breaker. Try a new coil.

Removing Studs.

From N. G. Near, New York.—We often read how to remove broken machine screw stubs, but we seldom, if ever, are told how to remove studs that are not broken. A stud usually stands out through a flange, presenting nothing more to the repairman or disassembler than a threaded surface.

We dislike very much to grip a threaded surface with pipe tongs or gas pliers, because of the danger of ruining the threads. By wrapping leather, cloth, or other protective materials around the threads before gripping, it is often possible to save the threads, but this method is not always satisfactory. Sometimes the wrapping slips in spite of all you can do.

I present herewith two little schemes that work very nicely for removing studs without using wrapping materials. In Fig. 1, two nuts, A, are tightened against each other. This is easily done either by the use of two wrenches, two pliers, or even by the use of pipe tongs. Care should be taken, though, not to make the stud tighter. Then by

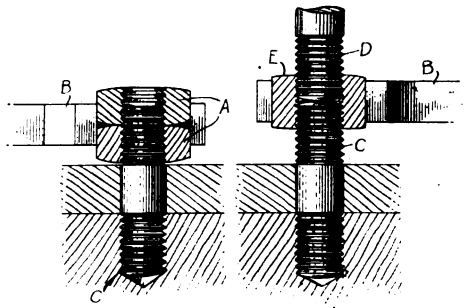


Fig. 1. Fig. 2.

gripping both nuts at once with a single wrench, B, as shown, the stud, C, is easily unscrewed and removed.

Where the stud does not project out a sufficient distance for two nuts it is possible to do the trick with only one nut and a machine screw or bolt, D, as shown in Fig. 2. The principle is almost identical with Fig. 1, except that the two screws, C and D, are tightened against each other within the nut, E. After tightening, the stud is removed by turning the nut to the left. A thick nut, of course, is preferable, because with a thin nut there is danger of stripping the threads. Of the two methods Fig. 1 is preferable because by its use, if the stud is sufficiently long, there is absolutely no danger of stripping threads.

Oversize Tire Service.

From J. G. Click, Indiana.—In a recent issue of the Automobile Dealer and Repairer, M. B. Stine, M. D., Iowa, says he "would like to hear from some of our readers who have had experience with oversize tires." I have had experience with both the regular equipment and with oversize tires and am certainly in favor of the oversize tire. My first car was a model F Buick, equipped with 30x3½ tires, and of course I had my share of tire trouble until I put 31x4 tires on the rear wheels. This was a decided improvement, but as I traded this car before the tires were worn out I do not know the mileage on the 4-inch casings. I then purchased a Buick 27, which weighed 2,550 pounds, and I had 33x4 casings put on all around instead of 32x3½, which was reg-

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ular, but used the 32x3½ tubes. I drove this car 9,273 miles, using this same set of casings and tubes, with only three punctures and one blowout. In all these miles I never carried an extra casing. When the first blowout occurred I took out the tube and drove to the nearest town on the disabled casing. I bought a full new set of 33x4 casings and sold the old set that had gone 9,273 miles for $9.50 and started out again with a full new set of casings. Those casings are still in service and have gone between 6,000 and 7,000 miles without a blowout.

Must say again that I certainly favor oversize tires.

OVERHEATING.

How It Puzzled the Owner and How He Finally Located It.

From Fisher Ames, New York.—I am much amused and sometimes disgusted at the questions asked in the Trouble Department. Perhaps my experience may be of interest to some car operators. I purchased a new Ford touring car in 1911, and during that summer ran it about 1,200 or 1,300 miles over all kinds of roads without much of any trouble. Early the next spring I took off the engine head and scraped out the carbon and carefully ground the valves and replaced it. I also drained out the old oil and put in new, and put on an oil glass. When the roads became passable I started with a load of five to take a ride. I had gone scarcely three miles before the water was boiling so hard that the overflow could scarcely let the steam out fast enough. I went home and put in a new cylinder head packing, with no better results. I then flushed the radiator and water jacket with a hose and several times later with weak acid solutions, until I was thoroughly convinced that the trouble did not lie there. To make sure I put on a water circulator with but little improvement. I also put on a new style carburetor, an air friction carburetor, and a master vibrator and new set of V-Ray spark plugs, but none of these stopped the trouble, although they greatly improved the running of the engine. In the meantime I diligently pursued the questions and answers in several trouble departments and interviewed every repairman and expert I came across. In every instance I was told that overheating was caused by too far advanced spark, carbon clogged water circulation, dragging brakes, etc. I felt that none of these applied in my case, but what was the trouble? In this way, during 1912-13, I was obliged to run with the hood off and only for short distances on the best roads. One day last summer when scraping carbon from the cylinder I thought I heard a very light tap inside the water jacket, when it was shaken a certain way. Upon closer investigation I located it between the first and second cylinders behind the bolt hole on the valve inside. I carefully put in some hydrochloric acid through the same water hole, and after much shaking and pounding got out two pieces of iron, each about as big as a 5-cent piece and a little thicker. They were round edged and looked as if the iron had spilled when molten. They were probably in the sand used for the core when the casting was made and failed to come out when the core was removed. After this the overheating stopped like magic. So much trouble for so small and simple a cause.

Spark Plug Tester.

From Newell F. Resseguie, South Dakota.—No. 1501 inquiries for a spark plug tester. Here is one I have used for several years to test plugs and vibrators. It is so simple I never thought it worth mentioning. Use ⅛ inch wire, wrapped around a

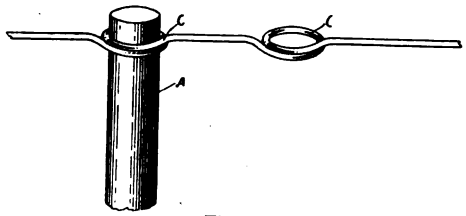


Fig. 1.

rod, A, Fig. 1, the size of the threaded plug end, B, Fig. 2. Make four of these loops, C, one for each plug, as illustrated in Fig. 2. Place the plugs therein. Connect up and set it on top of the engine, D. Mine fits in between two bolt heads, E, making a good connection. Turn the switch and crank the engine and watch results. They may not spark at all. If so the vibrator points may be fouled or too

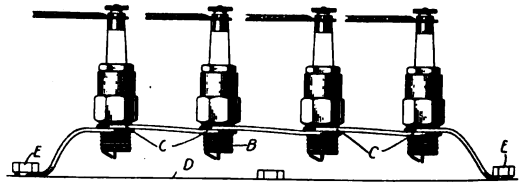


Fig. 2.

stiff. I get the plugs to spark alike by cleaning, taking them apart, scraping the shell out and setting the points alike about 2/3 the thickness of a dime for the Ford car. In starting the magneto, if the points are too far apart, it is hard to start the engine. Crank it at a normal speed.

NO TIME LOST

When Your Car Is Repaired, While You Regale Chocolate Sundae.

From Felix J. Koch, Ohio.—If your own city does not afford the convenience, drop in on your favorite auto dealer and repairman and give him a copy of the magazine containing this article. Let him get in touch with the city authorities and secure from them such permission as is needed, and you and every other motor enthusiast, as well as all others who depend on the auto for pleasure or profit, will be very grateful.

To begin with, almost every large city in Great Britain, Canada and America insists upon the so-called "parking." That is to say, when Jack Roosa takes his best girl to town in his new motor and draws up in front of an ice cream saloon for a chocolate sundae, he is not permitted to let the auto stand there, blocking travel, but after depositing the lady he must spin with it to some quieter street, park or esplanade, and leave it there to be called for when he desires. Obviously, at first the motor-lovers were opposed to this parking. However, it was found that this simplified things for everyone. Streets, formerly well-nigh choked by resting automobiles, were now open and passable. One could wheel up to just the given door he desired

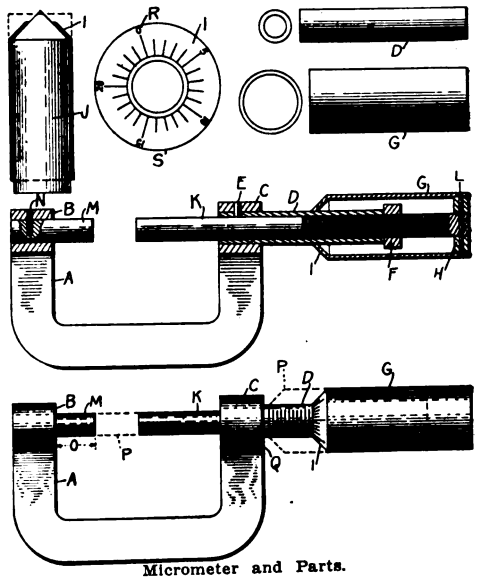
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and the cries of disapproval turned to those of approbation. The next step, however, was not so commendable. It was that of the man who takes advantage of the ease with which an auto could be spirited off, when standing thus — ownerless. Motorists returned to the parking place to find their cars missing and no one could say which way they were last seen speeding, nor by whom or when it was taken in charge.

In Cincinnati, not long ago, a party secured from the city council the right to check automobiles at 15 cents per day, and they could remain there as long as you cared to leave them at one stop. This was handy except for the poorer automobile owners, who heretofore had used their cars instead of the street car, and having to pay the 15 cents, found no saving at all. Then someone proceeded to contest the right of the checker to do exclusive business in this public highway and the status was changed. Today checkers are in charge at all hours, checking your car freely, but you are supposed to tip them and they make more now than they did before. The latest convenience incident to this, is the repairing of your automobile while it is parked. Suppose you come to town and suddenly find that your engine is missing, or you get a puncture or a blow-out, or you find that your valves need grinding. The nearest empty store to the parking place is secured by the checker and in this he establishes a first-class repair shop. You come to town and go to your respective places of amusement, business or whatever it may be, after parking your car as usual. Meanwhile, the repairman does as much repairing on your car as is necessary, or as is possible in the time you may allot him, and tomorrow or the next day he will finish the job when you check your car with him. It is far handier than having to drive to some other repairman and have your car tied up while he does his work at his leisure. So it pays, even when for so much the checker looks over your car, which seemingly is in good condition, and anticipates a trouble and puts in the "stitch in time." The same repairer finds that he does well in fitting up a window and selling accessores, such as jacks, tires, patches, buckets, auto trunks, tools, etc. He has an opportunity to draw your attention to these which other stores haven't and he doesn't let the opportunity slip. Why the plan is not carried out more generally is uncertain, as it both pays and pleases all parties concerned. If your own city hasn't attempted it, let some one get busy. He is sure to have more work than he can attend to.

Easily Made Micrometer.

The sketch is a design for a micrometer that will read to a thousandth of an inch, and will be found a very handy tool. The cost of a micrometer is so high that it prohibits many from buying one. This one illustrated will meet all the requirements, and can be made at a nominal cost. The frame, A, is made of strap iron ½x⅛ inch, and the ends, B and C, are rolled over to form an open ring. The opening in B is ¼ inch, whereas the opening in C is ⅜ inch in diameter. Then take a piece of brass tubing, D, ⅜x2 inches, and fasten it in the ring, C, by a pin, E. On the other end of the tube, D, braze upon it a nut, F, tapped with a ¼ inch tap. Now take a larger piece of tubing, G, large enough to clear the nut, F, to act as a sleeve. In one end of the sleeve, G, place a plug, H, with a ¼ inch hole, and bevel the other end, I, about 45 degrees. This can be accomplished by placing it over a piece of wood, J, and hammering it. Thread a 4 inch rod, K, about half-way, to fit the nut, F, and run a pin, L, through the sleeve, G, plug, H, and rod, K. The piece, M, being ¼ inch. It projects beyond the frame ½ inch as indicated at O. Turn the sleeve, G, down until the screw rod, K, comes against the piece, M, as shown in the dotted lines, P, and make a mark, Q, on the tube, D, to register with a zero mark as shown at R, on the sleeve, G. Turn the sleeve one revolution and make another mark and continue this operation until the micrometer is opened to its full length. The bevel, I, on the sleeve is marked into



Micrometer and Parts.

25 parts, numbering every fifth graduation, beginning with zero, as shown in the view, S. One complete turn of the sleeve, G, represents 1/40 of an inch; 1/25 of a turn equals 1/125 of 1/40 or 1/1000 of an inch.

Praise for the Mitchell Car.

From Samuel M. Sutton, Pennsylvania.—I have been driving a car for ten years and am one of the lucky ones. I have had no road trouble of any kind. I am driving a Mitchell 6, and think they are one of the best road cars on the market for hill and mountain driving. I toured over the mountains to Gettysburg, through Maryland, Baltimore, Washington, D. C., and all through the East on the one trip. We ran 1,050 miles and only had about seven minutes' stop in the entire trip. At this time we were changing a tire as we had a blowout. We had the pleasure of seeing almost every make of cars hung up on the mountains from over-heating and carburetor trouble. We did not make a single adjustment on our Mitchell. Any person wanting a machine for road work can't go wrong on purchasing a Mitchell. I have had four years' experience with this make. We did not have to go in to low speed on any mountain on our journey. For the benefit of new drivers touring over the mountains I will advise them not to try to overheat their cars by seeing how far up a hill they can go on high speed. I have always found it best to change before

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starting up a hill, for you have a chance to get your engine working well and it will pick up speed on any grade by changing at the foot of a long grade. There are many drivers to-day that think they can make any hill on high, but my advice to all new drivers is to be careful on hills and you won't have so much gear trouble as you will have when trying to change gears when the engine is running so fast. When driving in mud I find that four chains are very useful. Many drivers only use two chains, but you will find a great many of them along the roadside, in the ditch. It is best to be on the safe side.

DIFFICULT MOTORING

Troubles Experienced in the Hills and Valleys of Darkest Arizona.

From M. A. Foster, Arizona.—I see many questions asked and answered, which any motor driver can derive considerable information from, and I have often thought that if some of those fellows were located here in the jungles as I am, with hundreds of miles between them and the information, what they would do? I have been up against propositions when I would have been glad for the information that I could have had for the asking, but as time would not permit me to wait to get this information, I found that I must get busy and solve the problems myself. I am a hundred miles from a garage or other repair shop, and necessarily I must do my own repairing. I have owned and driven four different cars in and around Denver, Col. I never had any engine, differential or transmission trouble. All the trouble that I experienced in driving cars in Denver was tire and ignition trouble. But just listen: Since I have been engaged in motoring in the jungles of Arizona, I have experienced every trouble that is on the map of motoring, and some that isn't. When I get out fifty miles from any place, except bad mountain roads and a breakdown, or have some engine trouble, then what do I do? Write to some journal and ask what to do to get my car to going? Not much. I would get very hungry waiting. I just take in the situation clearly, determining what has to be done and then get busy and get the car in condition to get home at least. I find this is a good schooling.

If some of you people that drive mostly on graded roads and paved streets could see the roads here in the jungle, then you would say to drive a car over such roads could not be done. I thought so when I first came here, but I saw that some few people were driving a motor car over these roads, and I believed that I could do the same. Remember, we have no such a thing as graded roads here—just an opening cross the hills and valleys. We have very few bridges and have to cross streams of water 18 and 20 inches deep. Most cars in this locality are Fords, as the Ford appears to stand the mountain climbing and the mud baths that a car has to go through in this country, better than the heavy cars. The Ford car appears to be just about the right weight for the mountain climb and the heavy roads after a rainstorm. Sometimes we start on a trip and get 100 miles from home and get in a hard rainstorm. We can't stay there and wait for good roads and weather, for usually there is no place to stay, so we have to split the mud and make the best of it. We get up against propositions where we have to be able to make a car do a little more than it was built to do, and if we can't, then we have to stay there until some team comes along and pulls us out.

Now some of you people back in the States may think I have exaggerated the matter a little, but it is much worse than I have told it. There isn't a car in this locality that has been used for the last five months, and the prospect is good of no use for at least two months yet. The snow on the mountains is from one to ten feet deep, and we can't get out any distance either way from here without crossing the mountain. I have seen the inexperienced try to drive a car through this country, but the result was a serious break or wreck, with bearings melted out, connecting rod punched out through the side of the engine, or the engine hot and stuck; in fact every trouble that exists and many that don't exist back in a civilized country. The writer has experienced most of those troubles. I have always been able to bring my car in on its own power, except once. This was when I sheared off one of the keys in the differential gear. I cut the key out of a piece of steel that had been used on a brake box car. With the tools that I had with me, it was a very slow job, but the nearest garage was 23 miles away, and my car would not run at all, so you see this is how I learn repairing. This was the first time that I had the chance to see a differential gear, and a very unwelcome one it was at that time, being 65 miles from home, without tools or material for a job of this kind.

Simple, When Found.

From C. W. Case, Kansas.—I have been reading lots of the boys' experiences and I will tell one of my own. I am a repairman on gas engines for the Union Pacific Railroad. I have had all kinds of trouble with cars. I have had those queer knocks that I read about in the paper and misfiring, but I always found the cause and they were all very simple when found. The other day a man came in with a car and said it was "shorted" and would not run. I examined the wiring all over and found everything O. K. I got in the car and it started all right and ran 200 yards and stopped. I got out and examined everything but found nothing wrong and I got in again and it started all right and ran about the same distance and stopped again. The car did this trick for me about a half a dozen times and when I could find nothing wrong, I unscrewed the gasoline feed pipe from the carburetor to see if the gas was coming through the pipe and it was all right, so I got down and looked in the carburetor and there I saw my trouble. It was chock full of all kinds of trash and I cleaned it out and the car was all right. The next time I have a car that acts that way, maybe I will find the trouble some place else. There is always something to learn about a car every time you run one.

That Clutch Trouble.

From D. E. Martin, California.—If Mr. Carmichael of Florida, No. 1526, will (1) throw out his clutch, (2) touch the foot throttle slightly to speed up the engine and the driving discs in the clutch; then throw into low, he will have no trouble in engaging his low gear, even in cold weather, when oil in the clutch is thick. The reverse gear will grate

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the same as the low if he attempts to go into reverse. Driving and driven discs cling together even with clutch out. Speeding up the engine a bit by means of the foot throttle speeds up the driving discs, or one-half of the clutch and effectually separates these from the driven discs or other one-half of the clutch as nothing else will do, and hence the clutch stops spinning. I have a Hudson 33, 1912, and she is a peach, but my clutch acts the same as No. 1526.

WORN VALVE GUIDES AND STEMS.

The Trouble They Cause and How They May Be Remedied.

From C. P. Shattuck, M. E., Rhode Island.—One of the most difficult sources of trouble to locate in old motors is the cause of the engine missing when throttled down, and this is particularly true when the motor is equipped with a modern type of carburetor. As a rule the motorist brings his car to the repairman with the carburetor completely out of adjustment, and instances are recorded where the owner has tampered with the contact points of the magneto or altered its setting in an attempt to correct the trouble.

The general cause of missing when the motor is throttled is not as a rule difficult to locate but there

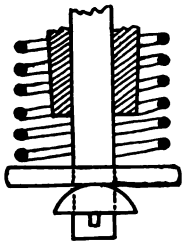


Fig. 1.

are other factors which are not taken into consideration, such as the seating of the valve springs, their retainers and the valve tappets. It is well known to the expert that worn guides and valve stems are responsible for the failure of the engine to throttle because air is drawn past the stems on the suction or intake stroke, diluting the mixture.

Wear of the valve stem and the guide is often due to side pressure present with the commonly used type of helical spring, and because in old motors the spring cup or collar cannot compensate for any unequal pressure that may be exerted upon it by the valve spring. That this side pressure is responsible for undue wear is shown by the drawing at Fig. 2 in which the dotted lines illustrate the amount of wear in a valve stem examined by the writer recently in which instance it amounted to almost 1/32 inch. No amount of grinding will remedy the trouble; in fact, grinding will only aggravate it because the grinding is done with the valve stem in a position which it will not maintain when the spring is in place.

The helical type of valve spring is often so made that the ends of the coil do not bear more than 90 degrees of its circumference, obtaining an unequal pressure which is increased 100 per cent. if the other bearing end of the spring is on the same side. If this unbalanced pressure be present in a valve spring of large diameter, mounted on a valve stem of rather small diameter, it is possible that after the spring had seated the valve it could so lift or tip one side of the valve as to allow the gases to escape during both the firing and compression stroke. If the pressure of compression or that of the explosion exceed that of the unbalanced spring, the valve would seat all around, but a loss of the mixture would be probable before this took place.

Much of the side thrust is due to the design of

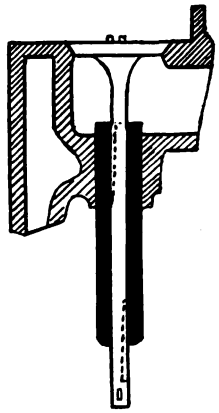


Fig. 2.

some tappets which, when they lift the valve, push it to one side; that is, the lifting effect is not applied vertically but sideways, causing wear of the tappets and their guides which increases the unbalanced pressure of the valve springs.

It may not be feasible to alter the valve spring, but when it is of large diameter and coarse pitch it may be that the balance of the spring can be improved by grinding the ends, especially if these be not at right angles to the stem. In the opinion of the writer this unbalanced pressure could be compensated for by fitting a washer having a spherical surface between the pin or key and the valve spring

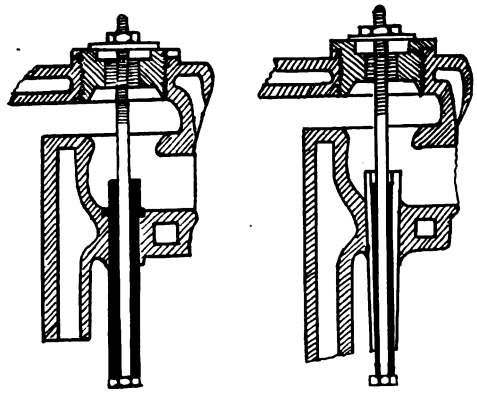


Fig. 3.

collar as shown at Fig. 1. This device would serve another useful purpose especially with old valve springs, in that it would increase their tension. The spherical washer need not be over 3/8 or 1/4 inch, and its fitting would not require any alteration in the design of the retaining pin.

The most effective remedy for badly worn valve guides and stems is the fitting of new members, but frequently the owner of an old car objects to the cost or it may be that the parts cannot be secured.

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If the guides are integral with the cylinder they will require enlarging to take a bushing, provided there is sufficient metal. When the stems are worn as shown at Fig. 2 it is advisable to fit new ones. The method of procedure will vary according to the design and the inclinations of the owner.

Fig. 3 shows a simple contrivance for removing and replacing valve guides when these members are a drive fit and not screwed in. It consists of a threaded bolt of sufficient length and small enough diameter to pass upwards through the guide and through the spark plug valve cap. A washer is threaded on to the top of the bolt and a nut screwed down upon the washer. The lower extremity of the bolt carries a nut as shown. This device will afford a pressure that will generally loosen the guide,

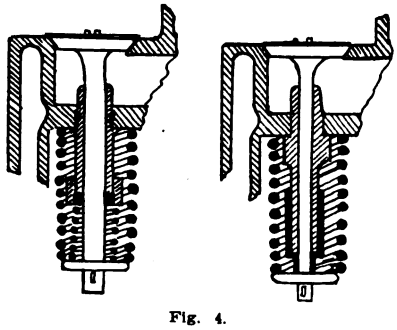


Fig. 4.

but when it is frozen it may be started by screwing up the butt, then tapping the lower end of the bolt with a hammer. The use of a punch and a hammer for driving out a bushing is not recommended as burrs will be set up on the walls of the hole, making it difficult to fit the new guide.

When it is not possible to fit a bushing or the owner does not desire to incur the expense of the work, either of the two methods shown at Fig. 4 may be employed with success. That at the left consists of a form of thimble turned up from a piece of brass or bronze to fit over the guide and it is filled with asbestos wicking saturated with graphite and grease. If the guide be badly worn its lower end should be beveled off so that the wicking will be packed in, obtaining the effect of a packing gland. A light spring is utilized to retain the thimble in place.

When there is insufficient room between the end of the guide and the collar the arrangement shown at the right in the drawing at Fig. 4 is more satisfactory. It comprises a thimble turned up from a piece of cast iron, constructed to slide easily on the guide and to be a push fit on the valve stem. As the contacting surfaces are fairly large and can be lubricated, they will indure sufficiently to warrant the expense of making the thimbles, which is small.

How They Get Business.

From Felix J. Koch, Ohio.—The chase after business these days, with competition growing ever more and more keen, is putting men to using their wits, and some interesting methods of securing the trade are hourly being brought to notice. Not the least successful of these is that of an automobile service concern in Cincinnati, which is enabled to give assistance when you are far from their shop. It obtains the names of all car owners from the State Licensing Board, and has furnished them with a stamped, self-addressed postal, bearing the date, name of the party mailing, his address, the license number on the car, 'phone of owner, make of car, year and model, spaces for tire sizes, both front and rear wheel, and whether clincher, quick detachable or straight side.

As soon as this card is received back from the owner it is properly numbered and filed away. In return, the sender will receive a card bearing his number, and this number is all he will need to give the repairer over the 'phone, together with the location of his breakdown. As soon as this call reaches the garage, one of its free service cars will be dispatched to him immediately to help him out.

"This organization," says the promoters, "is equipped to give to motorists of Cincinnati and vicinity a lift in time of tire troubles. Simply fill in the card and file it with us. Should you ever have any tire trouble, within a radius of ten or a dozen miles from the city, telephone, and no matter what the hour, day or night, we will hurry to you the help you need, in one of our fine, new fast-going, free service cars. We will bring gasoline or oil, should you be without the same. What is more, we change, deliver and apply tires or tubes to your car a dozen miles or more from our store at any time, day or night, at exactly the same price at which we would sell the same item across the counter."

Needless to say, hundreds of persons have already taken advantage of this new service.

A Spring Leaf Separator.

We know how much easier a car will ride when the springs are well lubricated, but to do this it is well to have a tool to hold the leaves of the spring

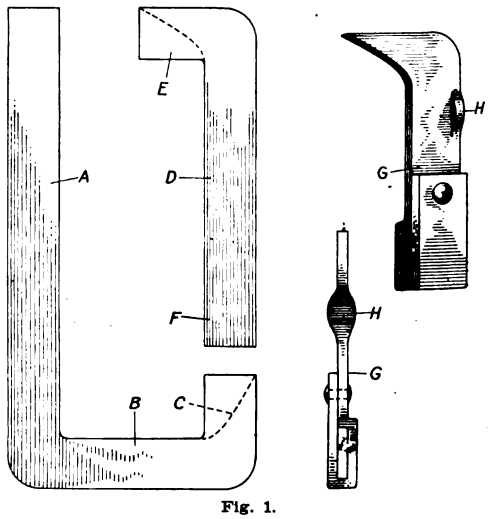


Fig. 1.

apart, while the lubricating operation is taking place. This tool can be easily made. Take an old carriage tire and cut off about 14 inches of it, as shown at A, Fig. 1. Then bend as at B, and with a hack saw cut on dotted line, C. Next take a second piece, D, and bend the end, E, and cut also with hack saw on dotted line, as you did at C. Now take the piece, D, and shape the end, F, so it will look like G, and place it on an anvil and strike at H to

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spread a flat surface. Place G on A, as shown in Fig. 2. Then bend the end, I, as shown. J is formed around a square nut, K, which is held in position by pins, L. The bolt, M, is placed in position as shown, and the nut, N, is drilled to admit a piece of steel, O, driven in and held in place by pin, P. This will enable the user to screw the bolt in the nut, K, and

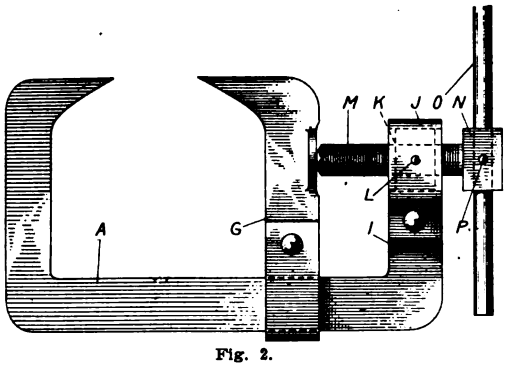


Fig. 2.

move the arm, G, forward so as to engage between the leaves of the spring, making it an easy matter to keep them well lubricated.

Care of Storage Batteries.

Service Engineer M. Hegelstine offers some good advice to Studebaker dealers on the care of storage batteries:

"Frequent and systematic inspection will forestall trouble almost entirely with storage battery," he remarks. "A dealer will find it very easy to follow the necessary steps in the care of a storage battery. He should educate new owners to follow the same plan. It will save him annoyance.

"A storage battery should never be allowed to go more than one month without being inspected. An inspection every two weeks is more to be desired.

"The solution in the battery cells must cover the plates by at least half an inch. If the solution is lower than half an inch above the plates, add pure water. By the term 'pure water' we include carefully filtered rain water, distilled water, or water from melted artificial ice. By far the greatest amount of battery trouble is caused by leaving the plates without a covering of solution.

"Do not allow anything to lie on top of the battery. Especially in the summer, do not pack anything around the outside of the battery. There is heat generated during the charging and discharging of the battery. The battery has been purposely placed in the open to allow radiation of the heat. A charged battery will not freeze.

"If your car is not operated for a period of two weeks, make a hydrometer test, and if required, charge the battery to the proper reading (1.280—1.300).

"On a car laid up for the winter, a battery should be given a hydrometer test every two or three weeks and battery recharged to prevent damage to plates and freezing.

"Never add acid to the solution. The acid cannot evaporate, whereas the water does evaporate. If you add acid, without it having been lost through leakage from a cell, the solution becomes too strong and the plates are damaged.

"Keep the terminals clean and tight. This precaution is based on the same reason that all electrical connections throughout the car must be tight and free from foreign substances.

"Clean the top of battery occasionally with a damp cloth (not wet). If this is done there will be less chance for the collection of dirt.

"With every inspection of the battery or when you have reason to believe that the battery is not fully charged, test with a hydrometer.

"A hydrometer should be in the possession of every dealer. A first class one can be purchased almost anywhere for $2.25. A battery is fully charged if the reading is at any point from 1.280 to 1.300. If the reading is below 1.250, the motor should be operated to charge the battery up to 1.280 or higher."

Front Wheel Alignment.

From Oscar O. Romundstad, Wisconsin.—The wheel alignment given in the January number doesn't correspond with the teaching I got in the shop, but that is not saying it is wrong, for auto construction changes faster than we can learn how to fix and adjust them. Most cars have the front wheels set so they are wider at the top than at the bottom, and such wheels must toe in or have "gather," as the wagonmaker calls it, and the amount of gather depends on the set and diameter of the wheels. No car with front wheels leaning out will steer well. The front axle should be put in so that the king bolts lean backward. It will be noticed that by this arrangement the inside wheel cuts a smaller circle in turning. But this is not the only way the inside wheel is brought to making a shorter

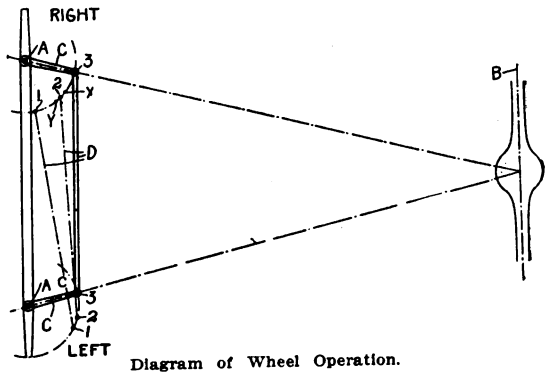


Diagram of Wheel Operation.

turn, for in looking over your car the steering arms on the stub axle will be found to be put on so a straight line from the king bolts, A, to the center of the back axle, B, will pass through the ends of the steering arms, C, or nearly so, and these two being connected by a rod, D, it is plain that in turning either to right or left the inside wheel will be swung the most. The sketch shows three positions of the steering rod, marked 1, 2 and 3. The distance from X to 2 is the amount of travel given to the right side over the left in turning to the right at the angle shown by No. 2, and the distance between Y and I is increased in travel of the right side over the left in turning to the right to the angle shown by No. 1. When it is remembered that the spindle and steering arm are always in the same relation to each other, it will be seen that the inner wheel in turning will have a reason for making a shorter turn.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, APRIL, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

SIGNING LETTERS.

It is a curious fact that many men will write a letter so distinctly that every word is intelligible, and yet attach their signatures in such a way that nobody can decipher them. This is done frequently in typewritten letters. One business man of our acquaintance has adopted the plan of having all letters signed by the typewriter and then he signs himself underneath so no mistake can be made by the recipient of the letter. This plan may be utilized to advantage by a great many business firms.

NEW THINGS.

The number of new devices and accessories appearing in the automobile field are as wide in range as they are interesting. They would be little short of marvellous were it not for the fact that the automobile industry or art is still practically in its infancy, and improvements may constantly be expected. Thousands of bright men are intently studying the subject, with the result that improvements upon improvements are appearing, until no one can foretell just when the business may be a "closed art," as they say in patent office circles.

Of course our readers are keenly interested in this development, and in order to keep posted as to just what is on the market they should closely watch our advertising pages each month or they will overlook many things of interest and value to them.

The automobile of to-day is as much superior in the sense of economy and usefulness to that of five years ago as the modern war vessel is to the old "Monitor" and "Merrimac" of whilom fame. We have stated, and it may be confidently repeated, that in its application to business and pleasure the automobile will not only continue to displace the horse, but it will soon make such inroads into the use of the street and general railway service, that it will be little short of revolutionary. The "jitney" 'bus system is spreading like wildfire, and for short haul commercial and passenger service, it is constantly increasing and extending. In each instance there is a gain in economy and convenience.

FOOD FOR THOUGHT.

Florence is one of the richest cities in Italy. It has one automobile to every 6,000 of population; Iowa has one automobile to every 20 of its population.

Our foreign markets are well enough. Let us get all the trade from them it is possible. And just now, when about all of Europe is engaged in war, this market, especially as it relates to military needs, is considerable. But when the war is over, as all should devoutly hope it soon may be, how much foreign trade will we then get? With the war countries prostrate, and every worker, including the discharged soldiers, destitute, and simply crazy to go to work and earn a living—and a meagre one at that—how much of foreign goods can they be expected to purchase? At that time the prosperous State of Iowa and of many other States, will furnish a better market for goods than the entire continent of Europe.

But please do not forget: The market depends upon the condition of the people, the condition of the people upon the rate of wages, the rate of wages upon the hours of work. Of course, if this enforced idleness continues, and the needs of the unemployed are used to compel those who are employed to accept such wages as employers wish to pay, thus increasing pauperism and want, the home market will suffer.

In this city of New York, it is reported that $20,000,000 annually are now being expended for charitable purposes. Thousands are being "fed" upon two cent meals. We trust it may not be forgotten that charity literally grows and multiplies by feeding upon itself. It is nearly as contagious as the plague or smallpox, and quite as deadly.

Of course, the foregoing is both desultory and fragmentary, but it should at least supply a text for thought.

A NEW ELECTRIC CAR.

Charles P. Steinmetz, the famous consulting engineer of the General Electric Company, of Syracuse, N. Y., claims that the gasoline car will soon be superseded by the electric vehicle.

It appears that a new invention promises to very much reduce the weight of the car. It will do away with the differential, the shafting from the motor to the rear axle, the bevel gearing, and the housing for these parts. Moreover, when the car coasts down hill, the motor is turned into a brake, and acts as a generator, putting current back into the battery.

Mr. Steinmetz thinks that with these improvements the weight of the electric car may be brought under 1,000 pounds, thus much reducing the consumption of propelling power.

All these things are worth noting. On the other hand, the gasoline automobile will not be easily displaced, even though all the foregoing claims may be

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ultimately demonstrated. The amount of electricity generated by the momentum of the car while descending a hill will not be important, and on the road or street there are on the average just as many and just as steep hills to ascend as there are to descend. The lighter weight referred to is attractive in the case of a car that has no more speed than the existing electric car, but for high speed, light weight is just a bit imprudent. The frequency of recharging the batteries seems not to be overcome in the consideration of this potential electric car.

GREATEST GOOD TO THE GREATEST NUMBER

Occasionally some reader complains because we have so much about the Ford car in this magazine, while on other occasions some one reminds us that we seldom have anything about the car that he himself owns. It is obvious that much should be published concerning the Ford car. It is unusually low priced and widely used. Although it undoubtedly gives good satisfaction compared to its cost, if it were as enduring and luxurious as a high priced car there would be no advantage whatever in owning a high-priced car. Moreover, it naturally is owned and purchased mostly by the great middle class who not only drive their own cars, but who also want to thoroughly understand their care and repair. Owners of high-priced cars often leave the question of care and repair to others, and thus information is often achieved less directly and at greater cost.

But information in relation to one automobile applies to a greater or less extent to most others. All automobiles have engines, ignition systems, transmission systems, lubricating systems, wheels, tires, paint, varnish, etc. Information concerning any of these is practically universal. We have no personal interest whatever in the Ford car. To the best of our knowledge, the firm manufacturing it has never paid us a dollar for any purpose whatever, although it goes without saying that this fact has no influence whatever, one way or another.

Our aim is to be of service to our readers. Sometimes it is felt that such service falls short of what it should be, but if this be the case it is not because of lack of effort. There is no better way to edit a magazine than to follow the old injunction of supplying "the greatest good to the greatest number."

"REASONABLE COMPLIANCE."

According to a reliable newspaper report, the Commissioner of the Department of Motor Vehicles of the State of New Jersey, has caught the more or less prevalent feeling that laws are not made to always be lived up to but to be adapted to convenience. He is quoted as saying:

"It has been the custom of the Motor Vehicle Department and of the police departments generally to be satisfied with a reasonable compliance with the speed regulations as outlined in the motor vehicle act. In fact, it has been the general police practice to allow any person to operate an automobile in the open country at the rate of 30 miles an hour and in the cities at the rate of 18 miles an hour without becoming subject to interference by the officers."

But the motor law of New Jersey fixes the speed limits at 12 and 25 miles an hour, and any greater speed than this is not "reasonable compliance" nor any other compliance; it is simply law violation.

If the limit of 12 and 25 miles an hour is unjust and a hardship, why, let the law be repealed or the speed limit be increased to such a rate as may seem to best promote the public welfare. But let there be no violation of law, and especially of a law so explicit that no one can violate it unknowingly.

Law violations are a bad, not to say dangerous, habit, and they grow on one something like the drink or the drug habit, dulling the moral sense and weakening the will power. In what may be termed fairly lawful communities, few appreciate the value of strict obedience to law. It is only when one is for some reason obliged to live in a country where there is no law that he begins to realize the blessings of a system where "right makes might" rather than one in which "might makes right."

PROMETHEUS BOUND.

Zeus bound Prometheus to a rock where his liver was pecked out by an eagle during the day only to grow again at night. It is devoutly to be hoped that the interminable commissions which are so fast encompassing public and private enterprise with rules, regulations and mandates, will not inflict the same punishment upon business. For if the liver of enterprise be once destroyed it will require more time than a single night for it to grow again.

Of course, no one can justly object to rules or orders that give promise of promoting the public welfare, but an interference that shackels or puts business in a straight-jacket should be zealously guarded against. It is contrary to that freedom which is the highest expression of self-government.

Although the supervision of existing business enterprises by public service commissions may be withstood, it can but make those who contemplate new enterprises apprehensive to the point of abandonment. Just at this time and under these conditions there should be no "wet blankets" to enterprise, whether they are of either a public or private nature.

The rapid growth of the "commission" form of government is fast becoming really alarming.

Trying to Standardize Treads.

In response to the insistent demand from Southern dealers as well as from the manufacturers generally, an effort is now being made by the National Automobile Chamber of Commerce to bring about the standardization of vehicle tracks in this country, which of course will mean lower manufacturing costs and ulitimately lower list prices to buyers of cars.

One of the difficult things in the making of motor cars has been to care for the wide treads which some parts of the South have deemed necessary. Now comes a demand from the legislatures of standard tracks, while the carriage and farm wagon manufacturers are appreciating the advantages that would come from standardizing the tread of four feet eight inches.

Dealers in the South have for a long time advocated the abandonment of the so-called wide tread, claiming it was unnecessary with the improved road conditions, while it so embarrassed the car manufacturer who seldom was able to make deliveries of

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cars to the dealers on time; thus resulting in a loss of trade.

From the manufacturers' standpoint, the making of wide treads has been a source of trouble and expense, because it necessitated the carrying of large stocks of extra parts, the making of special axles, special fenders, and in some cases, steering gears. Invariably he guessed wrong as to the number of cars to be used in the South, and cars also always came through too late for the southern selling season, besides being a disturbing factor in factory production.

On the other hand, there are some places in the South like Southern Florida and Southern Georgia where there is still a demand for the 60-inch tread, and this demand is being supplied, although the dealers state that another year or so should see such improvement in road conditions that the standard tread will be in demand.

It is expected that the ground work can then be laid for a thorough investigation of the subject, so that later the engineers can bring about a standardization of tracks at four feet eight inches, eliminating the narrow sleigh tracks and the wide vehicle tracks deemed necessary. This would not affect the very wide tracks of heavy trucks, both motor driven and horse drawn, which probably will continue to be offered in tracks necessary for carrying bulky or heavy loads.

The subject is most important because standardization will materially lessen the cost of manufacture and ultimately bring vehicles of all kinds to the consumer at lower prices.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Drives Machine Through Ferry Railing.—At Ironton, O., one little boy was drowned when a party of seven crashed through the railing of ferry. It appears that the ferryboat tender asked the driver to move his car and in doing so the car started and failed to stop in the proper place but crashed overboard.

Struck a Boulder.—Near Butte, Mont., a man was instantly killed when in making a sharp turn he encountered a boulder, upsetting the car and throwing the man 17 feet and breaking his neck.

Killed While Taking First Lesson.—A man was instantly killed at Woodland, Cal., while taking his first lesson at driving an automobile. The inexperienced man induced the driver to let him handle the machine. A horse and buggy suddenly loomed up out of the darkness in the flare of the headlights, causing the man to lose his nerve and control of the car. The car turned turtle, throwing one of the men clear of the car and crushing the other beneath it.

Kills Man and Sneaks Away.—At Akron, O., a man was borne down upon by a big touring car which flashed out of the darkness without warning. He was knocked several feet, crushing his head and killing him instantly. It is stated that the car sped down the street away from the scene with open throttle and dimmed lights.

Tracks Obscured.—Four children were killed and two adults severely injured as the result of accident at Albion, N. Y. The owner and driver failed to see an approaching trolley car running at express speed, because the view of the tracks was obscured by buildings. The rear wheels of the automobile were struck by the trolley car; three of the occupants were thrown fifty feet, landing on the track; the auto was hurled into the ditch; one passenger landed in a field and another in the ditch. One little girl was found dead near the machine. If motorists would "stop, look and listen" in crossings where the tracks are not visible, these horrible accidents would not occur.

Dog Wrecks Auto.—At Manila, P. I., two people were severely injured when a dog ran out from a house situated some distance back from the road and hurled himself directly in front of one of the front wheels of the car, causing the driver to lose control of the steering gear, while the machine swerved sharply and turned over. One of the occupants was thrown clear of the car and the other was pinned beneath it. Both were severely injured, but it is reported they will recover.

Attempting to Pass Another Car.—One man is dead, a young woman is dying in a hospital and two men and two women are suffering from severe bruises at Toledo, O., as the result of the overturning of a touring car when trying to pass another. The six persons were out for a ride and in an attempt to pass another machine went over an embankment, resulting in death and injury as above stated.

Car Skidded.—One man was killed and three injured at Alton, Ill., when the machine skidded and struck a curb, overturning the car. It appears that the driver was making an effort to avoid hitting a dog. The occupants were pinned beneath the car.

Result of Excessive Speed.—What might have been a fatal accident occurred at Ogden, Utah, when three boys returning from the city and driving at the rate of fifty miles per hour failed to calculate the distance and crashed into a hay rack, throwing the driver over the horse's head and the rack into a heap at the horse's heels. Three of the men were taken to the hospital severely injured.

Struck a Soft Spot in the Road.—Two children are dead, the mother will probably die, the father is suffering from a badly injured back, concussion of the brain and a broken shoulder, and two other people severely injured, as the result of an accident which occurred near Eaton, Col. The driver, in attempting to turn a corner, struck a soft spot in the road, and the car was completely overturned, throwing the occupants out.

Riding on Running Board.—At Indianapolis, Ind., a man was crushed between a gate post and an automobile on which he was standing on the running board. When the driver attempted to turn in the gate the man was caught and crushed about the chest and abdomen.

While Cranking His Car.—A man was painfully injured at Plainfield, Ill., when in the act of cranking his car he failed to push the handle on for connection with the shaft of the motor. Throwing his weight on the down stroke the handle went down without the expected resistance and the result was a painful injury to his wrist.

Lost Control of Wheel.—A car going at a moderate rate of speed in Houston, Tex., struck a soft

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spot in the road, causing the driver to lose control of the wheel. The car reeled off the road, turned turtle three times and then faced in the direction whence the party had come. One man was killed and two women seriously injured.

Gear Lever in "First."—A young man was fatally injured in Chicago, Ill., when in cranking a car it suddenly started forward and crushed him against the front of a truck. It appeared that the gear lever was in first speed.

Collided With Buggy.—While attempting to avoid a collision with a buggy, a man at Pass Christian, Miss., drove into a ditch. The automobile overturned, pinning the driver and his companion beneath. The driver received injuries from which he died shortly after his removal from the car.

Sudden Swerve to Avoid Collision.—A young man was instantly killed and three of his companions injured when traveling at the rate of 35 miles an hour; the sudden appearance of a buggy going in the opposite direction caused the driver to turn to one side so quickly that the wheel of the car ran into the ditch, upsetting the car and turning the occupants out, with the result as stated above.

Driving on Car Tracks.—Two are dead and four injured at Los Angeles, Cal. The party of six started out for a ride when the chauffeur drove on the car tracks before he saw the on-coming car. He made a frantic effort to drive off the track and avoid a collision, but without success. The street car struck the automobile and scattered its occupants, killing two and injuring four.

Car Cleaning.

Cushions should always be slowly dried by the application of a gentle heat. Grease marks from oily fingers will not disappear under hosing, and must not be rubbed off with a wet cloth or removed with kerosene, which is death to varnish; but they come away easily under soap lather, after which the place should be thoroughly flushed with clean water.

Bad spots on coach varnish, due to leaving dry mud on the car for several days, will never yield to hosing or kerosene, but can usually be eliminated with cotton-wool dipped in linseed oil; the same applies to bad rain marks on the bonnet. It is wise to polish up all the coachwork occasionally with one of the special polishes sold for the purpose, which, incidentally, removes most spots and vivifies the varnish. Dusty cars should never be wiped down with a dry cloth; the scratches thus made are ineradicable. A car should never be dried in bright sunlight after a wash down, or the polish will be dulled; notice that many private garages have their washing floors roofed in with opaque material for this reason.

Dusty cushions are best cleaned with a vacuum machine when such is available, otherwise the dirt may be mopped off with a damp cloth; when the latter method is used, the cushions deserve occasional treatment with a leather reviver. Soap, water, and a scrubbing brush are the best treatment for rubber-covered floor and running boards; when aluminum matting is provided, a little turpentine is the best cleanser.

Never take it for granted that the road will be clear when you cannot see right ahead.

REFITTING OLD CARS.

Some Things That May Be Done for Their Improvement.

Just how much it is desirable to expend on a used and out-of-date car to put it in shape for selling or satisfactory service, is a matter that depends much upon circumstances and conditions. It may be desirable to spend more on some cars than on others. Some are more adaptable to improvement and others, owing to structural pecularities, require much time and labor being expended on them to fit, for example, a new carburetor or a magneto. It requires a practical and experienced eye to judge the position as regards making improvements at a reasonable outlay.

It would be difficult, for instance, to justify from an economical standpoint the fitting of a new carburetor if it requires half as much more on fitting it. The same with a magneto. The question of ease of adaptability of a second-hand car to improvements is one that should be carefully taken into account in making a choice of one.

It is not the intention to give directions for fitting a carburetor, as this obviously is a question that would have to be decided on the merits of each case. Every car will require different treatment. Some general remarks on the subject, however, may be given. The chief defects of the older carburetors are heavy consumption of fuel, variability of the mixture and want of flexibility, so that the throttle range is much limited. The large number of carburetors on the market make it a matter of difficulty to decide whether any given type possesses the desired features, although, as a matter of course, each maker considers his particular carburetor as "the best." There are, however, a number of carburetors that might fairly be classed as "standard" types, in view of the fact that most of the well-known cars will be found to have one or other of them fitted. Hence to select one of these is a sound policy. Complication in a carburetor is not a desirable feature, and although extravagant claims may be made for a carburetor that embodies a large number of parts, these claims can be reasonably discounted. The results that any specified carburetor will give, particularly in the case of a second-hand car, cannot be calculated or guessed beforehand; it has to be tested, and it is as well not to expect an immediate big jump in improvement.

Every carburetor requires adjusting to its work and by trial or experiment. If the fitting is done by a concern that has had experience in that line, they can be relied upon to arrange the carburetor to the best advantage. In most cases a new and more efficiently shaped inlet pipe can be fitted, one that will give the mixture an easier flow to the cylinders. Particular care will be taken to keep the carburetor as close to the cylinders as possible, so that it can be maintained at a sufficient heat to ensure the vaporization of the mixture—a most important factor in economical fuel consumption in these days of heavy grades of gasoline. Not less important is it to arrange the carburetor so that it is assured of getting ample "head" of gasoline from the tank when climbing hills, and this may mean effecting a compromise between a short inlet pipe and a long one; this is an even more important re-

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quirement than keeping the carburetor warm by close contact with the engine.

For working in conjunction with a new carburetor a hand-controlled extra car inlet is an acquisition. A point that should be noted is that it is of such a type that it will actually admit an ample volume of air when required. Some of these devices simply open a quite small aperture that can actually have but little effect. Another point is that great care must be taken to avoid unintentional air leaks. The extra air valve should, therefore, be so well fitted that it can be kept airtight. There must similarly be no air leaks up the inlet valve guides or at any joints between the carburetor and cylinders. Neglect of these precautions is a prolific source of difficulty in getting good results from a new carburetor. An effective control for the throttle is very desirable, and this is rarely found on a second-hand car. Therefore, it certainly pays to remove any existing shaky arrangements of rods and loose connections and install an up-to-date wire control, giving fine gradations of throttle adjustment and avoiding backlash.

Any second-hand car that gives good results with coil and battery ignition may give even better results with magneto ignition. The engine will fire with greater regularity or synchronism; it will be more flexible and responsive to the throttle, and it will have more "life," especially on hills. Furthermore, the batteries being unnecessary, recharging is avoided, and there being no vibrators or contacts to attend to at short intervals the car owner is relieved of a lot of trouble. The whole ignition system is greatly simplified, and a lot of wiring and connecting up dispensed with; in fact, the coil, batteries, wiring, etc., on a second-hand car can be safely regarded as useless or out-of-date. Some there may be who like to make assurance doubly sure and who might care to retain it, but the up-to-date magneto is as "reliable" as anything to which the term can be applied. Moreover, given a well-adjusted carburetor it can be relied on to fire the charge in the first few pulls round of the engine.

Mounting and Driving a Magneto.

It is more satisfactory to have a magneto of the latest pattern, and preferably a new one fitted, rather than to economize by having a cheaper earlier pattern, as, even if in good condition, it is rarely the case that an easy start can be obtained on it owing to the weak initial spark produced. If a more recent pattern can be got it should at least be remagnetized to ensure an efficient starting up spark. The problem of adapting a magneto to a particular car is not always a simple one. Assuming that the engine is a four-cylinder the magneto will have to be positively driven, i. e., by toothed gearing or a chain at the same speed as the crankshaft. At the same time the magneto has to be in an accessible position, so that any adjustment of the contact breaker or distributor can be quickly effected.

Whatever point may be decided upon from which to take the drive, and this varies with every make of engine, a special rigid metal platform will have to be made to support it. This usually means making a pattern and having a casting in aluminum alloy or brass made from it. The best positive drive is by well cut gear wheels, as the accuracy of the timing is more constant.

A chain drive for the magneto is, nevertheless, quite practicable, and many of the older pattern cars are fitted with it. With well cut chain wheels mounted quite truly and a high-quality chain of small pitch, such as a ½-inch pitch bicycle chain, it will not give much trouble. The wear and consequent stretch of the chain will have to be provided for by mounting the magneto on a slotted base, so that as the chain becomes slack the magneto can be set farther back and the correct tension maintained. This question of adjusting the chain from time to time is an important one, as any undue slackness may easily result in the chain jumping the teeth and damaging the magneto or the chain wheels, particularly as the drive tends to be a jerky one, owing to the varying magnetic pull. As the chain will have to be run uncovered, it should be kept lubricated by an occasional application of graphite grease.

The question as to whether "fixed point" timing or variable ignition timing should be adopted should be decided in favor of the latter. Fixed point timing has nothing to recommend it beyond effecting a small amount of simplification by eliminating the ignition control. To obtain the advantage of such control, experience and careful observation of results are necessary, but it is nevertheless worth having.

Wiring and Use of a Switch.

The provision of a switch for the magneto means having an extra wire, and this sometimes is the cause of trouble from occasional short circuits if the wire should happen to get its insulation damaged and touch the metal work adjacent. It sometimes happens also that it is forgotten that the magneto is switched off, and thus considerable effort is wasted at the starting handle. The wiring from the magneto to the plugs should be done neatly and efficiently, which is an easier matter than is the case with coil ignition, as there are only four wires or cables necessary. A vulcanized fibre tube, supported by light metal brackets on top of the cylinders, is as neat an arrangement as any to carry the cables. This tube, of course, is drilled at four places corresponding to the position of the spark plugs, so that each cable can be brought through to connect up.

The Water Circulation System.

The radiator and water circulation system in general on the earlier patterns of cars offers scope for improvement. In most cases these cars are fitted with a pump to provide forced circulation. This detail is likely to be a source of trouble due to leaking or choking up. It becomes, therefore, a matter for consideration whether the system can be converted to the modern thermo-syphon principle. If the radiator is large enough this conversion should not entail anything beyond altering the pipes, so as to give a good flow and return from and to the cylinders. The pipes will have to be much larger in diameter, certainly not less than twice the internal diameter of those originally fitted, and with as short and direct a run as possible. It does not follow that this conversion would be practicable in every case. Even with a new radiator fitted—one designed for thermo-circulation—a sufficient flow could not be obtained, because in this system the position of engine and radiator must bear a definite relation to each other. Thus, if the engine is mounted low in the frame, so that the lowest part of the water jacket is several inches lower than the base of the radiator, an efficient degree of thermo-circulation cannot be

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obtained. In the case of a car having the radiator under the frame and well below the engine, it would be impossible to obtain a flow without a pump. Cars with this arrangement of radiator are, with one or two exceptions, of a much older pattern than presumably would be considered by a buyer of a second-hand car nowadays. The efficiency of any radiator can be increased by having a fan fitted. With a sufficient clearance available behind the radiator it is a fairly simple matter to fit a fan, the drive being taken from a pulley mounted on the forward extension of the crankshaft.

Increasing the Compression.

The question of increasing the compression of an engine as a means of obtaining more power or a better economy of fuel, is one not easily answered. The fact is that an engine with what could be termed an actual low compression type is rarely met with. On the other hand, many engines have weak compression as the result of leaky valves or piston rings —an easily remediable defect, which a faulty compression ratio is not. Engines designed so far back as 1905 have ratios giving somewhere between 60 lb. and 70 lb. per sq. in., and the touring car engine of to-day does not, as a rule, exceed 75 lb., and some are about 70 lb., as it is found that when these figures are exceeded the disadvantages, such as vibration and tendency to knock when the load becomes heavy, offset any higher efficiency obtained. There is, however, no reason why an engine which proves by test with a compression gauge to be less than 60 lb. should not be brought up to at least 65 lb. by having a set of longer pistons fitted. This plan is likely to prove more satisfactory than having an aluminum plate fitted on top of each piston, mainly owing to the great difficulty of getting the plates permanently fixed. Sooner or later the plates become loose and cause leakage. With some engines a small though sufficient increase of compression can be obtained by having a new set of valve caps made; these being so designed as to screw deeper into the port than the originals, care being taken that there is enough clearance between the bottom of the valve cap and the valve head to allow the latter its full amount of lift.

The question of the advisability of reducing the weight of reciprocating parts as a means of getting a smoother running engine can only be decided by a consideration of the weight of the existing parts. The difficulty that arises is that the reduction in the weight of pistons and connecting rods that can be effected by drilling or cutting away surplus metal is small, as a margin of safety must be left in the parts. Hence it is that so many experiments of this sort fall short of the results expected, and that would be commensurate with the time and labor expended. A much better result can be obtained by having new sets of steel pistons and connecting rods fitted, as, in this way, at least, half the weight of cast iron pistons and old-fashioned mild steel connecting rods can be saved. Here, again, it is a question of the outlay being warranted, and that remains for the owner to decide. There is hardly any limit to the amount of conversion and reconstruction that can be effected on a second-hand car, providing that the outlay be of no consequence. Of course, such conversion might be done in several instalments, particularly when the engine has to undergo an annual overhaul. The outlay thus spread over several seasons' use of the car might thus prove to be the sounder economy than expending a large amount straightaway.

Electric Lighting.

Apart from its high efficiency, the convenience of an electric-lighting set is a matter that every purchaser of a second-hand car should give due consideration to. He may be fortunate enough in being able to buy a car so equipped, but, if not, he can have any car he may buy fitted up with a dynamo set at an outlay ranging from about $75 upwards, the sum in any given instance depending on the class and power of the outfit and the amount of work necessary on the car to install it. There is the mounting of the dynamo, the provision of a driving pulley, mounting platform, the wiring-up and fixing of the switchboard and batteries, and other minor details. Some cars are more easily dealt with than others, particularly as regards driving the dynamo, hence, in some instances, the ratio of the cost of fitting up the set to its original cost may seem high; but it is actually money well laid out if the work be well done, and it means no further outlay. To be able to "light up" by the mere touch of a switch and have control over each lamp is a convenience that only those who have had lengthy experience with the older systems of lighting can fully appreciate. Thus there was the inevitable delay in lighting up, especially on a wet and windy night, the difficulties of getting an acetylene generator started, not to mention the periodical cleaning and recharging of it. Then there was the cleaning and trimming of oil lamps, at best messy and tedious work. All this and more is avoided with an electric lighting set. Nor should the prospective buyer have any doubts as to his ability of managing such a set.

The dynamo is an even less complicated machine than the ignition magneto, and equally as reliable, and electrical knowledge is, as everyone knows, not by any means indispensable to ensure obtaining good results from the magneto. It practically looks after itself, and, similarly, so will a lighting set. This is not to infer that the user of such a set would not find it worth his while to learn all that he can about it. For one thing, it makes a most interesting study to learn the why and wherefore of every part of a lighting set, and it is knowledge, moreover, that can be put to good account sooner or later. But present lack of this knowledge should not in the least deter anyone from having an electric lighting set. The tightening of the dynamo belt, the addition of a little water to the battery, or the replacing of a worn-out bulb in one of the lamps are operations of the simplest non-technical character.

The Metz as a Hill Climber.

From C. A. Sleeper, New Hampshire.—I note in your January number that Mr. Foster takes exception to Mr. Archer's opinion as to the superiority of the Metz car over the Ford, and it is, of course, an open question subject to debate; but it is safe to assume that the man who purchases the Metz car considers that machine superior, and the Ford purchaser doubtless has a similar opinion regarding the Ford.

The question raised, however, is not to compare the two machines from all standpoints, the Glidden tour answering this question, but simply their efficiency as to hill climbing; and when Mr. Foster states that in Arizona a Ford regularly negotiates

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hills impossible to the Metz, he is certainly ignorant of the hill-climbing properties of the Metz as a twenty per cent. grade in Arizona does not differ radically from a twenty per cent. grade in West Virginia, New Hampshire or Australia, and if he doubts the veracity of the statements of owners of Metz cars throughout the country, he may refer to the statements made by the Metz Company which they doubtless would be glad to substantiate with proofs, if necessary, proving that the Metz on hill work can do all that any car with engine of equal horsepower can do—and then some.

Mr. Foster states that the Ford car climbs hills that could not be taken by any car driven by friction. It is always better for one to tell what his make of car can do than what the other fellow's cannot do unless he can furnish the necessary proof, which I doubt if Mr. Foster can; and I am confident that the Metz Company will if asked to.

MAGNETO EFFICIENCY.

In Perfecting Its Details Much Ingenuity Has Been Expended.

It has often caused surprise that so apparently simple a piece of mechanism as a magneto should have taken so many years to develop into a thoroughly reliable machine. It must be remembered that the magneto of to-day is actually the successor of a much simpler type, namely, the low-tension magneto. The reason that this latter type of machine had but a comparatively short existence was not that there was any fault in the machine itself, but because of the fact that it could not be used with an ordinary spark plug, but required a special mechanical arrangement which had to be made as part of the engine, and which was both complicated and liable to failure. If anyone had discovered a means of operating the ordinary form of plug in a direct manner with the low-tension magneto, it is safe to say that the present-day magneto would be non-existent. The construction of an efficient low-tension machine was easy, but, as it proved, the experience gained with it did not avail to any extent in the construction of an equally efficient high-tension magneto to operate an ordinary sparking plug.

It was soon discovered that an entirely new set of problems had to be solved, problems of a mechanical and electrical nature that required the highest scientific skill to elucidate. Take, for example, the most sensitive part of a magneto, viz., the armature. The efficiency of this very largely depends on the retention of perfect insulation indefinitely and it was in this respect that a great proportion of the early efforts to make a self-contained high-tension magneto failed. A breakdown of the insulation is, in fact, comparable with a burst set of cylinders, as immediate repair is hopeless. The strain on the insulation of a magneto working at normal high speeds is enormous, nevertheless it is a very rare occurrence nowadays for armature insulation to fail.

One of the most troublesome problems of the early magnetos was the provision of a really reliable condenser, a part which probably the average car owner knows very little of, hidden away as it is in the end of the armature. This part also is subjected to a very severe insulation stress. Many of the early magnetos had this part made as a detachable unit, and it was certainly not advisable to go out without a spare condenser. One of the most remarkable achievements of the modern magneto is the excellent manner in which the platinum contacts resist wear and tear. Instead of having to trim them up every 400 miles or so, as was at one time necessary, it is quite usual now to run 2,500 miles without looking at the contacts. This achievement has only been possible because of a practically perfect condenser being fitted.

The chief mechanical part of the magneto, known as the contact make and break, is a most satisfactory device despite the fact that it is subjected to more wear and tear than any other part. In the construction of this part the extremely fine workmanship of the magneto as a whole is exemplified, and undoubtedly if it were not for the fine workmanship such a part could not be relied upon to run the many thousands of miles it does without requiring the renewal of any detail. The application of ball bearings have done much towards making the magneto a perfect machine. These bearings are a comparatively recent innovation, and the use of them has made possible what may be termed the extremely close working of the armature relative to the magneto; the clearance in fact has been made as small as .0005 or half-a-thousandth of an inch, a point which greatly increases the sparking efficiency of the machine, especially at starting. Any failure of the bearings in the shape of wear would, of course, render so fine a clearance an impossibility.

In perfecting the smaller details of the magneto a wealth of ingenuity has been expended. For instance, by various improvements the whole machine has been made waterproof, and this has been a much greater accomplishment than that of only making it dustproof. In the matter of making the connections of the cables that lead to the spark plugs from being awkward and unreliable fitments, it would be difficult now to suggest any further improvement. The provision of efficient lubricators which give access to all bearings is a point that has received much consideration in the design of a magneto, and contributed in some measure to its reliability. One of the troubles of the earlier patterns of machine arose from haphazard oiling. This resulted in oil reaching the contact-breaker surfaces and fouling them, but this is a trouble which is very rarely experienced nowadays. The foregoing will doubtless convey an idea of the various points which in combination have made the magneto so reliable and efficient a machine for the arduous work it has to accomplish. This fact is of particular interest at a time when the question of having to construct magnetos for the home market has to be considered.

Leaky Radiators.

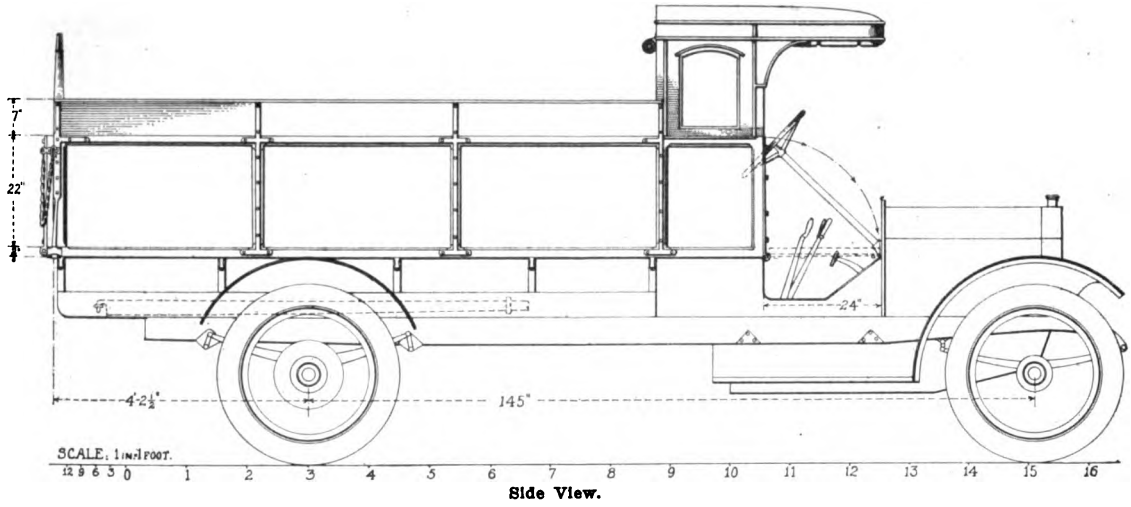
From Dr. S. Harper Smith, Pennsylvania.—Tell "C. H. L.," Connecticut, who asks for "dope" for leaky radiators, there is a reddish colored powder called "Se-ment-ol" made by The Northwestern Chemical Co., that will stop his leaks, and add furthermore that if he prefers he can just get 2 or 3 cents' worth of powdered flaxseed (flaxseed meal) and use that. It will work just as well if it isn't colored red. I've tried both and I know it is not the color nor the scent that does the work.

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NEW COMMERCIAL BODY.

Maximum Loading Space and Handy for All Kinds of Traffic.

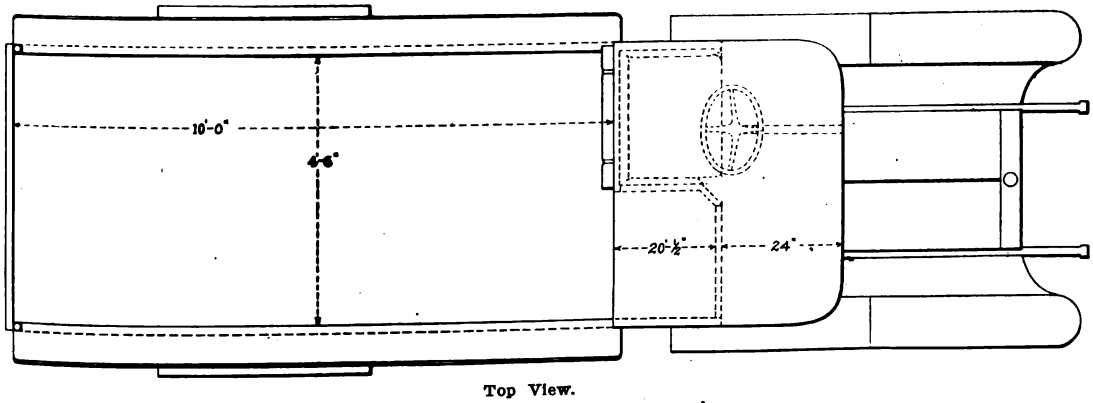
It is the axiom of good business management to get from an investment in a motor vehicle for commercial purposes, the maximum in return, and any change or addition in the body design that makes the vehicle more comprehensive as a general utility proposition is sure to be given due consideration. The motor vehicle is a machine that should be made to deliver automatically up to the limit of its possibilities, so as to properly satisfy the investment of the capital, and provided that the car is right and has the required horsepower for the work, the question of its properly doing its full duty depends largely on whether the body is made to suit the business for which the vehicle is intended to be used.



Side View.

The body here presented has one advantage over the average. This feature is not entirely new, but has been used to a limited extent for suburban traffic, yet it is surprising that it has not been more generally adopted. The idea is to use the space beside the driver for the loading purposes and to permit the taking off and on of the load from the front; that is those articles comprising the load that will so permit of being handled at this end. Ordinarily only one man is needed to handle a car and the most of the time the space beside the driver is wasted. The commercial car carries the gasoline tank under the seat and when the body is narrow and sets down on the frame this plan could not be considered. In the design illustrated, however, the body is above the wheels for clearance and therefore there is ample space for the tank and still carry out the plan as outlined above.

The average body has carrying space back of the seat only. In this design we propose to show how sensible it is to use every inch of space for the load not needed for the driver and in cases where lengths of pipe or lumber are carried, this arrangement is very satisfactory. The several views here shown clearly illustrate how this is accomplished. The space back of the seat is 10 feet long by 4 feet 6 inches wide by 22 inches high to the top of the sides and an additional 7 inches to the top of the flare boards. The overhang of the body back of the center of the rear wheel is 4 feet 2½ inches and this makes more than three-fourths of the load on the rear wheels, therefore it is an advantage to add to the load at the front end, and by the arrangement herein devised the additional space gained is equal to 1/12 of the space back of the seat and if the front tailboard is let down as shown in dotted lines

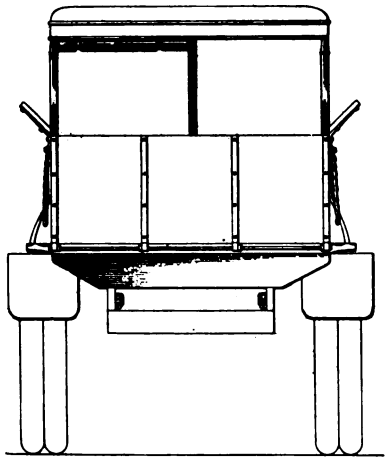


Top View.

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on the side view, the additional space gained will equal more than 1/6 of the total space back of the seat.

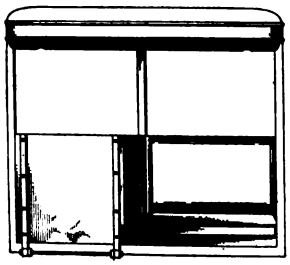
The body is designed for carrying hay, grain and feed, or it is suitable for plumbing supplies or trucking, the free space from the rear to the dash being especially adapted for lengths of pipe, etc. As a rule these bodies are not provided with a top for the driver, but the idea of a driver's cab suggested it-



End Perspective.

self because it is easier to incorporate the feature mentioned and still preserve the appearance of a body as it ordinarily looks, and then again the furnishing of proper protection for the driver is along sensible lines, especially for long hauls.

The driver is on the left side, and ample room is conserved for one man's comfort. The partition surrounding this seat on the side and the back are the height of the body. Side and drop curtains are



End Perspective.

used at the rear in addition to the regular curtains on the sides and the front. The shift levers are in the center and by looking at the plan view it will be noted that a corner has been lopped off the front of the middle wall to allow free arm movement for the operator when shifting the gears, and the tailboard, which is provided for the front end of the body, is continued only to the angle line, and therefore when it is lowered it is narrow enough to clear the lever handles and allow of them being operated when the board is down. This tailboard is not provided with chains like the rear but is fastened when up by hooks. The idea of letting the tailboard down is not only to allow lengths of pipe or lumber to extend forward up to the dash, but it will also serve as a loading platform. It seems reasonable if light delivery bodies are all made so that the packages can be taken from the front that this rule will also apply to bodies that carry heavier merchandise.

This board is fitted with strong hinges, and as the body is wide the tailboard when down will extend out over the runboards and therefore the person lifting can move directly up to the platform. Moreover, this front loading has the advantage that it is less in height for the lift, because the person stands on the sidewalk while the truck is on the road, and then again the man does not have to go into the muddy road so often as ordinarily, and anything that saves a man's strength promotes his efficiency. It is this line of reasoning that has made more general the adoption of the truck with the motor in front in place of under the seat, because the driver does not have to climb so high. The motor in front can have more flexible springs and the shock to the motor parts is less than with the motor under the seat, but consideration for the man has also been a factor in bringing about this general change.

The body is fitted to a 1½ ton chassis, having 145 inch wheel base and the tires are pneumatic, front 36 inch by 4½ inch, and rear are dual of the same dimensions. The body is built in one piece from the sill line up, and including the cab. It is set 5½ inches above the rear wheels for clearance and this will allow of a 11¾ inch high under body at the front which will permit of a gasoline tank of 12 gallons capacity.

WELL WORTH NOTING.

Piston Rings and Compression Leakage and Spark Plug Troubles.

BY JAMES F. HOBART, M. E.

You can't get full power from an engine with leaky piston rings, and I don't believe you can find one in one thousand but what leaks more or less. It is practically a physical impossibility to make and fit a piston ring which won't leak at all. You can make 'em which are pretty tight and leak but very little, but never yet have I seen one which would hold compression without losing it gradually. To be sure you can grind the cylinders pretty smooth and you can fit the rings to the ground cylinders by more grinding so there is a mighty snug fit between them, but you can't stop all the leakage for any length of time even with double rings where one part covers most of the leakage through the cut in the other part of the ring.

From the very nature of the piston ring, it is bound to leak more and more with wear, and the closer it becomes fitted to the cylinder and the less leakage exists there, the more leakage there will be past the cut ends of the ring. When the ring is new, it should have been fitted so the ends practically touch each other when hot, but if you fit the rings too close together endwise, so the expansion of the ring throws its ends together, then the ring will wedge itself together endwise, sieze the cylinder, and if it don't score or cut, it will wedge so tightly as to require half the engine power to push the tight ring back and forth. I have seen cases

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where it required more than all the engine power to do that trick, and the engine stopped dead and we had to drive the rings out and polish up the inside of the cylinders again.

The more the rings wear the farther apart the cut ends must be and the more leakage space past them. This makes the engine lose compression slightly but steadily all the time after a set of rings have been fitted. The ring leakage past the cut ends is practically the same in a very small cylinder as in a medium sized one, but the percentage of volume leakage is very much less in the medium than in the small cylinder, therefore the large cylinder loses much less compression through ring-end leakage than is lost in the small cylinder.

The fast running engine has a great advantage over the slow moving one in the way of piston ring leakage also and the engine which makes 1,000 strokes per minute loses less than one-half as much compression through ring leakage as the same engine when making only 500 strokes per minute.

Therefore, select the large bore cylinder and the short, high rotative speed stroke engine and you will minimize piston ring compression losses. Remember that there can be high piston speed without having high rotative speed. The long stroke with slow crank-shaft speed may give greater piston speed than the short stroke engine which revolves much faster than the slow moving one, but this is not the kind of high piston speed which is wanted to save compression leakage. With a given leakage, the quicker the compression stroke is made the less leakage loss, and this is where the economy of the short stroke, high rotative speed engine comes in. The compression stroke is made so quickly that little of the compression has time to leak past the ends of the piston rings. That's all there is to it, and that's the reason why the large bore, high rotative speed engine "has it all over" the other kinds for economy as far as leakage is concerned.

Spark Plug Troubles.

There is another considerable source of compression loss in a good many engines, and that loss is through spark plug leakage. Many a time have I seen a man remove dirty spark plugs, take them to pieces and clean them carefully with gasoline and work off all the carbon deposit. Then, he would carefully oil the plug, screw it together, oil the threads with a little cylinder oil, and screw the plug into the cylinder. I like to listen at that plug as he cranks the engine, and in nine times out of ten, I can hear the compression—or what should have been compression—pushing its way out of the cylinder past the badly fitting spark plug. If the man cannot hear the escape of gas, then just mix up a dish of soap and water—just the same as if you were going to blow soap bubbles. Then, with a clean brush, paint all over and around the spark plug with the soap-suds, and set a man to cranking the engine while you watch the soaped spark plug. If there be the least leakage, in, around or through that plug, the issuing gas will blow up a whole swarm of small bubbles which tell just where and how much the leakage is and your man can see for himself in a manner which admits of no doubting or dodging the returns.

The Soap-Suds Test.

Testing with soap-suds is not only good for spark plugs which are suspected of leakage, but the test is also first class for cylinder ends, induction and exhaust valves and for whatever other gas joints may be found in and around the engine which are subject to compression pressure. Just spread the soap-suds over the parts, crank up compression as slowly as you can and hold it as long as you can, and the bubbles will "give away" any leakage which may exist in the engine.

The soap-suds method is also a mighty good one for testing any piping which you may have made up for gasoline or for air-handling purposes. Just close one end of the pipe, either by attaching a valve temporarily, or by plugging it. Attach the tire pump or a hose from an air tank to the other end of the pipe to be tested. Apply a liberal coating of soap-suds and turn a little air into the pipe, and if there be the slightest leakage in any of the connections—well, the air-bubbles will tell the story at once and also locate the leak with exactness.

The same test may be applied to a gasoline storage tank, but be very careful with the air and do not let in more than a few pounds pressure or you may distort the tank, rip off some of the stays or otherwise tear things up the back. Only a pound or two pressure should be put into a flat gasoline tank for leak testing purposes for there is danger of serious trouble if greater pressure be used. A pound of air pressure will blow a mighty big lot of bubbles through a very small opening, so go slow with the air pressure when testing tanks for leakage. You may use all the pressure you wish on pipes or cylinder connections, and there is no danger from excess pressure, but go very slow when it comes to the testing of tanks—especially of tanks with one or more flat sides or ends. Such flat sides won't stand much pressure without being forced out of shape and perhaps made to leak badly in more places than one.

That Sooty Spark Plug.

But to come back to spark plugs again. The plug which leaks gas is not the only plug defect that must be contended with. There are many plugs which leak electricity almost as fast as a sieve will leak water. I find it does not pay to bother with a plug of this kind. It may be possible to make it electricity-tight, but once a plug gets to leaking better throw that plug aside and put in a new one. When a plug of this kind gets a little dirty, the spark will crawl all around and over the plug, in fact, the discharge will take place anywhere and everywhere except between the proper points. Then there is another plug which belongs to the scrap box, and that plug is the one with many very fine cracks all through the porcelain part of the tube, and when you watch the discharge, you will see it sneak through one or more of those little cracks—anywhere, in fact, save through the proper spark points of the plug. When I see a man wrestling with one of this type of plug, I say to myself, "too much gasoline." He is and has been using too rich a mixture. A plug will not become covered with carbon unless the mixture is too rich, or there is imperfect combustion of the charge from some other reason.

You can usually tell pretty closely, what has been going on in a cylinder by simply unscrewing a spark plug and taking a look at the inner end of the plug. When the plug comes out covered with black soot, or streaked with oil or gasoline, you may be mighty sure that too much gasoline is used in that cylinder, and that things would be vastly improved, at once

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and permanently by cutting down the gasoline supply.

But when the inner end of a plug looks as though it had come from the inside of a furnace heated to 1,000 to 2,000 degrees, with never a sign of soot or oil on it—then you may be sure that there is good combustion habitually taking place inside the cylinder that plug came from, and that the gasoline and lubricating oil supply is not excessive.

Some Cylinders Skipped.

Only a few days ago, right in front of the office window, a drummer stood over his Ford machine, trying to find which cylinder was missing. He would take out a plug, look it over and wipe off soot as best he could, then he would try another plug and remove and examine that one also. Then he would run the engine slowly for a few seconds, then open up and spin the engine fast, while black smoke rolled out of the exhaust pipe in clouds. He kept this performance up for ten or fifteen minutes, trying first one plug, then another and then spinning the engine again.

Why will a man be guilty of foolishness of this kind? Why will he sit and spin an engine with an over-rich mixture, while the spark plugs are coating with carbon and refusing to function properly? It is hard to understand why men will do this, but they do, time after time, and when the mixture is already so rich that it can't burn, they will shake out another reef from the carburetor, or squirt an extra dose of gasoline into a cylinder, trying to cure indigestion by over-eating! Queer way that of making a cure. No wonder it won't work, but it is a great wonder to me that men with seemingly common sense in other things, will stuff an automobile engine cylinder with gasoline when it is already overfed with gas and can't ignite or burn the charge because there is not enough oxygen in the charge to combine with the amount of gasoline present.

After fooling with his machine as above, for about fifteen minutes, and just as he was about to drive along with cylinders missing occasionally, another machine came along and stopped behind the one in trouble. A few seconds' talk between the drivers of the two machines, and they both went to removing and cleaning spark plugs. The second driver got into the first machine and adjusted the gasoline and turned the engine over a few times before he put the spark on. Then he turned on the juice, gave the crank a single quarter turn, and pu-r-r-r, went the engine, with never a miss and with no black smoke trailing behind. The little machine went off in style, running as well as any machine ever ran, with each and every cylinder working full time.

Why can't drivers of automobiles get it into their heads that most spark troubles come directly or indirectly from too much gasoline? And why can't they remember to cut down the gasoline supply when they have spark plug troubles, instead of increasing the gasoline when it is already too much in evidence? I don't know why they all do this, but they do, nine times out of ten. And I presume that drummer will do the same thing in a day or a week, and then wonder why he has spark plug troubles again.

Recording License and Engine Numbers.

Can you tell off-hand, the number of your automobile license, the number stamped on the engine, also the body number, and the number of the transmission, if that has any number? If you can, you will do better than a majority of automobile users. A good many of them cannot tell even their license number, and if they want the engine number, they may have it recorded or they may not—usually the latter.

A case happened right here in Indianapolis, on the 27th of February of this year. A gentleman had a little "Tin Lizzie" and drove it to market, purchased a lot of groceries and placed them aboard, together with his box of carpenter's tools. They drove downtown and stopped in front of the Union Station for a few minutes, removing the plug from the ignition circuit, but not locking the machine in any way.

Ten minutes later, when they came back, the machine was gone, and they saw nothing more of it Saturday night or Sunday. They reported the matter to the police, but were unable to give the license number but after making a trip home by trolley, the owner was able to produce the engine number. Nothing was heard from the missing machine until Tuesday morning, while, as they were going to work, the owner and his friend saw a machine with a double tire, standing at the curb, a machine which resembled theirs very closely. They looked the machine over and decided it was theirs. The chassis was nicely covered with a blanket and the drip under the machine, indicated that it had stood there all night.

They phoned to the police station, and were advised, if they thought the machine theirs, to drive it to the station. This they did, and upon investigation, it was found that their engine number was stamped upon the engine. The machine was in perfect order, as good as when it was taken, but the groceries and the tools were gone, and they have staid gone ever since. The speedometer showed that the machine had been run about 500 miles during the time it was gone.

As professional automobile thieves make a point of at once changing the license and engine numbers, together with any other numbers they may find, it stands well for any automobile owner to establish private marks or numbers and stamp them upon some accessible but out of sight portion of the car for use in case of a change of number as above mentioned.

Furthermore, it is a pity that automobile thieves cannot be served with the "wild and wooly West" cure for horse stealing. If an automobile thief knew with certainty that he would be strung up at once when caught, there would not be one automobile stolen where twenty are taken now. Evidently the lamp post cure would be almost a sure one against automobile stealing.

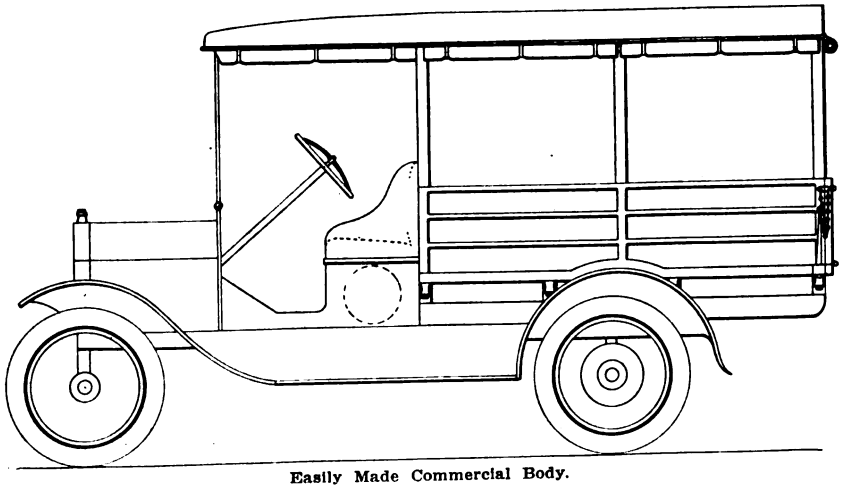
License Fees Cut in Half.

From C. H. Billings, New York.—Referring to your answer to F. M. Groth, N. Y., in the March number, would refer you to Chapter 491, "An Act to amend the Highway Law, in relation to motor vehicles," Sec. 6: "Provided that if a motor vehicle other than one used solely for commercial purposes shall have been licensed for four separate years hereunder and for which there shall have been paid the annual registration fees herein provided during said period, the annual registration fees thereafter shall be one-half the amount."

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A Good Commercial Body.

This design of body is for express, parcel and light delivery service. For this purpose two considerations are of prime importance. The driver's seat must be convenient of access and the contents of the fore part of the body must be within easy reach from the driver's seat. To gain these results the seat must be placed as low as possible, this being essential in a body of the sidewalk delivery type. In the illustration it is shown mounted on a standard Ford chassis with a wheel base of 100 inches. With a body of this length, on such a small wheelbase, it is necessary to bring the seat forward about 20 inches from the dash. From the floor to the top of the seat cushion is about 14 inches; from the front of the cushion to the back of the seat is 15 inches. The length of the body back of the driver's seat is 6 feet, 6 inches; the width of the body is 5 feet; the height of the body is 4 feet, 3 inches; the sides of the body are 18 inches high. This body has roll curtains and a hinged tail board, and it is also necessary to use a wood frame built on the chassis to support the overhang of the body, as the chassis frame on a Ford ends at the center of the rear wheels. This will be found to be a very useful body and easily constructed.



Easily Made Commercial Body.

THE FIT OF PISTONS.

A Paper by E. W. Weaver Before the Society of Automobile Engineers.

As the satisfactory running of an engine depends upon the correct functioning of all the different parts, it is improper to single out any particular point as the most important part of the engine. However, the piston being the part first affected by the impulse of the explosion, friction at this point cuts into the efficiency of the engine to a greater extent proportionately than at any point further along the line. It is, therefore, of prime importance that its fit in the cylinder be the best obtainable—sufficiently free to allow for the necessary oil film and for slight distortions in shape under heat, and close enough to prevent "piston slap."

The question of the fit of the piston in the cylinder is not that of a solid plunger operating in a cylinder of heavy enough body and surrounded by such conditions as to insure an unchanging form, and permitting of copious lubrication. The problem is that of a comparatively delicate piston working in a cylinder the walls of which are thin as the designer dares make them and which is subject to great variations of temperature at different points. Lubrication, too, must be held down to the minimum in order to conform to various smoke ordinances, or lacking such inducements, to one's own sense of the fitness of things.

The question of the ideal allowance to make will be considered apart from that of manufacturing tolerances. Some engineers use the very convenient rule of making the piston .001 small for each inch of diameter of the cylinder bore. I believe that the following rule comes closer to actual requirements: Allow from .002 to .0025 for each inch of diameter above two inches.

As it is impossible to manufacture commercially parts that are all exactly alike, due allowance must be made for variations. The engine builder has the choice of the following three methods: (1) putting limits on the drawing and holding the inspection to such a point that any piston will work in any cylinder; (2) sorting the cylinders and pistons according to size, and assembling the large pistons in the large cylinders, etc.; (3) making all the pistons a closer fit than they are expected to run and lapping them down to the proper fit, each in its own cylinder.

I shall touch on the first method only, that of strictly interchangeable production. The fixing of the limits to which the shop is to work is very important, as it affects directly the cost of the product. My idea is that the drawing should represent what the engineer expects, what the shop will guarantee, and what the company is willing to pay for.

Considering the cylinder first, a permitted variation between maximum and minimum size of .0015 is absolutely necessary—.002 is the ordinary allowance—and the cylinder must not be tapered or be "out of round" to in any wise exceed the given allowance.

A variation of .001 between the maximum and minimum for the piston is the usual allowance. If wider limits are given, more care must be exercised in assembling, or the quality of the engine will be lowered.

The head of the piston, being exposed to the

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intense heat of the explosion, must be made considerably smaller than the skirt. The amount is usually fixed at from .002 to .0025 small for each inch in diameter.

The fit of the piston ring in the groove is another particular point. The rings must be loose enough to operate freely and close enough to prevent gas from leaking past. The minimum allowance that is safe is .0005, and the tolerances on both ring and groove must be given in such a way that this allowance is not diminished. The closest limits that are being worked to commercially are .0005 variation between the minimum and maximum of both ring and groove width.

Allowance must be made between the ends of the piston ring for expansion under heat. From .006 to .015 is the usual amount allowed.

The fit of the piston-pin in the piston is the final point at which great care must be exercised, the proper allowance for the fit being .001 of an inch. The hole in the piston being reamed or broached can be held from exact size to .0005 under size. In the case of a one-inch piston-pin, the hole in the piston would be dimensioned from 1.000 to .9995, while the piston pin would be given as .9990 to .9985, thus insuring a minimum allowance of .0005 and a maximum allowance of .0015.

A company making a specialty of the manufacture of pistons and cylinders is acutely aware of the advantage to be gained by having an accepted standard for the nominal sizes of cylinder bore. For instance, with a nominal diameter, of four inches, one engine-maker may give tolerances of +or—.001; another maker may give tolerances of +0, —.002; and there are various other combinations. This, of course, necessitates carrying special tools and gauges for each size which is made.

It should be stated in conclusion that the suggestions in this paper apply particularly to water-cooled engines, the writer not having had sufficient experience with air-cooled engines to offer any suggestions along those lines.

A SUMMER TRIP.

Suggestions for Car Owners Who Have Never Tasted the Pleasures of an Outing.

From J. F. Shaw, Wisconsin.—I have been wondering whether or not your eastern readers would be interested in a brief account of an August automobile trip along the upper reaches of the Mississippi. Nothing sensational I assure you and perhaps hardly worth the perusal and yet a little outing replete with kindly reminiscence for myself and family.

Leaving Minneapolis on Washington Avenue the route followed an excellent highway to Anoka and Elk River, thence paralleling the Northern Pacific track through a beautiful farming country taking in St. Cloud, Little Falls and Brainerd, all charming and prosperous Minnesota cities. The blazed trail placed by kindly disposed motorists who had preceded us was a welcome beacon which helped us over many a stretch of indifferent highway and around some lonesome corners. By the way the "trail" helpful as it is, follows the wrong side of the river between St. Cloud and Little Falls. On the return trip, leaving the trail at Royalton we bore to the left and soon came to an abandoned Northern Pacific right of way where we had the pleasure of riding many miles on a water-level, cindered roadway. This was worth finding and leads me to the observation the blazed trail is sometimes subject to modification in a new country.

Though approaching its northern environs the Mississippi still presents a lordly aspect through this section. It seems a thing of life, proudly conscious of the important part it plays in the welfare of the vast region it traverses. Its spacious banks abound in attractive camping places where the eye is charmed with delightful vistas of land and water scenery. I will never forget the pleasant lunch hour on the river bank where we wasted time scandalously, skipping stones, wading, visiting and idling. Did I say "wasted?" Quite the contrary after all. Time spent in the society of your own family in the big out-doors is never wasted.

Numerous trains passed us en route and we always got a friendly wave from the fireman. Passengers would frequently beckon us to come on but inequalities in the roadway would soon render a slowdown justifiable if not imperative in the interest of "safety first," so we invariably suffered defeat. But it was some fun to try.

Some eight or ten miles south of Brainerd we came to a splendid piece of permanent road constructed of iron slag. This lasts until within a mile of the city, the balance of the way being over sand interspersed with jack pine roots. I dare say this iron highway will be connected up with Brainerd's excellent macadam system in the near future.

After a week's vacation at Brainerd, Marse Ford declined to start at six o'clock in the morning for the return trip. The insertion of one new spark plug, however, remedied the difficulty and we were soon bowling merrily along through a succession of mud holes occasioned by a heavy rainfall of the previous night. A two hours' ride in the warm, moist air of early morning found us in capital shape to enjoy a bountiful open air breakfast provided by friends at International Falls. We stopped near the shore of a little lake on the opposite side of which a number of tepes bespoke the probable presence of a band of Indians, mild and peaceful descendants of the proud warriors who once roamed this region.

With reference to vegetation we were on the dividing line, the various evergreen growths giving way to the oak family, these in turn to be superseded as we journeyed southward by the big elm, maple and basswood with which we are familiar in Wisconsin. Characteristic vines clustered the adjoining hedge and the slender hazel gave timid evidence of later fruitage; the sumac claimed attention through the conspicuous wizardry of early frost.

Breakfast over we hustled along without special incident enjoying every moment of the ride. A pretty park and an adjacent cold spring helped us while away our rest hour at St. Cloud. Toward evening the one blow-out of the trip occurred inopportunely (was ever a blow-out opportune?) and the consequent delay made the brilliant illuminations of Hennepin Avenue, Minneapolis, doubly attractive through the promise of restaurants galore.

The Twin Cities are replete with attractive drives for the motorist. Minnehaha Park, Minneapolis, is the Mecca for thousands of auto parties, picnic bent. from all over the northwest. Lake Harriet and Lake of the Isles drives are unsurpassed for beauty. Riverside Drive, for pleasure driving exclusively, follows the high banks of the river between the two

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cities and includes historic Fort Snelling and other points of interest. Thence down Summit Avenue, St. Paul, said to be one of the handsomest streets in the world. Tourists traversing St. Paul should not miss Como and Indian Mounds Parks.

Leaving St. Paul on East Seventh Street, the friendly blazed trail leads the way along the river southward through St. Paul Park, Hastings, Red Wing and Lake City. Between the latter named towns the celebrated Lake Pepin may be seen nestling at the foot of the Wisconsin bluffs. The scenery in this locality is truly of surpassing loveliness. The lake lies like an emerald, reflecting every passing shadow, its surface sparkling in the sunshine or in turn dark and frowning as storm clouds skud above it; for the little lake with all its charm and beauty is also treacherous and on many a sad occasion has taken toll of human life. The locality abounds in Indian legend and romance, the very names as Red Wing, Waucouta, Frontenac, Maiden Rock, etc., indicating their origin and here the lover of Indian tradition can unearth enough to fill a volume. Here in this land of romance lying so peacefully in the warmth of August sunshine we must resist the beckoning call of the majestic river and reluctantly leaving the friendly sign of the blazed trail we wend our way across the bluffs to the good, old Wisconsin home, each and all the better for our little outing and looking forward with pleasant anticipation toward the next opportunity for a similar trip.

MOTOR AMBULANCES.

A Prize Competition and a New Body Design by Hale & Kilbern Co., Chicago, Ill.

The motor ambulance has attained a good deal of prominence since the great European war and it is now being extensively used. Experts have already begun to study the matter to find out if something may not be done to improve the present type. Moreover, in England, at the instance of Mr. Henry S. Wellcome, the founder of the Wellcome Bureau of Scientific Research, a commission has been formed, and the names of members show at once that the matter is regarded as of first importance by those most intimately connected with the welfare of the wounded soldier. This commission will first act as a judging committee for the award of prizes of the value of £2000 provided by the Wellcome Bureau of Scientific Research. These prizes are offered for the best designs of ambulance body which shall fit a standard pattern motor chassis for field motor-ambulances. The last day for the receipt of completing designs is June 30, 1915. It is hoped that the competition will bring in a number of ingenious designs, from which the ideal field ambulance-body will be evolved.

The sum of two thousand pounds will be divided into a first prize of £1000, a second prize of £500, a third prize of £300, and the remaining £200 will be awarded in smaller sums.

The first, second and third prizes are for a complete design of an ambulance-body, complying with the conditions hereinafter laid down. The Commission reserves the right to award the whole or any part of the remaining £200 for details, such as an ingenious method of springing, an invention which could be applied to any motor-chassis, an ingenious method of storing arms and equipment, a novel system of lighting, mechanical devices for self-haulage, etc.

Among the conditions relating to construction are that the ambulance must carry four patients; the driver and orderly must be provided with shelter; the vehicle must be capable of being loaded from the ground by four or less bearers; the center of gravity of the body must be low; and the material of the body must be as non-inflammable as possible. There are other requirements which will naturally be borne in mind by those who compete.

In this connection, a body design is presented herewith which of course was outlined and completed before this competition was published, the builders being the Hale & Kilburn Co., Chicago, Ill.

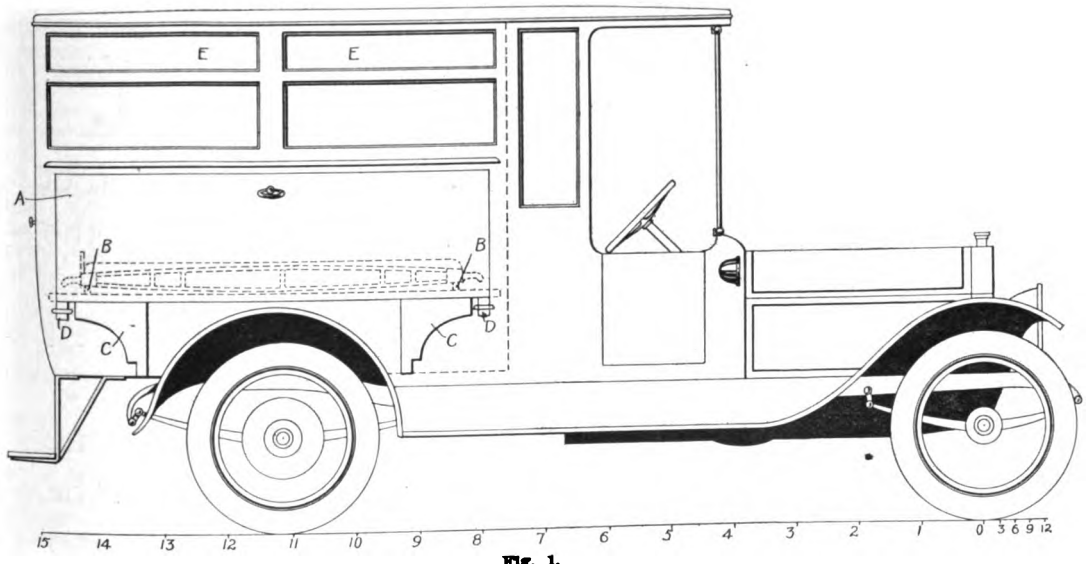


Fig. 1.

This body is built entirely of steel, there being no wood used in its construction. It is shown mounted on a Pierce-Arrow chassis. Even the stretcher is of steel. The novel and highly convenient method of access for injured persons will be noted. The side panel A, shown in Fig. 1, falls

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outward, allowing the stretcher to be run out on a pair of runners B, shown in Fig. 1, and Fig. 3, for enabling the patient to be deposited on it with greater ease than is possible when access is made use of by the rear and in other types of bodies. The body also has two brackets C, which are hinged to the side of the body in such a way that they can be swung outward to support the panel when open. There are also two sliding brackets D, which are pulled out of a recess, to also help in the support of the panel. In Fig. 2, I have shown a window next to the driver, for means of giving light into the body, as well as from the sides and rear. There are two ventilators over the side windows marked E, in Fig. 1. This design is conveniently constructed in many ways and one of its advantages is that it is unnecessary to back to the curb but is drawn up lengthwise with the curb, therefore, not interfering with traffic, as the ambulance bodies of the past, but allows other vehicles to pass conveniently.

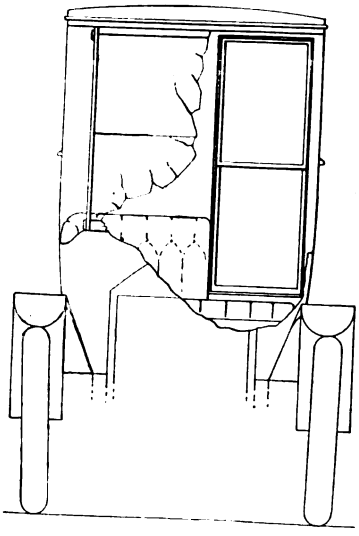


Fig. 2.

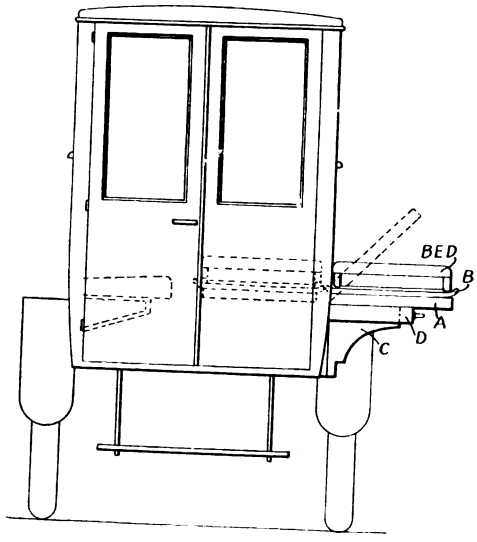


Fig. 3.

ONE STROKE OF A BELL

in a thick fog does not give any lasting impression of its location, and if it were not followed by others the vessel might strike the rock. But repeated strokes at regular intervals, even in the densest fog or the darkest night, will soon make its exact location absolutely sure. It is absolutely the same with advertising; one insertion hardly makes a sufficient impression on the mind of the possible purchaser, and if faint of sound it might about as well not have been inserted at all. But constantly repeated, it will soon make an impression that cannot be forgotten.

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NEW AND INTERESTING THINGS IN MOTORDOM

Korine Carbon Remover.

This is a preparation for removing carbon from motor cylinders. The manufacturers state that it contains no acid, grit or chemicals and it will do the work thoroughly and quickly. This is an especially attractive proposition for dealers, and any who may be interested should write for full particulars to the Korine Carbon Remover Company, 136 Federal Street, Boston, Mass.

Price Was Incorrectly Stated.

In the March number of the Automobile Dealer and Repairer, we published in this department a description of the Stream Line Hood for Ford cars, manufactured by the Superior Lamp Manufacturing Company, 136 West 52nd Street, New York City, and the price of this hood was erroneously quoted at $11.40. The correct price of this hood is only $8.00, as it was stated in the advertisement appearing from this company, in the same issue.

Special Wheels for Ford Cars.

A line of special wheels and demountable rims for Ford cars, also automobile wood wheels of all kinds is manufactured by the Meeker Manufacturing Company of Dayton, Ohio (Station A). They will be pleased to furnish best estimates and full particulars to all readers who will take the trouble to write to them, and prompt deliveries are guaranteed.

The Ideal Oil Gauge.

This is a thoroughly practical oil gauge especially designed for the Ford car. It is attached right on the dash in plain sight and it is accurate and reliable. It has the enthusiastic endorsement of thousands of Ford owners now using it. It is simple, inexpensive and there is nothing to break or get out of order. Can be attached in five minutes by anybody, and it is made to fit exactly. It is an especially good proposition for jobbers and dealers. Any who are interested should write to the manufacturers, A. B. Worthington, 1220 San Pedro Street, Los Angeles, Calif.

Double Tread Tires.

B. Liben & Co., 261 West 54th Street, New York City, are manufacturing what they call the Double Tread Tires, and they state that this tire is made of 12 layers of fabric and one-inch of solid rubber. It is further stated that this combination makes a tire of great strength, and it is also claimed that this tire has greater resiliency than the ordinary shoe. It is also guaranteed to be absolutely puncture-proof and it is claimed that a stone bruise has no effect whatever on this tire. Readers who will take the trouble to write this firm will be given full particulars, prices, etc.

Enlarging Their Plant.

On account of the rapid increase in business of the Connecticut Telephone & Electric Company, it has been necessary to make an extension to their plant by another addition approximately 50 x 100 feet. This building when completed will have four floors and a basement, and will be of modern brick mill construction with all up-to-date appliances. This building will be completed for occupancy by April 15th, and will be largely devoted to the manufacture of Connecticut Automatic Igniter Systems. This makes the third modern extension to their plant within the last few years.

Bethlehem Spark Plugs for Racing.

Johnny Aitken, the well-known driver of National cars, has used Bethlehem Spark Plugs and he has highly commended them in a written testimonial, stating that in his judgment they are the best plugs on the market. Of course the test to which a driver like Aitken puts his spark plugs are unusually severe and the fact that the Bethlehem stands right up under every one of these tests is evidence of the sturdy construction and mechanical merit of the plug. This plug is manufactured as most of our readers know by the Silver Company with a main office at 171 Madison Avenue, New York City.

Armstrong Stocks and Dies.

A very complete line of stock and dies for cutting A. L. A. M. treads is manufactured by The Armstrong Manufacturing Company, 335 Knowlton Street, Bridgeport, Conn. The dies are adjustable, and as tools of this character are practically indispensable in repair shops many of our readers are likely to be interested in them. Correspondence direct with the manufacturer is invited.

The Witherbee Storage Battery.

The manufacturers of this well known battery claim that it will stand up in ignition, illumination, and starting service under the most trying conditions, and they also state that it is a conservatively rated battery. This battery is backed by over 10 years practical experience which should be in itself a guarantee of reliability. Readers who are interested should address the Meder-Staudt Company, Inc., 1876 Broadway, New York City. This company also specializes in the repair and exchange of batteries of any manufacture, and they carry complete facilities for this work both in New York City and at their factory in Springfield, Mass.

Will Protect the Public.

At the first meeting of the Directors of the United Garage Association of New York State, Inc., held at Albany, it was announced that detectives had been retained to search out dishonest garage proprietors and assist the association in exposing them and their methods and protecting the public.

The Carburette Vaporizer.

The manufacturers of this new device state that it enables the driver to throttle a Ford car down to four miles per hour, and also get away quicker and with a degree of smoothness which would not be possible without it. This device is designed to fasten neatly to the exhaust pipe, just back of the dash, with suitable means for connecting the gasoline pipe leading from the tank, and connecting the broken end from the carburetor. The gasoline passing through the Carburette becomes heated and also clean of any dirt, water or sediment, and it is claimed that the heating of the gasoline causes more complete carburetion. The warm gasoline coming in contact with the air attains a finer degree of vaporization making far more power, flexibility and smoothness of the motor, and it is also claimed that with the Carburette Vaporizer, the needle valve can be closed about ¼ of a turn, allowing a saving in gasoline of 20 to 30 per cent. It can be installed in 20 to 30 minutes with no tools other than a file and wrench, and it is so reasonable in price that it will interest a great many Ford owners. For prices and full particulars, address The Perkins Appliance Co., 539 Worthington St., Springfield, Mass.

The "Aeolus" Tire Pump.

This is a powerful compound pump that makes inflation of tires an easy task. It is substantial and long lasting. The pump cylinders are made of seamless brass tubing (not steel) which will not rust, and the joints are positively non-leakable. This is only one of the many desirable styles of tire pumps manufactured by the Bridgeport Brass Company of Bridgeport, Conn., and readers are urged to send to this company for their 1915 catalogue, which describes and illustrates their full line.

A New House Organ.

The Auto Parts Company, Providence, R. I., manufacturer of the Apco line of specialties, is issuing a house organ termed the Ford Dealer. It is published on the 20th of each month and its contents are devoted to the interests of the Ford dealer and garage. It contains much useful information to the trade to whom copies will be mailed free upon request.

The "K. & S." Ratchet Wrench.

This is a very handy ratchet wrench with reverse shift and it makes an important addition to the kit of any motorist or garage owner. This wrench is made of the best material and all parts are interchangeable. For printed matter and particulars, write direct to the manufacturers, Henry M. Kolb, 2311 North 16th Street, Philadelphia, Pa.

Automobile Specialties.

The Nathan Novelty Manufacturing Company, 84 Reade Street, New York City, have just issued a new catalogue in relation to their automobile supplies for Ford cars, as well as motor cycles. It is well illustrated, the price of each article is given, and it will be sent to any dealer or car owner who applies for it, at the cost of a postage stamp.

Subscribe to the "Automobile Dealer and Repairer." $1.00 Per Year.

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Johnson's Prepared Wax.

This is a preparation for use on the body, hood and fenders of automobiles, whether old or new. The manufacturers state that this wax will preserve the varnish and protect it from the weather. It will cover all small scratches and it minimizes the labor of keeping cars in good condition. Mud spots can be easily and entirely removed from cars that have been polished with this wax. This wax does not gather the dust and it is largely used for polishing floors, linoleum, woodwork, furniture, pianos, etc. The manufacturers want every reader of this magazine to try a can of this wax, and they are therefore making a special offer at this time. If you will cut out the coupon attached to their advertisement in this issue and send it to them, together with ten cents in coin or stamps, they will forward you absolutely free and postpaid, a can of this wax, sufficient for one application on a large car. Fill out the coupon before you forget it and take advantage of this remarkably liberal offer, addressing your request to S. C. Johnson & Son, Racine, Wis. To secure the free can be sure to use the coupon.

A New Auxiliary Seat.

We illustrate a new seat made by the Hill Manufacturing Company of 25-27



Hill's Auxiliary Seat No. 24, Open and Closed.

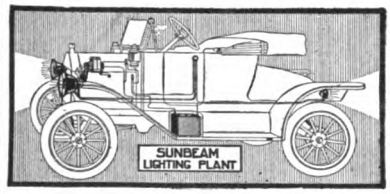
Fuller Street, Buffalo. The seat is round and has a diameter of 13 inches, from the bottom of the seat to the top of the back is 18 inches and the seat folds up flat against the back, thus giving free access to enter the door of the tonneau. The chair revolves and is made with springs in the cushion. This seat is especially adapted to Reo 6 and Overland touring cars, or any car where the tonneau space is somewhat crowded. A large line of other seats is made by the same manufacturers, to whom all inquiries should be addressed.

The Adamson Vulcanizer.

A very handy vulcanizer for motorists which can be easily carried in a touring kit is manufactured by the Adamson Manufacturing Company of East Palestine, Ohio. This vulcanizer is not an experiment, but is in extensive use all over the United States, and it can be found in the kit of half a million or more motorists. This is a simple and practical device and absolutely certain in its operation. It is also so low in price that it is easily within the reach of every motorist. This vulcanizer is made in various styles and sizes and those who are interested should write to the manufacturers for complete information.

The Sunbeam Lighting Outfit.

The manufacturers of this outfit guarantee its efficiency in the strongest manner, and the price of the outfit is so low that it is certain to interest many of our readers. It is especially adapted for Ford cars and is equipped where desired with complete brackets for attaching.

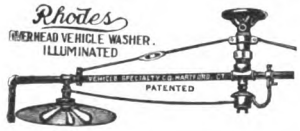


Made by Milwaukee Specialty Mfg. Co., Milwaukee, Wis.

The manufacturers have been conducting a test of the generator used on this outfit and after running one of these generators 10 hours per day for 20 days, it was found in perfect condition and at no time did it overheat or fail in any way to work in first-class shape. The price of this lighting outfit is so very low that it is easily within the reach of every Ford car owner. The illustration shows how the outfit appears when attached to the Ford car. For further particulars write to the Milwaukee Specialty Manufacturing Company, who will gladly furnish prices and complete particulars.

Automobile Washers.

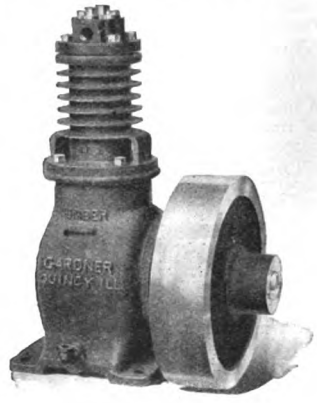
The Rhodes Overhead Vehicle Washers are useful for all owners of automobiles and carriages. They are made in two styles, the Excelsior Plain Washer and the Superior Illuminated Washer. The Rhodes Excelsior Plain Washer is designed for use where a direct light on any and all parts of the vehicle are not required. The Rhodes Superior Illuminated Washer is equipped with electric lights, which allows of washing vehicles at night or in a dark place, and will throw a strong light directly on the vehicle to be washed, when you want it and where you want it, and makes daylight conditions where night work is required. This illuminated washer has a special electrical contact box, the result of long experience and which positively insures a perfect electrical contact without any danger of short circuiting,



under the most severe conditions, and has been tested and approved by the National Board of Fire Underwriters. By the use of this washer you can reduce your electric light bills, as you do not have to light up the whole four sides of your washstand, and the person doing the washing can do far better work, as the light shines directly on the side of the vehicle, showing up all crevices where dirt would otherwise be concealed. Both models of the Rhodes washer are of simple, strong construction with no complicated parts to get out of order, and all vital parts are made of brass, the rest are wrought or malleable iron, insuring absolutely first-class construction, with an easy, smooth working revolving joint at all times. The washers require only a short piece of hose, which is suspended clear of the ground, and swings around the vehicle being washed, putting the water just where it is needed. The arms extend 4½ feet from the center, thus giving a 9 foot circle, which is sufficient for any ordinary car. They can be made longer or shorter as requested, to meet any special requirements. They are made by The Vehicle Supply Company, 26 State Street, Hartford, Conn.

Gee Gee Garage Pump.

Gardner's "Gee Gee Special" Garage Pump is a thoroughly practical air compressor for use in garages. It is an air-cooled pump with enclosed crank case, which is dirt and dust proof. The lubrication is automatic, through the splash system. Every working part is drenched with oil, which prevents wear and insures long life to the pump. This air compressor under test ran continuously at a speed of 600 revolutions per minute, 150 pounds air pressure, until it had made more than 30,000,000 turns. After this test every working part was



New Garage Pump.

still in perfect condition without a semblance of wear. The machine is well balanced and accurately built and fills the need for a low-priced reliable pump. Write for full particulars to The Gardner Governor Company, Quincy, Ill.

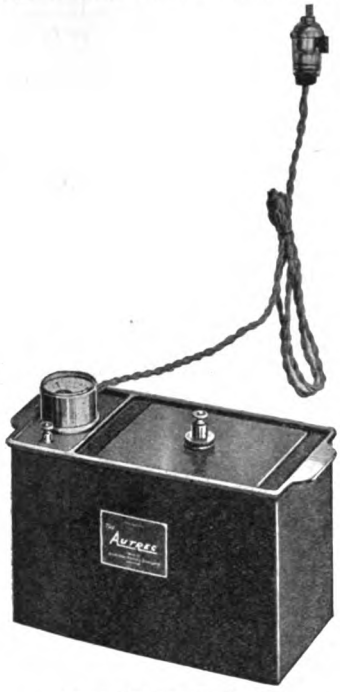
Electrical Starting and Lighting Equipment.

A new and important source of revenue for garage owners has been opened up by the increasing use of the electrical starting and lighting equipment. With the exception of a very few low-priced cars, practically every car now made has this equipment, which includes motor, generator, battery, switches, regulating devices, wiring, lamps, etc. Any dealer or garage owner who doesn't carry this line at present should communicate with the Weston Electrical Instrument Company, 2 Weston Avenue, Newark, N. J. They have a special proposition which should be intensely interesting to every garage owner, and they are making a special offer which will soon be withdrawn. We therefore advise prompt action. This is something worth while and gives the dealer or garage owner control of the cream of high class trade in any given territory.

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For Battery Recharging.

The device illustrated herewith enables you to charge a 6, 8, 12, 18 or 24 volt storage battery from an alternating current circuit. It is almost as easy to manage as an electric household iron. Screw the attachment plug in any socket where there is alternating current and then run two wires from the Autrec terminals to the storage battery to be charged. The latter may be left on the car. Turn the socket key and the battery will receive a direct current. The Autrec will pass a current of about two amperes or a little lower if the voltage of the battery is high. With this current, you can charge a battery of any ampere-hour capacity if time is not limited. A charging over night will put a discharged battery in serviceable shape, and if the latter is of large ampere-hour capacity, the current may be left on long enough to effect a complete charge, or it may be put on at different times and the same result accomplished. Charging the battery at regular intervals is good practice. Made by the American Battery Company, 1132-1134 Fulton Street, Chicago.



Autrec Battery Recharger.

New Spark Plug Line.

The Fulton Company, 726 National Avenue, Milwaukee, Wis., manufacturers of the Aermore Exhaust Horns, are offering a new line of spark plugs under the trade name of Eklips.

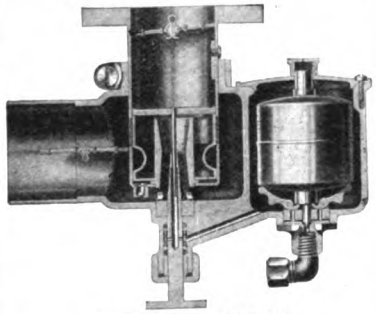
In this line is employed imported hand-turned porcelains, insured against breakage by a series of spring washers. Electrodes are of a special heat-resisting alloy, which does not fuse nor flake. A noteworthy construction is the shape of the electrodes, which are so shaped that oil runs to their lowest point to drip off, thus running away from the sparking point. The petticoat of the porcelain is kept well back from the points, leaving a chamber within the steel shell, and serves to clean the plug out at each explosion. Where heat or oil conditions require, a mica core can be furnished, which has strips of mica wrapped around the center core, in addition to the usual washers. The electrodes are extended ¼ inch below the shell, so that the spark occurs in a body of fresh gas near the center of the combustion chamber.

Do You Lock Your Car?

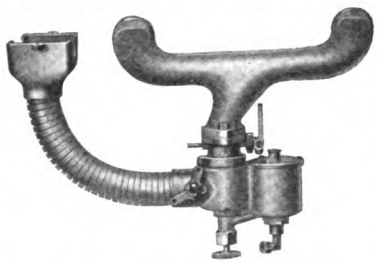
In view of the growing activity and cleverness of automobile thieves not the least of the worries of the auto owner is the chance of finding his car missing when he returns to the place where he left it. From time to time locking devices have been brought out which fulfilled their mission with varying success, but owing to their high cost and the mechanical fitting required, they have not found favor with the average automobile owner. With these conditions in mind the makers of the commercial auto lock have produced a simple device which securely locks the shift lever in the neutral position on all cars having the "H" plate, thus making it impossible for anyone not having the key to move the car. The lock is made of manganese bronze, requires no fitting and to put it within the reach of all who desire to protect themselves from the loss and annoyance of theft, it is being sold at a very modest price, The lock is the production of the Commercial Specialty Company of Cleveland, Ohio, who will be glad to supply you should you be unable to secure one from your dealer.

An Effective Carburetor.

The Frost Manufacturing Company, Kenosha, Wis., make the new Brad-Kent Carburetor which is surely an innovation. Its simplicity, light weight and automatic operation are decidedly novel. It has no cams, springs, or other delicate mechanism to be thrown out of adjustment by vibration. It requires one adjustment only—for gasoline—which is obtained by hand-wheel on underside of the carburetor. The firm manufactures a special equipment for Fords, consisting of carburetor and manifold, hot air tube and stove. It can be installed on any Model "T" Ford automobile in a few minutes by disconnecting and removing manifold and carburetor and replacing with the Brad-Kent carburetor and manifold. No bolts, nuts, screws or washers required, except such as are now on your car.



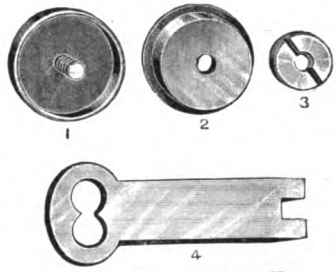
Brad-Kent Carburetor.



Manifold, hot air tube and stove.

Reliable Puncture Plugs.

There is no preparation necessary to insert and lock the Spitler Tire Puncture Plugs. The operation is clean and simple. It is not always an absolute certainty that a vulcanized repair is going to hold. The Spitler Puncture Plugs clinch and permanently lock the punctures. With both the patch and vulcanized repairs to inner tubes there always remains one or more weak spots in the tube, which are liable to be punctured again just at those spots; then another patch or vulcanizing job is necessary. This is not the case when Spitler Puncture Plugs are used. Another puncture cannot occur just over the spot covered by one of these plugs. They can be used over and over again. They also vulcanize themselves to the inner tube automatically. They are made by B. W. Spitler, 52 Claybourne Street, Dorchester, Mass.



Puncture Plug parts and Key.

Atwater Kent Unisparker.

For the benefit of automobile owners wishing to replace magneto equipment on their cars for Atwater Kent Ignition, the Atwater Kent Manufacturing Works have produced a special form of mounting. This consists of a base 4½ x 3⅛ inches to fit the standard magneto platform, containing a bevel gear reduction, by which the vertical shaft is run at cam shaft speed. The bevel gears are packed in grease and require no attention. The horizontal shaft projects clear through the housing, so that the drive can be taken from either end, thereby permitting it to run right or left hand to suit the engine.

The Unisparker with this outfit is furnished with or without the automatic advance feature. If automatic advance is furnished, the Unisparker casing is first set in the proper angular position to produce a retarded spark on cranking, and is then clamped fast by the cap screw. Owing to the simplicity of this outfit and its freedom from delicate adjustments it can be installed by the garage man without difficulty.

High-Grade Tire Accessories.

A full line of high-grade tire accessories, including tire covers, reliners, inner and outer shoes, raw stocks, and cementless patches is made by the Chicago Tire Goods Company, 1216 Webster Avenue, Chicago, who will gladly furnish prices and particulars on application.

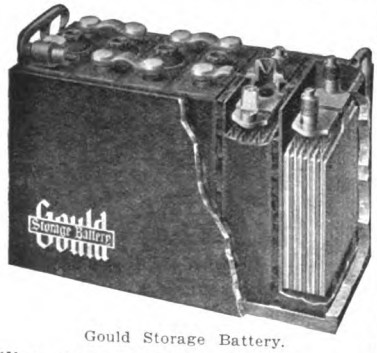
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Rapid Growth of a Well-Known Firm.

The recent completion of another addition to the plant of the Atwater-Kent Manufacturing Works in Philadelphia gives further testimony to the extremely rapid rate at which this concern has grown and to the increasing popularity of the ignition system that has made the name famous among automobile owners. The present addition is the twelfth extension which has been made during the last twelve years. It was not considered definitely until the latter part of November, at which time it became apparent that the rapidly growing schedule of deliveries for the spring months would tax the present plant, which, when it was built two years ago, was thought to be of ample size to take care of any normal increase for years to come. The new plant has a capacity of over 700 ignition systems per day.

For Starting, Lighting and Ignition.

The Gould Storage Battery Company, 30 East 42d Street, New York, manufacturers of storage batteries, are now marketing an improved battery for starting, lighting and ignition of gasoline cars. The grids of these batteries are of the same well known Gould type, assuring high conductivity and low internal resistance throughout the life of the plate. The active material in the positive plate is harder than ordinarily used, and wears evenly, the result being more uniform capacity throughout exceptionally long plate life. The maintenance of this uniform or normal capacity throughout the battery life is very desirable, as it permits safe use of a battery having capacity much nearer to actual requirements and one consequently smaller and lighter than where the plates get decidedly weaker with age. A large set-



Gould Storage Battery.

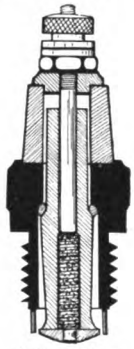
tling chamber at the bottom of each jar permits long service without cleaning. Short circuits between the plates are prevented by wide separation and rugged separators. For business information, address the manufacturers as above.

Parts For Obsolete Cars.

The Puritan Machine Company, 411 Lafayette Boulevard, Detroit, Mich., has been for years making a specialty of the manufacture of parts for cars no longer manufactured. This business of making parts for obsolete cars is quite important, as it accommodates the owners of these cars, who could not otherwise be served except at great expense. Large quantities of the assets of the defunct Krit Motor Car Company and the Krit Motor Sales Company have been purchased by Alfred G. Dunk, president of the Puritan Machine Company, and this company will continue the manufacturing of parts for the Krit, and will also build a limited number of complete cars from the Krit patterns. The Puritan Machine Company makes parts for something like 60 makes of cars which are no longer manufactured.

Peco Valve Plug.

The Power and Efficiency Company, of 137-139 East State Street, Trenton, N. J., are placing upon the market in addition to their regular "Peco" two point ignition plug, a single pole plug that is called the "Peco Valve," and bids well to jump into great demand and



A New Plug.

become as popular as their two point ignition plug. The important feature of this plug is the method of seating the porcelain, making an absolute air tight joint with the use of very little pressure or strain upon the porcelain, also eliminating any chances of leakage of the mixture by compression. The seat being reversed from the ordinary plug, placed in the socket from the bottom of the plug, so that the compression acts directly upon the same, and forces the porcelain tighter and tighter by upward pressure against the gasket, similar in action to the compression acting upon a poppet valve. The insulation is composed of two parts, an outer member which surrounds the inner core, and acts as a bridge resting upon the face of the socket. It not only acts as an insulator but also is used as a means of support to hold in place the inner insulation. Ample room is left in the insulation and all other points for free expansion and contraction. The lower end of the electrode is properly threaded to receive the cement and is placed in the porcelain in the same manner that the porcelain is placed in the socket and positively cannot leak. At the end of the insulation and attached to the electrode is a baffle plate made of special non-corroding material from which the spark jumps to the special projecting ground wires, inserted at the bottom of socket or shell. There are four of these special wires in number, so that if any fouling deposit should occur at one point it will automatically change to another point. It can be assembled and dissembled in a minute's time without the aid of any tools. All parts are made from the very best material obtainable for the purpose and highly finished.

Non-Carbene.

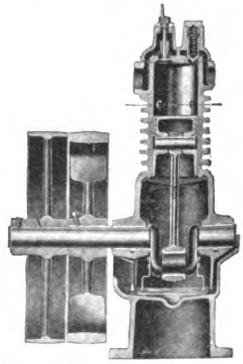
This is described by the manufacturers as a carbon preventer and power stimulator. It is made for use in all internal combustion engines, including automobile, motor truck, motorcycle, motorboat and aeroplane engines. The manufacturers claim that this preparation combined with gasoline will increase your mileage 20 per cent., prevent formation of carbon and improve the running qualities of your car. Non-Carbene is guaranteed to contain neither acid, alcohol, ether or any substance injurious to the carburetor or motor mechanism. Full information will be furnished in regard to this new product if you write to The Noncarbene Company, 1765 Broadway, New York City.

Master Vibrator for Ford Cars.

The modern tendency in motor car equipment is to avoid having the dash littered with all kinds of so-called accessories. For this reason, the master vibrator has not always been acceptable to those who, while convinced as to its possible merits, objected to the apparently makeshift device. Recognizing this natural tendency, the American Coil Company, of Foxboro, Mass., devised a master vibrator which completely removes this objection on the part of many owners and produced a master vibrator identical in material and finish with the Ford coil box and provided an easy method of attaching the vibrator to the coil box in place of the switch. The combination of coil box and master vibrator is perfectly harmonious as it is about the size of an efficient coil switch. The type of cowl dash on this year's Ford practically excludes the installation of an old style vibrator on the dash and, so far, no other vibrator has been produced which can be conveniently attached to the coil box. In this harmonious combination of vibrator and coil, all extra wiring is eliminated. The only thing necessary to do is to detach the switch, put the vibrator in its place and attach the switch wires to the vibrator.

A Fine Garage Pump.

Illustrated herewith is the Curtis Common Sense Garage Pump, manufactured by the Curtis Pneumatic Ma-



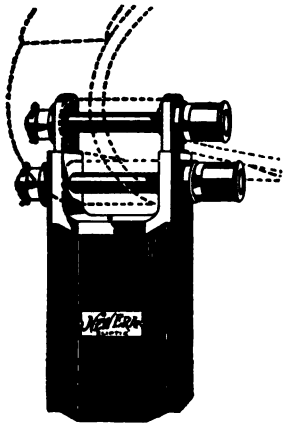
A Powerful Garage Air Pump.

chinery Company, 1530 Kienlen Avenue, St. Louis, Mo. It will pump from 2 to 24 cubic feet of air per minute, costs very little to operate, and it was designed after 20 years' experience in air appliances and machinery. It will probably never get out of order much less wear out, and is always ready for business on an instant's notice. Address the manufacturers for further information.

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A Shock Absorber of Merit.

The New Era Eliptic Shock Absorber, for light, medium and heavyweight cars, having simplified construction and handsome design that will appeal to the vast number of owners needing more comfort and desiring to save the car from excessive abuse. Any user of absorbers will readily state they are almost a necessity, and it is a fact that they will more than save their cost in a season on tires alone, and frequently



on springs. The efficiency of the New Era gives great resiliency and absorption of constant vibration of all small depressions and by its double spiral vanadium springs of scientific apportionment and adjustment for the weight of car intended, produced the ideal shock absorber at a price all can easily afford to buy. This shock absorber is low in price and practically indestructible. It is made by the New Era Spring and Specialty Company, Detroit, Mich.

Motor Touring and Camping Specialties.

Many motorists who are contemplating an extended tour do not fully realize what is necessary in the way of equipment, and the Kansas City Automobile Supply Company, Kansas City, Mo., is making a specialty of giving this information. They will be only too glad, without charge, to help all interested automobile owners, and they will bring out a special number of what they call the Service News, to be issued April 1st, 1915. Any readers who may be interested in this publication should cut out the coupon appearing in the advertisement of this company in the present issue and send it on to them with your name and address. If you will do this the Service News will be mailed absolutely free of charge.

Universal Treads and Repair Boots.

The Indiana Specialty Manufacturing Company, Angola, Ind., has purchased the plant and property of the Universal Protector Company, and they have for sale a moderate stock of strictly first quality, new treads and repair boots, which were manufactured by the Universal Company before the change in ownership. They quote very reasonable prices on these repair specialties and any who are interested should write direct to the Indiana Specialty Manufacturing Company for full particulars, or consult the advertisement in this magazine for prices.

Northeast System of Starting and Lighting.

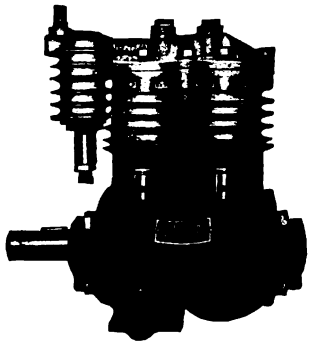
A system of electric starting and lighting for the Ford car, which is highly recommended, has been brought out by the Northeast Electric Company, of Rochester, N. Y. This apparatus cranks the motor, gives a brilliant light at all times and charges the storage battery. The manufacturer states that any garage man can install this in a few hours and no change of the Ford car is necessary. Readers who are interested should write for prices and complete description direct to the manufacturer. In all correspondence if you are interested in this outfit, be sure to write for Bulletin 30-A.

Burd High Compression Piston Rings.

The manufacturers state that these piston rings are absolutely reliable and 98 per cent. efficient. They also say that they will positively hold the compression so that the motor will deliver full power. There is nothing fancy about Burd rings—they are just plain, honest, old-fashioned piston rings, accurately made—the kind all engineers endorse, and the opening in the piston ring is guarded so that it cannot leak. For prices and full particulars readers are requested to write direct to the Burd High Compression Ring Company, Rockford, Ill.

"Purair" Tire Pump.

This is a good motor-driven tire pump. It is manufactured either with one or two cylinders and we illustrate the two-cylinder pump herewith. This pump may be easily installed by anyone, as no machine work or special tools are required. In most cases it is only necessary to re-



Effective and Compact.

move two cap screws and put them back again with bracket in place, and clamp split gear to its shaft. Full directions are sent out with each pump. For full particulars write direct to The Hert Manufacturing Company, Indianapolis, Ind.

An Interesting Catalogue.

The Standard Auto Supply Company, 97 Chambers Street, New York City, have brought out their new catalogue for 1915, which includes a great variety of automobile supplies. This company claims to save you considerable as compared with the ordinary local dealer. If you will write for this catalogue it will be sent free and post paid on application.

The Pneu-Meter.

The well known automatic tire pressure gauge which was placed on the market by the Hill Pump Valve Company, of Chicago, in 1913, has recently been improved in a very striking way, so as to make it a simple piece of mechanism. This device controls tire pressure from 40 to 120 pounds, and is graded in 5 pound units. Its simplicity and its accuracy are its most striking features.



Novel Tire Pressure Gauge.

To operate this device, one merely sets it at the correct pressure desired, and when the tire is inflated at this point, the Pneu-Meter becomes a safety blow-off valve, and all excess pressure escapes through an exhaust port, with a shrill whistling noise which can be heard fully a block away. The manufacturers state that this automatic device allows the motorist to put away his tools or do any other work which he desires, while the pump is inflating his tires without any danger whatever of over-inflation. The Pneu-Meter is installed on the hose line of all Utility and Utility Jr. Pumps made by this firm, as well as is furnished separately for use in connection with other power pumps or garage air tanks.

Auto Tires at Wholesale.

The Kenmore Manufacturing Company, 320 Bromide Building, Chicago, Ill., is offering automobile tires at wholesale prices to introduce them quickly in towns where they have no dealers. These tires are of all sizes and types, and readers are urged to write to this firm direct for catalogue and the special introductory offer.

A Special Ford Turntable.

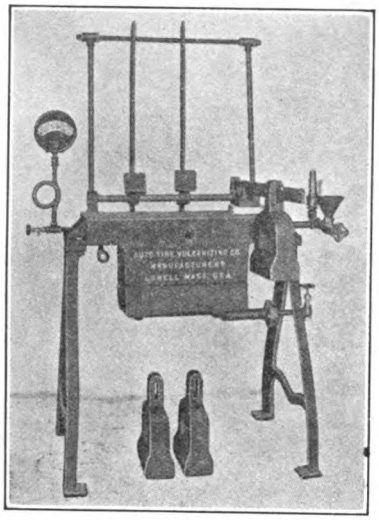
A special turntable for Ford cars has been placed upon the market by the Pitless Auto Turntable Co., 2400 Broadway, Kansas City, Mo. This turntable is made with all steel runways ball bearings throughout, and it is stated that you can turn your Ford car with your little finger, and that this turntable will last a lifetime. This is adapted not only for Ford cars, but any light car up to 108 inch wheel base, and it is sold at a very low price. Correspondence especially from Ford owners is invited.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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High Class Vulcanizers.

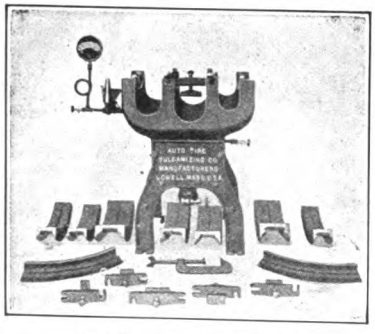
Illustrated herewith are two vulcanizers of the line made by the Auto Tire Vulcanizing Company, of Lowell, Mass. No. 8 vulcanizers will cure perfectly any tire made, either foreign or American make, from 3 in. to 5½ in., including all the various makes of clincher, quick detachable and straight side tires. The vulcanizer is equipped with steam gauge, water gauge, safety valve, filler and filler



No. 2 Tube Vulcanizer.

valve and gas burner with burner valve, so that steam can be generated in the vulcanizer. It is steam jacketed and like other vulcanizers of their make is cast in one piece having no packed or bolted joints, thus avoiding the possibility of leaks. The vulcanizer is very compact, it occupies a space only 27 in. long and 21 in. wide.

The No. 2 tube vulcanizer is made of semi-steel. It is fitted with three weights and levers. The top of the vulcanizer is finely machine finished and polished. It is 20 in. long, 7½ in. wide



No. 8 Sectional Vulcanizer.

and 7 in. deep at water chamber. It is complete with steam gauge, water gauge, safety valve, filler and filler valve and gas burner to generate its own steam. All the vulcanizers of this well-known firm are guaranteed and they are not offering vulcanizers in the experimental stage, but vulcanizers which have been thoroughly tested and approved, by some of the best tire manufacturers and experienced tire repair men.

1915 Pilot Models.

Among the new models for 1915 which are attracting a lot of attention among buyers of good automobiles are the standard Light Six and the Pilot 75 made by the Pilot Car Sales Company, Richmond, Ind. For years this firm has been making the highest grade cars and selling them at very reasonable prices and a study of their new models shows a great many things which should interest an automobile buyer. Pilots have always been noted for their wonderful power and strength, and the new models are striking examples of sturdiness in construction. Pilot 75 is becoming recognized as a wonderful hill climbing car. Among recent performances in hill climbing on high gear are climbing Carr Hill, Tacoma, Wash., a long 20 per cent. grade, difficult of approach over five hills of lower grade; climbing from Colorado Springs to Cripple Creek, 44½ miles, in one hour and thirty-eight minutes and rising 4,500 feet in altitude; climbing Ute Pass, Colorado Springs; taking five passengers from Nashua, N. H., through the White Mountains and return without changing gears; taking the long side of Corey Hill in Boston with a full load of seven passengers at thirty-five miles per hour; Angel Street in Providence, R. I., at thirty miles per hour, and all the important hills known to tourists in Pennsylvania. The Pilot Car Sales Company for a year have issued a challenge to any and all stock pleasure cars, regardless of size, weight, price or number of cylinders to a hill climbing contest with Pilot 75. The Pilot 55, the Light Six, is equipped with a 3⅞ x 5¼ Teetor motor, giving 63 horsepower and as the car weighs but 3,175 pounds, which is equivalent to about one horse-power to each fifty pounds of weight, the Light Six should be in the Light Six class as great a hill climber as the Pilot 75 is in the larger car class.

Waterhouse Welding Outfits.

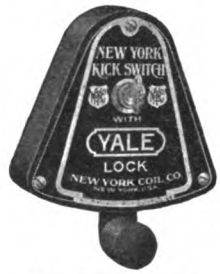
The automobile dealer, repairman, or garage owner who has not yet installed an oxyacetylene welding outfit is losing an opportunity to make considerable extra money to say nothing of the great accommodation to customers. A good outfit is made at a very reasonable price by the Waterhouse Welding Company, 16 Pelham Street, Boston, Mass. This outfit includes everything that is needed for doing this work and it includes complete instructions dealing with the treatment of repairs of all kinds of metal. This outfit is put on the market at a remarkably low price and yet all the apparatus furnished is absolutely guaranteed as to quality.

Apex Electric Air Compressor.

This is an excellent two-cylinder air compressor suitable for use in private and public garages. It pumps air direct into the tire and no storage tank is necessary. To operate it it is only necessary to attach to any electric lamp socket. This device is manufactured by the Apex Electric Manufacturing Company, 1410-12 West 59th Street, Chicago, Ill. This company also manufactures the celebrated "Yankee" Folding Tire Pump and the Apex Multiple-Cartridge Electric Soldering Irons. Write for illustrated printed matter and full information.

N. Y. Coil Co.'s Latest.

The New York Coil Company, of 338 Pearl Street, New York City, N. Y., manufacturers of the well known Uni-Coil ignition system, model "T" master vibrators, Ford lubricating devices, shock absorbers, etc., have just placed upon the market their New York Kick Switch with Yale lock. This switch is designed in such a manner that the three holes for attaching to the Ford metal coil box register so that all that is necessary is to remove the present switch and by means of the three bolts, secure the switch in position and con-



New Lock Switch.

nect the three wires to the connections marked 1, 2, 3, which may be accomplished in a few minutes without the splicing of wires or the slightest difficulty. This switch is an entirely new departure from anything heretofore offered in the lock switch line, to all outward appearances it represents the regular kick switch, but has incorporated in its construction a genuine Yale lock. When the key of the lock is turned the ignition circuit is locked in the "off" or "on" position, effectively preventing the loss of your car by theft, or its use by unauthorized persons. It will therefore be seen that the convenience of the kick switch is secured as well as the protection afforded by the locking feature. The switch may also be used on wood coil boxes or dash without change..

The Conover Cowl-Windshield.

This is a special windshield for Ford cars and thousands of Fords are already



equipped with it in all parts of the country. This shield has ventilating top and bottom which is automatic in action and it also has provision for rain vision and a clear view of the road. It may be used on Model T Ford cars of 1912, 1913, 1914 and 1915, and it bolts on without fitting. In appearance it is exactly like the shields used on higher price cars. Dealers are finding this line easy to sell and very profitable. For full particulars write to the Page Woven Wire Fence Company (Windshield Dept.), Adrian, Mich.

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Transmission Band Assembly for Ford Cars.

We illustrate a new transmission band assembly for Ford cars which is called the Ideal Transmission Band Assembly. It consists of a highly tempered steel band with two detachable shoulders, which being easily removed enable any mechanic to extract the band and replace it in one-sixth of the time that it can be done under ordinary circumstances. This device is lined with a good quality of asbestos band lining, and this advantage will undoubtedly appeal to many of our readers. It is manufactured by the Metal Stamping Company, Long Island City, N. Y., to whom all inquiries in regard to price, etc., should be addressed.



With Casting Attached.



With Casting Detached.

The Ideal Transmission Band Assembly Manufactured by Metal Stamping Co., Long Island City, N. Y.

Marvel-Mist.

This is a preparation for cleaning and polishing the varnish surfaces of automobiles, also the metallic and leather portions of the car by spraying a light vapor of Marvel-Mist over any part of the car, including the body, hood, fenders, leather, upholstery, top windshields, or lamp lenses, a high polish is obtained, the finish is preserved, and the car is perfectly and completely cleansed. Marvel-Mist is applied through a sprayer similar in effect to the ordinary medical atomizer and should never be used in ordinary liquid form. Marvel-Mist is guaranteed to be absolutely free from acids, alkali or grease. It never hardens, does not collect dust or dirt and will not evaporate or dry out when lying idle. This preparation is sold in a one pint can with combination sprayer and cloth or one quart with the same equipment. The price is reasonable. Address your orders and inquiries to the Marvel-Mist Manufacturing Company, 48-54 Greenpoint Avenue, Brooklyn, N. Y.



The Marvel-Mist Trade Mark.

New Witte Engine Catalogue.

The new catalogue, No. 46, of the Witte Engine Works, 2494 Oakland Avenue, Kansas City, Mo., is just out. It contains much of interest to every intending engine buyer. The matter on two pages alone, pages 4 and 5, "Lower Cost of Engine Power," shows the big stride made in the last two or three years in the reduction of cost of dependable gasoline and kerosene engine power. Price making and operation cost are here figured out with striking plainness. Whether any of our readers should ever buy a Witte engine or not, the Witte catalogue is worth careful reading, for it shows the interest of the engine user in his possession and use of an engine in a way that everyone ought to see, whichever engine he may later buy. A 6 H. P. Witte at $97.75 sets a new low mark in prices, as indeed do the prices on all the other of the seven Witte sizes and the 36 styles in which the various sizes are furnished. Any of our readers can secure one of the new catalogues by writing for it, to the address above given.

"Air-In-Al."

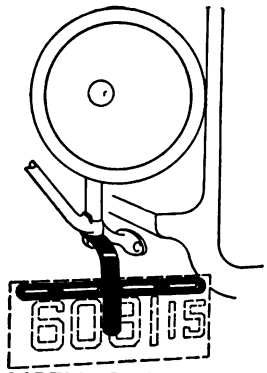
A new preparation called "Air-In-Al" has been put on the market and the manufacturers state that it will seal punctures in automobile tires instantly. It is simple to use and is non-injurious to rubber, paint, varnish or clothing, and can be removed from same with cold water. This is an extremely handy thing to have in your tool-kit while touring, and the price is so low that it is within the reach of all. Some choice territory on this article is open to live dealers. Readers are urged to send for circular and full particulars immediately, addressing inquiries to the Woodbridge Chemical Company, Inc., U. S. Rubber Company Building, New York.

Magneto Parts for the Trade.

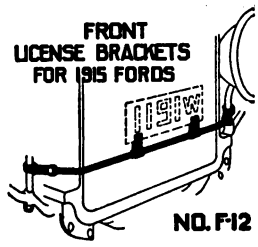
The Magneto Parts Company, Inc., 1790 Broadway, New York, are furnishing interchangeable parts for all standard makes of magnetos, including Bosch, Eisemann, Splitdorf, Remy and Mea for several types of magnetos. These parts are absolutely interchangeable and they are guaranteed to give satisfactory service. This will undoubtedly be interesting to many repair shops, and repairmen are urged to write to this company for complete catalogue containing parts listed with their respective prices. Get full particulars on the attractive agency proposition offered by this company.

Attractive Specialties.

Illustrated herewith will be found a new 1915 model of license bracket for Ford cars. It will be noted that these cars require special license brackets, both front and rear. The illustrations will give an idea of their advantages. They are easily attached, neat, substantial and well finished in black enamel.



Another valuable accessory for the Ford car is the new steering wheel shown herewith. As will be seen it is larger than usual, giving greater leverage and making steering very much easier. With it, there is no danger of the Ford car getting away from its driver on any road or locality.



The Garage Equipment Manufacturing Company of Milwaukee, Wis., makes a wide range of accessories for Ford cars, and they are all of good workmanship, practical, and low in price.



New Firestone Tire.

A new tire designed especially for use on electric pleasure cars has been developed by the Firestone Tire & Rubber Company, Akron, Ohio, and was recently placed on the market. The new pneumatic is built up with unusually heavy gum cushions between the layers of fabric to provide a high degree of resiliency; the construction is worked out with a view to obtaining the greatest possible economy of power, and the makers state that the result has been very satisfactory. But one type of tread is used—the Firestone dual tread, in which there is a central depression between two raised sections.

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Improved Wire Wheel.

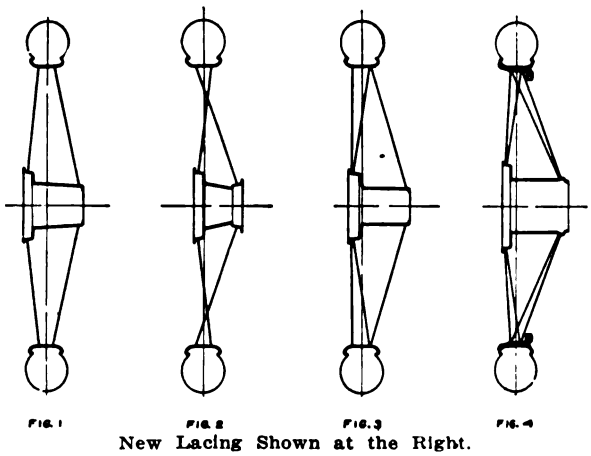
The General Rim Company, Cleveland, Ohio, has perfected and now is placing on the market a new type of demountable, detachable rim designated to overcome the effect of excessive unbalanced weight. Combined with this is a simple and effective arrangement for attaching the rim to the wheel band which eliminates all nuts, bolts, wedges or other loose parts. At the same time the company is marketing a quadruple-laced wire wheel designed to carry this rim equipment. Although it has not always been customary to take into account the weight of the spreader, valve stem, nut, dust cap, etc., with which every pneumatic tube is fitted, General Manager F. Hughes Moyer of the General Rim Company, points out that, "Any automobile wheel, not in perfect balance, has an unbalanced action, when rotating, which resolves itself into a pound on the tire in varying amounts, depending upon the speed and the amount it is out of balance."

In the new G-R-C wire wheel the spokes are in four planes, so designed that every spoke in the wheel can and does take its share of side strain, producing a wire wheel in which all strains are balanced. Rim and wheel construction is covered by patents or patents pending.

Fig. 1 shows the original form of wire spoke lacing as applied to automobiles. Fig. 2 shows the cross bracing which followed later. Fig. 3 shows the partially braced construction. Fig. 4 shows General Rim Company lacing.

All four types will carry the same vertical driving and braking load. The wheel shown in Fig. 4 is the only one in which the full value of each spoke can be utilized to resist side strain, and in which side strain is balanced.

The improvements mentioned seem to be unquestionable and useful. A mechanically correct rim is important and with this new form of lacing wire wheels will soon "come into their own."



New Lacing Shown at the Right.


New Rim Attachment.

A Robe Lock.

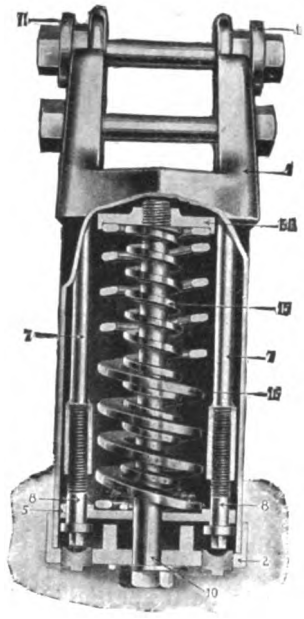
A device which removes the possibility of losing robes by theft from the car has been placed upon the market by the Robe Lock Company, Inc., Oakland, Calif. This will appeal to every motorist and many of our readers will undoubtedly write direct to the manufacturers for prices and full particulars.

New Magnet Charger.

The Kokomo Electric Company of Kokomo, Ind., is manufacturing the Kingston magnet charger for Ford cars. With this charger, which works on a 12-volt storage battery, the magnets on a Ford magneto may be charged to full saturation without removing them from the car and the magnets on all other types of magnetos may be fully charged by removing them from the magneto.

A New Shock Absorber.

We illustrate the Flaum Shock Absorber, a new device which is meeting with favor. This absorber is simple and effective and instantaneously adjustable to all load and road conditions. There



are no wearing parts or friction surfaces, consequently no oiling parts or packing in grease is necessary. For further particulars address Flaum Shock Absorber Company, 173-175 Hudson Street, New York City.

A Line of Garage Equipment.

An unusually attractive line of garage equipment will be advertised in the next issue of the Automobile Dealer and Repairer by the United Engine & Manufacturing Company, Hanover, Pa. Watch for their important announcement.

Chaney Automobile Headlight Dimmer.

This is a device to prevent the danger and inconvenience often caused, especially in city streets, by the blinding glare of automobile headlights. This invention enables the driver to graduate the intensity of the light. It can be changed from high to low as you would turn down an oil lamp and it gives complete control of the headlights from the seat. Dealers as well as car owners are urged to write for full particulars, and address inquiries to the L. F. Chaney Company, Springfield, Ohio.

Housel's Improved Ford Starter.

Housel Sales Company, Inc., of Buffalo, N. Y., is making a special offer to our readers, and they propose to sell 500 starters at a very low price on the basis of cash with order, and for further particulars readers are referred to the advertisement of this company. They also manufacture what is called the "Two Minute" Tire Tool for clincher tires, which is also sold at a very low price. Asch & Co., 1777 Broadway, New York, are acting as Eastern distributors for the goods manufactured by the Housel Sales Company, and inquiries may be addressed either to them or to the main office at Buffalo.

Pumpelly Battery Company.

This well-known company manufactures a large line of storage batteries and last July they moved into a new factory at 34 East Georgia Street, Indianapolis, Ind. In addition to supplying some of the leading factories with storage batteries, such as the Maxwell, Crow, Sphinx, Premier, Hercules, and others, this company is also putting out batteries for every car and starter and they make them to fit every size and shape of standard battery box. The battery was first brought out by Mr. James K. Pumpelly, and it is claimed that he is the founder of the battery business in the United States, having built the first practical storage battery in 1883 for use with Edison phonographs. Mr. Pumpelly is now 85 years old, but he is still active in the business. The officers of the Pumpelly Battery Company are: Harry Murphy, president; James K. Pumpelly, vice-president, and S. W. Elston, secretary and treasurer.

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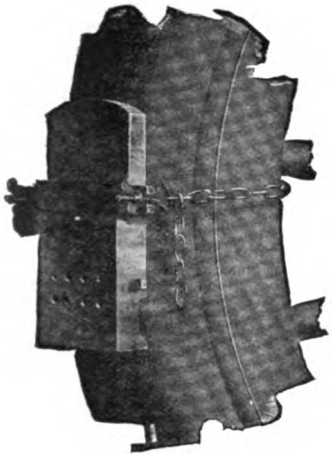
"WIZARD" AND "G WIZ"

STEAM VULCANIZERS

WILL CUT YOUR TIRE EXPENSE IN HALF

HOW TO GET MORE MILES OUT OF YOUR TIRES: You lose thousands of tire miles by not keeping them properly inflated; by applying brakes too quickly, by rubbing against curb stones, by letting car set on oily floors, etc. However, the greatest abuse is to **neglect those small cuts in casings.** Layers of fabric supply strength to the tire, and the rubber covering is to protect them. Small cuts expose the fabric to water and sand, forming sand blisters and rotting the fabric. A blowout at the weakened spot is the sure result. Keep those cuts vulcanized and your tire will last until the rubber tread is worn off all the way around, giving you double the usual mileage.

WHICH IS THE BEST VULCANIZER FOR YOU? The fact that we are the oldest and largest manufacturer of portable steam vulcanizers in the world should mean a lot to you in deciding. Our vulcanizers have been adopted by the U. S. and many foreign governments, and are recommended by the large tire factories. We use **steam heat** in all our machines. **Steam** will not burn or overcure the tire. **Steam** is used by **all** tire makers and large repair shops **exclusively.** Our long experience and large factory facilities guarantee you a better vulcanizer for less money than you can get elsewhere. If you do not find it so, send it back and get your money.

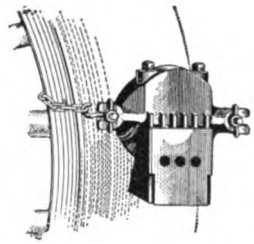


WIZARD Automatic Steam Vulcanizer

For both tubes and casings of any size. Burns gasoline with no smoke and no flame exposed. Requires no watching, as heat is automatically controlled. Water put in at factory and never needs refilling. Steam is the only safe method of vulcanizing. Vulcanizing surface 3″x6″, curved for casings and clamps against plate for tubes. Highly polished and nickel plated all over. Insulated handle. Weight six pounds. It has saved thousands of dollars for our customers. No experience required to use it.

PRICE, With Instructions and All Supplies by Mail, Prepaid, $3.50

Order to-day and save those tires.

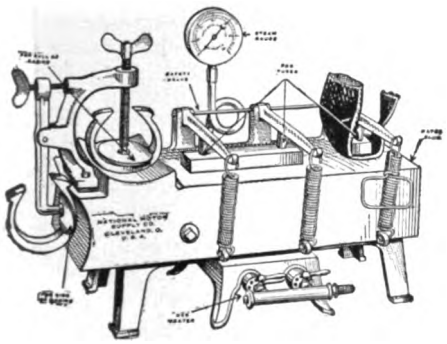


G-WIZ Automatic Steam Vulcanizer

For both tubes and casings 3½″ or smaller. Works like Wizard in every way, the only difference being that it is made for small tires. Guaranteed to do perfect work. Thousands of satisfied users. Saves its cost in repairing one tire, and will last forever. Weight 3 lbs.

PRICE, With Instructions and All Supplies by Mail, Prepaid, $1.80

10 DAYS' FREE TRIAL! After you have tried any of our vulcanizers ten days, if not entirely satisfied, return, get your money.



GARAGE AND REPAIR MEN, LOOK!

Thousands of garagemen all over the world are making big profits with our

National Garage Steam Vulcanizer

Vulcanizes three tubes and two casings at a time. Heated by either gas or gasoline. We have made this machine without any change for six years, which shows how satisfactory it is. You might as well have the big profits for vulcanizing in your vicinity. The National is the easiest and cheapest machine to operate on the market.

LIST PRICE, $60.00

Write for full details and discounts. A card will do.

MANUFACTURED BY

THE NATIONAL MOTOR SUPPLY CO.

Main Office and Factory
5633 Euclid Avenue, CLEVELAND, OHIO

TRADE HIGHEST QUALITY NMS CO MARK

Branch Office
2204 Michigan Ave., CHICAGO, ILLINOIS

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Bethlehem Spark Plug.

The Silvex Company announce the consummation of an arrangement with the New York Sporting Goods Company, 17 Warren Street, New York, which certainly seems to be about the limit in manufacturers' co-operation with a jobber. The Silvex Company are advertising their plugs in the New York City



Note the Name.

subway and are now in the second year of a three-year contract. They have arranged to run the New York Sporting Goods Company's name and address on all their cards as distributors of the Bethlehem Motorcycle Plug, and, in addition thereto, will give the New York Sporting Goods Company representation on their Indian Motorcycle and Smith Motor Wheel line, of which they are the exclusive distributors throughout a big Eastern territory.

Sales Manager Fischer, in comment-

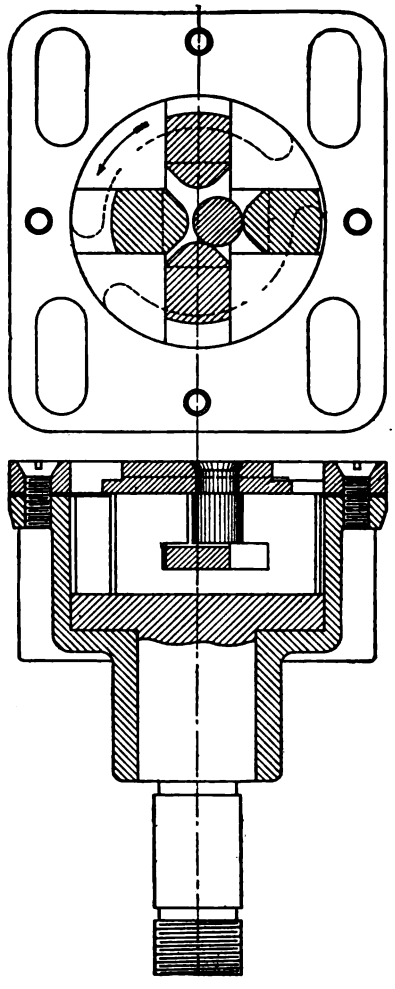


Spark Plug Case.

ing on this item, said: "The Silvex Company has been the pioneer in offering co-operation of the most intensive kind to the jobber, and, while this particular case is an extreme, we have offered similar forms of co-operation all over the Union to jobbers and dealers who, by live sales work and exhibition of "pep," show their friendly co-operation and desire to get out and get the business. Every effort of the Silvex Company has been to establish the closest relations with its accounts, and such a policy we are certain will be appreciated to the full in the long run.

The Pederson Oil Pump.

A new type of oil pump has been brought out by the Pederson Lubricator Company, 644 First Avenue, New York City. It is a rotating pump, the rotating member containing two double acting plungers. The whole is enclosed in a stationary casing, in the cover of which are slots which act as inlet and outlet ports for the slots which are the cylinders of the pump. The illustration will give a good idea as to the practical



Pedersen Rotating Plunger Oil Pump.

working of this pump. As shown in the cut, the right-hand end of one plunger is at the end of the discharge stroke, and the left-hand end at the end of the intake stroke, while the upper end of the other plunger is at about the middle of the inlet stroke and the lower end on the discharge stroke. The positions of the discharge and inlet ports in the head are indicated by dotted lines in the plan view. The pump is a self-contained unit like a gear pump and it gives a continuous discharge, but it has the ample wearing surfaces of the plunger type. The size shown gives a discharge of one gallon per 600 revolutions.

Utility Varnish Renovator.

This is a compound which the manufacturers state will keep the varnish on an automobile looking good as new. It is non-acid, non-alkali, and will not injure the finest surface. Readers who are interested should ask their jobber, or send direct for trial size to the Poughkeepsie Utilities Corporation, Dept. A, Poughkeepsie, N. Y.

"Arclite" Glass Spark Plug.

This is a spark plug embodying an entirely new idea in plug construction. It has a brass base, the threads of which will not damage the cast iron threads of the cylinder, and also will not "freeze" by rusting and releases easily on un-



screwing. The glass is pressed and locked solid within the shell and is of the highest insulating material known. The sparking points are heat-resisting nickel, and will not pit, corrode or burn. This plug shows by flash light color rays the true mixture of gas on explosion in the cylinder; it gives a blue light for the best mixture and yellow for poor mixture. With this plug the engine can be tuned up and the carburetor set quickly, and even the carbon deposit in a cylinder is shown by the color of the light. The manufacturers also state that this spark plug is not affected by heat, cold, or water spray. The "Arclite" is made by Long Brothers, Kokomo, Indiana, to whom all inquiries should be addressed.

New Radiator for Fords.

We illustrate a V-Type radiator for Ford cars, which is manufactured by the Superior Lamp Manufacturing Company,



V Type for Ford Cars.

136 W. 52nd St., N. Y. This is made in brass or German silver finish as desired, and it adds very much to the appearance of a Ford car. The same firm also repairs all makes of radiators and builds special radiators to order. Correspondence is invited.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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THREE MILLION, SIX HUNDRED THOUSAND consumers are reading the advertisement reproduced below. They will read others like it next month and each month thereafter. This advertising is being done for *you*—it must benefit you before it can show us any return for our heavy outlay.

Are you ready to cash in on the business we are building for you? Or is somebody else going to collect the profits? You can have them for the taking if you stock up with

SPIT-FIRE and VESUVIUS

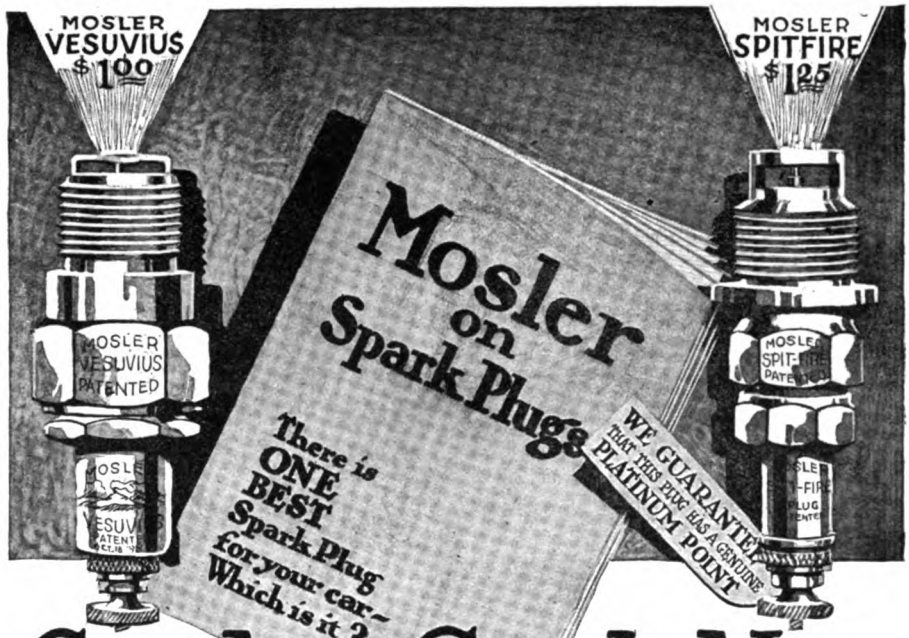
Get them from your jobber NOW! You can't lose on them—they have always sold on their merits without advertising—they will sell better than ever now. Don't hesitate—every day you wait costs you money.

We are trying our hardest to put money into your pocket. All you need is to have the two plugs—SPIT-FIRE and VESUVIUS on hand. If you'll attend to that we'll do the rest.

"Mosler on Spark-Plugs"

—the new Mosler guide which tells the right kind, size and type of plug for any engine, is now ready for distribution. Write us NOW for a FREE supply—your customers will be pleased if you distribute them. How many shall we send you?

A. R. Mosler & Co.
Mt. Vernon, N. Y.



Get this Guide Now

"MOSLER on Spark Plugs" tells at a glance just which kind, type and size of plug *your* engine needs. Until you equip with that *one best* plug you waste gas and current, lose speed and power, invite ignition trouble. Get this **free** guide now—at your dealer's or by mail—equip as it directs and see what real plug-service means. You can safely take advice from A. R. Mosler, the pioneer of the spark-plug industry, the inventor of the famous **Spit-Fire** and **Vesuvius** plugs.

Mosler's SPIT-FIRE $1.25 Literally *spits-fire* throughout the mixture, insuring, swift, uniform, complete combustion and getting all the power out of the gas. Spark-length adjustable at will; proof against leakage, soot, water, oil and heat. Standard equipment on such cars as the Pierce-Arrow; ideal for Packard, Peerless, etc. Insist on the RED-TAG which guarantees you the ever-lasting IRIDIUM PLATINUM points.

Mosler's VESUVIUS $1.00 Stone-insulated, open-end plug defies heat, oil, water and soot; absolutely gas-tight; continuous knife-edge electrode with innumerable sparking-points. Easy to clean, efficient, ever-lasting. Standard equipment on Pierce-Arrow, etc.

Ask Your Dealer

If he can't supply, we mail postpaid on receipt of price. (Specify car; mention dealer.) Write for "Mosler on Spark-Plugs"—free.

A. R. Mosler & Co., Dept. Mt. Vernon, N. Y.

THIS ADVERTISEMENT APPEARS IN

The Saturday Evening Post, May 8	2,100,000	Circulation
Collier's Weekly, May 15	835,000	"
Literary Digest, April 17	315,000	"
Scientific American, April 24	65,000	"
Leslie's Weekly, April 29	350,000	"
TOTAL	3,665,000	"

Watch for these advertisements every month. They are inserted for YOUR benefit.

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Letting Well Enough Alone.

The Massachusetts Legislature has just turned down two bills which would have limited automobile speed to 30 miles an hour outside thickly settled districts. The present law practically allows the driver to use his own discretion in such districts.

Awakened Garage Owners.

Under the title of the Garage Owners' Protective Association of New Jersey the garage owners of Newark and surrounding territory have organized for their mutual protection and to advance the general business to a higher standard. The new association is to be state-wide in its activities and will include in its membership garage owners throughout New Jersey.

Automobile Turntables.

The Canton Foundry and Machine Company of Canton, Ohio, have published an interesting booklet in relation to their turntables. It is well illustrated, attractively printed, gives useful information and is extremely reasonable. Those who have an idea of purchasing a turntable, or want to learn all about them, ought to write and get a copy of this booklet.

An Efficient Piston Ring.

Readers are frequently inquiring as to the efficiency of various kinds of piston rings and no doubt defective piston rings give a good deal of trouble. There is nothing that interferes with the good service of an automobile more than poor compression, and of course good com-



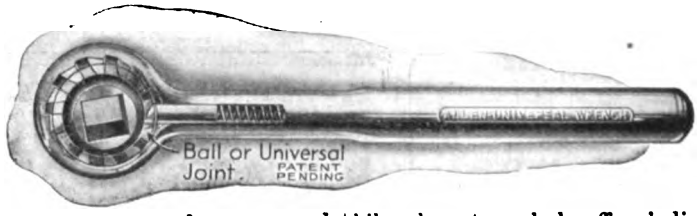
pression cannot be expected with poor piston rings. It is claimed for the Peerless piston ring that it gives the minimum of leak with very little friction indeed. The manufacturers are so confident it will give satisfaction that they will send one to any engineering organization for the purpose of making a test of it in comparison with any other make of piston rings. They guarantee it to produce more power and to save more lubricating oil and to make less wear of the engine cylinders than the ordinary piston ring or they will refund the money for it. It is made by the Peerless Piston Ring Company, 91-107 Lafayette Street, Newark, N. J.

For Carbon Removing and Welding.

An outfit for welding and carbon removing, at a low price, is being put on the market by the Dyer Apparatus Company, 155 Brookline Street, Cambridge, Mass. It is claimed the outfit has just as wide a range of work as the highest priced, and it will do about everything that is likely to come into a garage or repair shop. As is well known, carbon removing by the oxyacetylene process is considered one of the best methods for thoroughly doing this work. For full particulars write for catalogue and prices, addressing the firm as stated above.

New Socket Wrench.

The Allen Wrench & Tool Company of Providence, R. I., have recently brought out a new line of socket wrench sets. This wrench has what may be termed universal action. It is made from a drop forging and as it has a universal joint it can be used at any angle. It will immediately appeal to mechanics as



being something new and very much needed in work shops.

New Ford Models.

New Ford models show some changes, the changes being principally in the body and appearance, the model T chassis adhering to standard Ford practice except that the flywheel magneto has been somewhat enlarged to take care of the lighting of the electric headlamps, which now are standard equipment. Control of the lamps is through a dash switch. The side and tail lamps are oil-burning but of new form. They are more compact and better conform to the body lines. The most noticeable change is the incorporation of a pressed steel dash in place of a flat wood type. The switches and other apparatus are placed under a cowl on the dash. Other improvement are in the windshield, which is a stronger and more compact type to fit the cowl, and louvres in the hood to give better ventilation to the engine. Another noticeable change is in the rear mudguards, which now conform to the curve of the wheels instead of running straight back horizontally from the point of greatest height. The guards are heavier than the former ones, and their form admits of better bracing against rattle.

A New Starter.

A new automobile starter which differs from anything yet put on the market in some respects, is said to start the car every time and is fully guaranteed. It is low in price, durable and is made by the Sandbo Starter Company, 34 Sandbo Building, Rock Island, Ill.

Car Polish.

A well recommended car polish is that made by the U-Sav-Your Manufacturing Company, Warren, Mass. The statement that it is well recommended is made advisedly as the firm has no end of letters expressing the satisfaction of thousands who have used it. One man states it has made a very decided saving in the time of polishing his car and has greatly improved its appearance. He says that with its use the varnish seems as perfect as when it first came from the shop. This firm has a proposition by which thousands who wish to try it can do so for a little or nothing by addressing the manufacturers as above.

A Better Law.

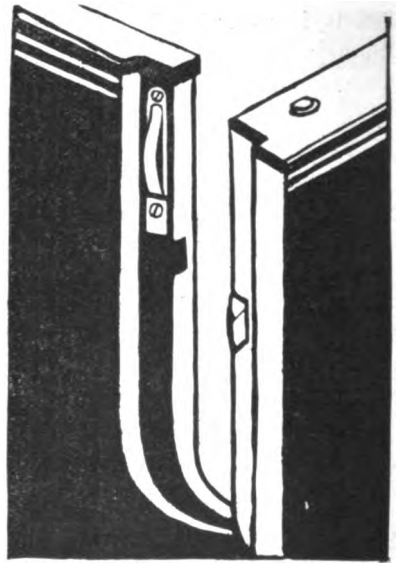
By the new Minnesota law an owner of a machine who drives his own car in the transportation of passengers does not need a chauffeur's license. Instead of paying $3, as under the old law, the applicant for a chauffeur's license will now pay $1.50 and $1 annually for renewal of his badge. The applicant for a license will not have to furnish his photograph to be placed on file with the Secretary of State, as under the old system. Men employed by manufacturers and dealers in demonstrating automobiles do not need chauffeur's licenses. If they drive a machine other than their own and the owner of the car or the driver receives a compensation for the service, the drivers must become licensed chauffeurs. Another change is that the owner rather than the machine is registered. He may change the license tags from one machine to another, and is responsible for this number wherever placed.

Clifton Spark Plug.

The Clifton Motor Works, 1878 Broadway, N. Y., are offering four of their well-known spark plugs for the price of one. The highest grade of material is used in these spark plugs, they are made in all sizes, and to meet all requirements.

No More Rattling.

The rattle of an automobile door, or of anything else about a car, for that matter, is extremely annoying. The rattling door may be quickly stopped by the

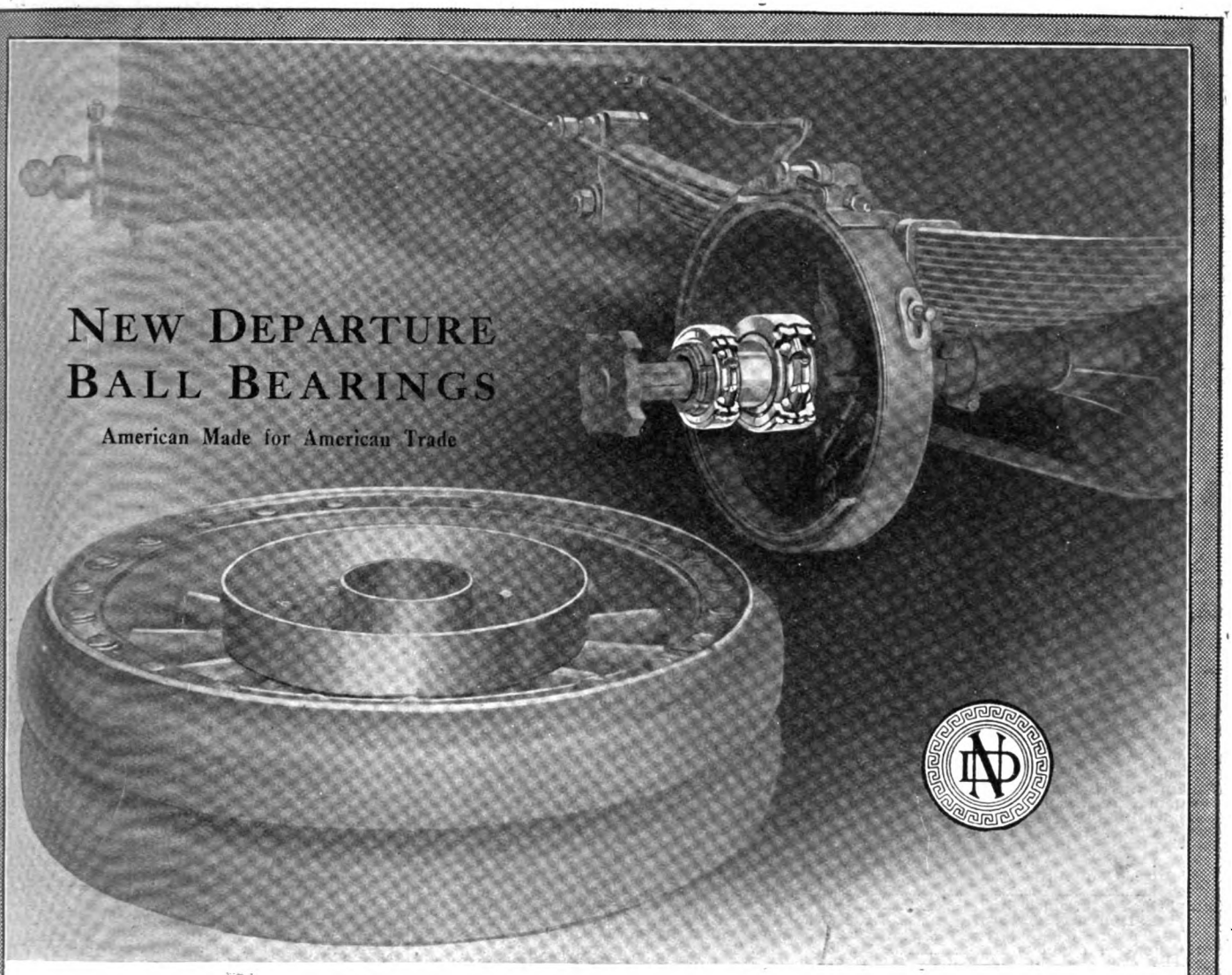


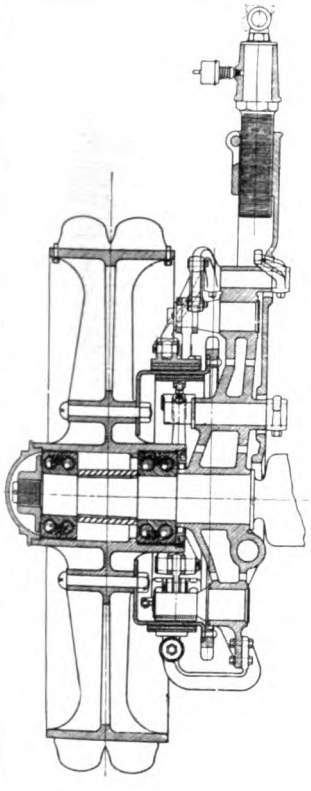
Gouin Anti-Rattler.

use of a new device called Gouin's Anti-Rattler. It is made by L. J. Gouin Company, 14 Roosevelt Ave., Poughkeepsie, N. Y. It can be applied in a minute or two. Its cost is trifling and it is sure to absolutely meet the requirements. Car owners and car drivers as well, will welcome this new appliance. And remember it will stop the rattling of a window as well. It is death on rattles.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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IN every big motor truck, the five tons or more of load, plus the great weight of the vehicle itself, must be carried on the wheel bearings. More than that, the shocks, the grinding pressures, the numberless strains, stresses and jolts due to rough roads, to change of direction and side-sway, to the use of solid tires and to overloading, combine with weight of car and load and focus at the wheel hubs, thus imposing tremendous burdens upon the bearings.

Compared with other types, the New Departure Double Row Ball Bearing is vastly superior for installation in heavy truck axles because it accepts successfully all of these loads and stresses, either radial or thrust, regardless of the angle from whence they come, doing its work with a lower coefficient of friction than does the conventional type of plain or roller bearing in similar service. The new Departure Double Row Bearing is non-adjustable, hence independent of trouble or damage due to inexperience in handling and the quality of its materials assure a service-life, practically equal to the life of the truck itself.

The rear wheel mounting here shown is ideal for heavy truck work. The inner bearing is clamped to take radial and thrust loads, singly or in combination, while the outer bearing, outer race, is allowed to float and sustains its just proportion of radial load only.

Our Catalog describes and illustrates the complete line of New Departure Ball Bearings and contains besides, comprehensive data covering their practical application and care. Send for a copy.

The New Departure Mfg. Company

Bristol, Conn., U. S. A.

Distributors in Trade Centers Throughout the United States
Western Branch: 1016-17 Ford Bldg., Detroit, Mich.

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This is an excellent vulcanizer for garages and repair shops. The manufacturers state that this machine will vulcanize 18 tubes and one casing every hour and it is particularly economical as one gallon of gasoline will do ten hours' work. The Simplex carries a sheet of water between the fire and the tire making a damp heat which cannot burn your tires. Complete instructions are furnished with the machine, showing just how to do the work, and this vulcanizer is especially adapted for use in small repair shops as well as in the largest garages where prompt service is required. Any readers who are interested should write for catalogue and prices to the Simplex Tire Repair Company, 2042 Farnham Street, Omaha, Nebr.

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"Sheds Water Like a Duck's Back"

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City and State.....

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Auto Accessories

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Magnetos. All makes, expert repairing. Remagnetizing. Magnetos made into Dual $12.50, including coil.
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DOUBLE TREAD TIRES

By using our double tread tires you will save 75% on your tire bills.

These are our prices for double tread tires in stock.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS

MAIN STORE

1319A Fifth Avenue, New York

BRANCH AT

282A Halsey Street, Newark, N. J.

CUT YOUR TIRE BILLS

BY USING

Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

We pay express charges on receiving your old tires and return C. O. D. subject to inspection.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain Tread	Non Skid	Size	Plain Tread	Non Skid
28x3	$4.00	$4.50	34x4	$9.00	$10.00
30x3	5.00	6.00	35x4½	10.00	11.00
30x3½	6.00	7.00	36x4½	11.00	12.00
32x3½	7.00	8.00	37x5	12.00	13.00

For all other sizes write for prices.

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN

127A East 110th St. NEW YORK CITY

Branch: 205 W. 48th St., New York City

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Automobile Dealers Take Notice.

We now offer for sale our Henschel Special tires in all sizes and types. **Write for our special dealers' proposition.**

HENSCHEL TIRE & RUBBER COMPANY
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DOUBLE TREAD TIRES

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GUARANTEED. "HEAVY TIRES FOR LIGHT CARS."
30x3, $6.90 30x3½, $9.80
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Tires

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All sizes up to 38x5½
Guaranteed for 3500 Miles

Size	Plain	Non Skid	Pure Gum Tubes	Red
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30x3½	6.00	7.00	2.55	3.20
32x3½	7.00	8.00	2.70	3.44
32x4	8.00	9.00	3.35	4.14
33x4	9.00	10.00	3.46	4.14
34x4	9.00	10.00	3.58	4.36
35x4	9.00	10.00	3.68	4.56

These tires are **Absolutely Puncture Proof.**
Be sure to state whether regular Q. D. or straight bead.

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ON YOUR TIRE BILLS

Factory Seconds Blemished Re-manufactured Tires. Guaranteed 2000 Miles. Good Adjustments when Tires are Defective.

Size	Tire	Guaranteed Tube
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30x3	5.85	2.35
30x3½	8.00	2.70
31x3½	8.15	2.75
32x3½	8.40	2.80
34x3½	8.85	2.95
30x4	11.15	3.30
31x4	11.25	3.35
32x4	11.50	3.50
33x4	11.85	3.90
34x4	12.50	4.00
35x4	12.75	4.10
36x4	12.95	4.20
34x4½	16.50	5.00
35x4½	17.00	5.10
36x4½	17.50	5.20
37x4½	18.00	5.30
36x5	20.00	6.20
37x5	21.00	6.30

We have all makes. Firestone and Goodyear Non-Skids 20% extra. State make preferred when ordering. 5% discount for Cash with order, Send deposit if C. O. D.

Order a set of Tires and Tubes now and we will prove to you that the Tires we offer you are just as good as you are paying 25% more for.

STAR RUBBER CO.

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Phone, 6611 Columbus.

DOUBLE TREAD

Points the way to tire satisfaction and will surely save you 75% of your tire expense

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Terms C. O. D. 10% deposit.

B. LIBEN & COMPANY

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New York City
The Home of Double-Tread Tires

PACKARD TIRES

(Honest as the dollar that buys them.)
Write for Free Circular.
INDIAN HEAD TIRE CO., 161 W. 51st St., NEW YORK CITY

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YOUR OLD TIRES

Why not reclaim your old worn out or rim cut tires and have from

2,000 to 5,000 MILES MORE USAGE?

Send us two old tires, one with a good bead, the rubber could be all worn off, and the other with a good tread but can be all rim cut or blown out on the side, and we will combine them into a sound one by our

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For a cost of from $2.00 to $4.00.

If you have only one tire in this shape we can furnish you with the other one at a cost of from $4.00 to $9.00. If you have no old tires to have remade you can purchase ready remade ones that we carry in stock. All sizes, from $4.00 to $12.00.

Size	Plain	Non Skid	Size	Plain	Non Skid
30x3	$5.00	$5.50	36x4½	$11.00	$12.00
30x3½	6 00	7.00	34x3½	7.00	8.00
37x5	11.00	12.00	32x3½	7.00	8.00

For other sizes get our complete price list.

LEON JAFFESS

Double Tread Tire Expert

252 WEST 55th ST. NEW YORK CITY
Open Day and Night.

Branch: 5904 Central Ave., Cleveland, Ohio

We pay express charges on receiving your old tires and will send them back C. O. D.

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GUARANTEED 5,000 MILES

We have at last perfected the Double Tread. It is practically blow-out and puncture proof. **Our Tires Are Not Sewed On,** there are no stitches to cut your inner tubes. Let us send one to you to-day for trial. Money back if not satisfactory.

Size	Tires	Tubes	Size	Tires	Tubes
30x3	$5.00	$1.93	33x4	$9.00	$3.25
30x3½	7.50	2.42	34x4	9.75	3.35
32x3½	8.00	2.55	36x4	10.00	3.38
34x3½	8.50	3.00	34x4½	11.50	4.24
30x4	8.00	2.97	36x4½	12.50	4.55
32x4	8.50	3.17	37x5	14.75	5.30

Tires are sent subject to examination, C. O. D., 10% deposit required. **Tubes are guaranteed.**

TUXEDO AUTO TIRE EXCHANGE

896A Eighth Avenue NEW YORK CITY

Double Tread Tires

All sizes up to 37x5

GUARANTEED

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.50	$9.50
30x3	$5.00	$5.25	36x4	8.75	9.50
30x3½	5.75	6.25	34x4½	9.50	10.50
32x3½	6.50	7.00	35x4½	9.50	10.50
32x4	8.00	8.50	36x4½	9.50	10.50
33x4	8.00	8.75	37x4½	9.50	10.50
34x4	8.00	8.75	37x5	11.00	12.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

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METAL SPINNING
OF ALL KINDS

Parts for Auto Lamps made to order. Auto Lamps repaired and made as good as new. Experimental work a specialty. No job too small, or we will figure on large contracts for the trade. Send sample or blue prints and specifications for estimates.

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150½ ELM STREET AMESBURY, MASS.

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HUDSON AUTO LAMP WORKS
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FORD DEALERS
Get our proposition on our special "More Speed For the Ford" Gears and on Ford Honeycomb and Fin & Tube radiators.
It will be worth your while.
DETROIT RADIATOR & SPECIALTY CO.,
969 Woodward Ave., Detroit, Mich.

RADIATORS OF QUALITY
WRIGHT HAS IT IN STOCK
Abbott-Detroit, 30-1910-11: Ames, Buick, 16-29-39; Cadillac, 1909-10-11; Chalmers, F30-1909, 30-1912; Cino, Courier, 1910; Flanders 20, Ford T, Henry 40, Hudson 33, Hudson 54, Hupmobile, 20-1910-11; Hupmobile 32, Imperial 30-1910; Little Four, Marion 30-1911; Michigan F, 1911; Moline 30-1910; Nyberg, 1912; Oakland 40-1910 Oakland 30-1912; Oldsmobile Special, 1910; Overland 51-56-1911; Premier 4-40-1910; R.C.H., 1912; Regal 20-30, Richmond K, Studebaker Garford 40-1910; Studebaker 1913; 25 H.P., Velie 30, 1909; Warren-Detroit 30, 1910, and many others. New Radiators built to specifications in 2 days. Fully guaranteed.
WRIGHT RADIATOR & HOOD MFG. CO.
1253-55 S. Michigan Ave., Chicago

COLUMBIA LAMP WORKS
Radiator specialists. All makes repaired on short notice. Manufacturers of fenders, all styles and shapes. Lamps that will stay lit. Over 1,000 pairs to select from. Plating and polishing, silver, nickel and brass enameling, sprayed or baked. The oldest and most up-to-date metal workers. 243-245 W. 47th St., New York City. Telephone Bryant 4266.

HUPP DEALERS
Get our proposition on Honeycomb Hupp 20 radiators.
DETROIT RADIATOR & SPECIALTY CO.,
969 Woodward Ave., Detroit, Mich.

Auto Lists

200,000 1915 N. E. REGISTRATIONS $13.00
During 1915 from January 1st we shall publish in weekly installments and numerical order, all the motor registrations of New England as filed. Sub. $13.00. AUTO LIST PUB. COMPANY, 133 Pearl Street, Boston

MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. Motor List Co. of America, 1111 Locust St., Des Moines, Iowa.

1915 AUTO MAILING LISTS OF ALL LINES FOR SALE

	Per M
30,370 Auto Dealers, U. S.	$40.00 or $2.50
6,200 Auto Ford Dealers, U.S.	15.00 or 3.00
19,543 Garages, U. S.	30.00 or 2.50
20,924 Auto Supply Dealers, U.S.	30.00 or 2.50
21,983 Auto Repair Shops, U.S.	30.00 or 2.50
1,680,000 Auto owners	2.00
353,000 Auto Ford owners	3.00

Have every other Auto Trade list. All Typewritten, Showing Financial Rating. Ask for particular territory wanted.
Franklin 1182.
A. F. WILLIAMS, Mgr.
166 West Adams St., Desk B Chicago, Ill.

1915 Automobile Registrations
NEW YORK STATE OR ANY OTHER.
supplied on sheets or cards. Addressing, folding and mailing to auto owners. Special lists promptly compiled such as Ford owners, dealers, chauffeurs, etc.
Daily Service Any State, First, $25.00.
New York State 1915 Registrations, $5.00.
NAT'L TRADE LIST & ADDRESSING COMPANY
ALBANY, N. Y.

Miscellaneous

CYLINDERS REBORED AND REGROUND and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.
McCADDEN MACHINE WORKS,
St. Cloud, Minn.

PAINT YOUR OWN CAR
We supply material and instruction. Write for particulars. ECONOMY SERVICE CO., Indianapolis, Ind., 2714 Boulevard Place.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

AUTOMOBILES FOR SALE.
Stanley Car Condensers, Kerosene-Distillate Burners, High Pressure, Direct Reading Gauges. 526 Fourteenth, Denver, Colo.

TOPS BUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REGROUND
and fitted with new pistons and rings for $5 to $11 per cylinder. We do this class of work exclusively and give you the highest quality of work at these prices. Ford cylinders reground and fitted with pistons, rings and wrist-pins for $20, discount to dealers.
CROWN MACHINE SHOP
Crown Point, Ind.

AUTOMOBILE AND MOTORCYCLE TOURS —Three hundred and fifty trips over the best roads in every state; 56 large pages of maps and road direction; 25 cents postpaid. Motor Tours, 51 Chambers St., New York.

CUTTING Owners and dealers—Note sale of Cutting parts at ridiculous prices: Fenders, Models T 35, A 40 and B 40, each, $2.50; Radiators, A and B 40, $35; Radiators T 35 and F 60, $30; Radiator Hoods, $3.50; Transmissions, T 35, 3 speed, $35; Transmissions, A 40 and B 40, 3 speed, $40; Cutting 4 speed Warner Transmissions, $70; Trunks for A 40, $9.50. Lots of other Cutting parts at bargain prices. Send for complete list. Automobile Appliance Co., 1436-38 Michigan Ave., Chicago, Ill.

SCORED CYLINDERS
We fill your scores with a silver composition by patent electric process. No heating to warp cylinders. Welding in all its branches. L. Lawrence & Co., Newark, N. J.

CARBON REMOVED—Economy, convenience. Ball Carbon Remover keeps your cylinders free of carbon; does the trick quickly, effectively, inexpensively. Investigate now. The Bowling Green Sales Co., 323 Decatur St., Brooklyn, N. Y.

NEW SUBSTITUTE FOR WELDING ALUMINUM
by our **aluminum solder** (German process) at only **fractional cost** of **welding**, as evidenced by favorable notices in Automobile Magazines. Territorial Rights negotiated. Big money for repair shops.
German-American Aluminum Co.
25 WEST 42nd ST. NEW YORK CITY

CYLINDER GRINDING
NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
Prompt and reasonable.
NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

WE SPECIALIZE IN CYLINDER GRINDing, pistons and rings. First class equipment, 20 years' experience make low prices possible. Ford and Metz cylinders reground, new pistons and rings, $20. Bridgeport Piston Ring Co., 346 Connecticut Ave., Bridgeport, Conn.

Miscellaneous

GET A RUFF-FORD POWER TRANSMITTING ATTACHMENT and utilize the power of your car for most any purpose. For descriptive circular address Tire Trading Company, Newark, N. J.

SOLDER ALUMINUM, with Eaton's Aluminum Solder. Sticks to stay stuck. No flux required. Sample stick postpaid for 50 cents. Money back if not satisfied. J. Eaton, 4512 Colorado Ave., Chicago, Ill.

THE TRUMP RING
(Never Loses Compression)
Increases the motor's power; uses less gas; prevents carbon; saves oil. Wherever there's a piston ring—use Trump. Guaranteed. Write
TRUMP MANUFACTURING CO., Crown Point, Ind.

CYLINDERS REBORED
Best quality piston and rings fitted, any make and size. $3.00 and up.
KENNEY COLWELL CO., NORFOLK, NEBR.

For Sale or Rent

MACHINE SHOP AND GARAGE—Will sell all or one-half interest to a good auto machinist. Splendid location, no competition. Unusual opportunity to secure a business that will continually increase, or would rent shop fully equipped. Box 427, Indianola, Miss.

Agencies Wanted

PRINCIPAL OF PARIS COMMISSION House Agents in London, Warsaw, is visiting America to arrange Agencies with manufacturers desirous of developing business relations in above markets. Reply, Camille V. c/o American Express Co., New York.

Books

"HOW TO RUN A LATHE"—A 50-cent book, 64 pages, 75 illustrations, sent postpaid on receipt of 10 cents. Stamps accepted. South Bend Lathe Works, 540 Madison St., South Bend, Ind.

COUPON BOOKS for gasoline trade. Sample free. J. P. Forbes, Coshocton, Ohio.

Patents

RIGHT WITHIN CALL—Beekman 3396
It may save a good invention, ensure a good patent and save you money to enquire about any patent matters before action. No charge, but information gladly furnished.
Patent Attorney, JAMES F. DUHAMEL, 132 Nassau St., New York City

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building, Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law In Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 15 William Street, New York, N. Y.

Wanted

WANTED—Salesmen calling on the Ford trade to handle new line of Ford specialties. Goods guaranteed. Exclusive territory to hustlers. Liberal commission. W. S. Graffan & Co., Northampton, Mass.

WANTED—Old single cylinder DeDion, Renault or Peugeot cars. Any condition. Describe fully and state year made if possible. Address B., c/o Automobile Dealer and Repairer, P. O. Box 654, N. Y. City.

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Parts

WE CARRY IN STOCK

PACKARD REPAIR PARTS

Regal, Chalmers and E. M. F. Transmission Gears

AT DISCOUNT

Gears duplicated for any make car. Send us your broken gears for quotation.

AUTO PARTS & ACCESSORIES CO.
1933 Broadway New York City

AUTOMOBILE PARTS, CHARRON (C.G.V.) and DARRACQ
Also Ball Bearings. Repairs and parts for all models.
G. J. KLUYSKENS, Bryant 886 112 WEST 42d STREET

RIMS

ALL MAKES AND TYPES

Also parts for all old types including Goodyear '07 parts.
LARGEST DISTRIBUTORS.
DEALERS—Write for Prices.

CITY AUTO TIRE & SUPPLY CO.
2352 Euclid Avenue Cleveland, Ohio

RACING SEATS

with permanent or detachable trimming. Racing bodies, tops, tanks, hoods, and all equipment for changing your car into a raceabout.
WRITE FOR PRICES.

CHICAGO AUTO BODY COMPANY
1626 Michigan Ave., Chicago
FORE DOORS MADE FOR ALL OLD MODELS

WE CARRY IN STOCK

STODDARD-DAYTON PARTS

DAYTON AUTO REPAIR COMPANY
353 West 52nd St., New York City

PARTS AND ACCESSORY MAKERS—Motorcycle Illustrated has just been consolidated with the Bicycling World. Paid circulation upwards of 14,000, including 4,500 motorcycle and bicycle dealers. Leading medium in the field. Motorcycle Illustrated, 51 Chambers St., New York.

Magneto Parts

MAGNETO PARTS

We manufacture parts for all types of

Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos

Liberal discount to the trade.

Illustrated Catalogue on request.

MAGNETO PARTS CO., Inc.
1790 Broadway New York City, N. Y

If interested in agency write for particulars.

Bodies

COMMERCIAL BODIES FOR FORD CARS

Write for pamphlet and prices. Economy Service Company, 2714 Boulevard Place, Indianapolis, Ind.

FORD PLEASURE BODIES—Make your old car a new car by putting on a brand new 1914 Ford body. We have them at prices that will appeal to you. London Auto Supply Company, 2548 Wabash Ave., Chicago, Ill.

Welding

SEE OUR ADVERTISEMENT on page 22 regarding cylinder regrinding and welding broken cylinders or crankcases. Waterbury Welding Co., Waterbury, Conn.

WELDING PLANTS THAT ARE SAFE—$50.00 to $175.00. Carbon remover with each welder. Your credit is good with us. The welder pays for itself and you save the middleman's profit. Write for terms. Address Manager, Dept. B, Bermo Welding Apparatus Co., Omaha, Neb.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

SAVE THE PROFITS

on welding and carbon removing. Install the

IDEAL WELDER AND DECARBONIZER

The investment is small, profits are large.
Write at once for prices and special terms.

GENERAL WELDING CO.
359 14th Street HOBOKEN, N. J.

High Class Welding
on all metals, aluminum special.
CROWN WELDING WORKS
Phone 8887 Col. 157 W. 54th St., New York

WELDING, BRAZING AND SPOT HEATING
BY THE
SCHAAP FLAME WELDING SYSTEM
Our charges are nominal—all work guaranteed.
An expert for each metal.
SCHAAP AUTOMOBILE CO.
Owners Schaap Flame Patents
344 Cumberland Street BROOKLYN, N. Y

WE DO WELDING others cannot do. Send your worst smashed crank cases, transmission housings and broken cylinders made of aluminum or cast iron. Jobs finished up so do not show repair, and painted. Finest equipped plant west of Chicago. Hobbie Welding Plant, Hampton, Iowa.

OXY-ACETYLENE WELDING

Crankshafts, crankcases, connecting rods, pistons.

SCORED CYLINDERS

made equal to new with our new silver iron process—USE THE SAME PISTON AND RINGS.

POWELL-ELLIOT AUTO REPAIR CO.
143 Rogers Ave., Cor. Sterling Pl.,
BROOKLYN, N. Y.

CYLINDERS REBORED
Including new pistons and rings, $7 to $11 per cylinder. General overhauling and repairing.
WELDING
Cylinders, crankcases and crankshafts welded.
STERLING ENGINE COMPANY
331 S. Clinton Street Chicago, Ill.

Used Cars

CADILLAC, SEDAN BODIES, New; 50% OFF Limousine, Landaulet, Cab Bodies, $100 to $600 Tops, $10. Top Covers, $1. Batteries, $10.
20th CENTURY CO., 1894 Broadway near 53d St., New York

YOUR CHOICE OF THE BEST VALUES IN CHICAGO. Write for Used Car Bulletin, No. 9.
THOS. J. HAY
2523 So. Michigan Avenue Chicago, Illinois

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Help Wanted

WANTED—Names of Ford owners. We pay $5.00 per 100. Send 25 cents for contract blanks, particulars, instructions and outfit. Universal Syndicate, 1123 13th Ave., Moline, Ill.

MEN AND WOMEN OVER 18 WANTED—$65.00 to $150 month. U. S. Government Life Jobs. Common education. Write immediately for list of positions open to you. Franklin Institute, Dept. S78, Rochester, N. Y.

WANTED—Salesmen calling on Garage trade to handle a specialty. Vest-pocket sample. Credit on repeat orders. R. S. Mueller, 423 High Ave., Cleveland, Ohio.

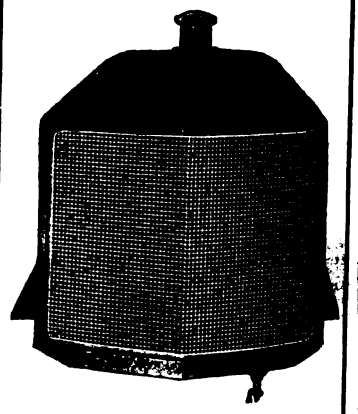
Vulcanizers

VULCANIZERS—Shop and individual use. A slightly used shop vulcanizer; A1 condition. Write at once. Vanderpool, Springfield, Ohio.

IMPROVE THE APPEARANCE AND EFFICIENCY OF YOUR CAR.

A New Rome-Turney Radiator will make the biggest improvement in appearance and efficiency you can possibly add to your car. Thousands of Ford owners are taking advantage of this means to make their cars better and handsomer.

We have types for every kind of car and truck.



Extended V-Front Ford Radiator.

Genuine Square Tube Honeycomb construction.

We Replace Any Make of Radiator.

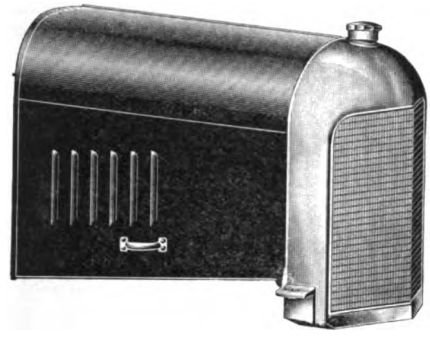
Large Stock Carried for Immediate Shipment.

Write for details.

ROME-TURNEY RADIATOR COMPANY,
Whitesboro Street, ROME, N. Y.

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The NATIONAL "V" TYPE RADIATOR AND STREAM LINE HOOD FOR FORD CARS



Just What the Ford Owner Has Been Looking For

Adds the One Supreme Touch and Gives an Air of Distinctiveness and Quality

Rapid circulation. Will not boil. Great cooling capacity. Minimum Evaporation. Not injured by freezing. Makes a beauty of any Ford and improves its efficiency.

Write for Full Particulars

PRICE { Polished Brass or Black Enamel, Complete with Stream Line Hood } **$45.00**

WE WILL PUT NEW CORES IN ANY CELLULAR OR HONEYCOMB TYPE RADIATOR FOR ANY CAR

Ask for Particulars on Our Ford Speedster Body and Demountable Rim Wire Wheels

UNIVERSAL CAR EQUIPMENT CO.

62 EAST JEFFERSON AVE. **DETROIT, MICH.**

Little Giant Grease and Oil Gun.

The manufacturer states that this is a gun which you can load and shoot without mussing or fussing. The No. 1 capacity, weighing 2½ pounds, sells for $5, and the No. 2 gun, weighing 16 ounces, is priced at $3.50. See the Little Giant gun at your dealers, or write direct to the manufacturers, the Neiman Machine Works, Freeport, Ill.

Individuality in Motors.

We have received from the Continental Motor Manufacturing Company, Detroit, Mich., a little booklet of unusual interest entitled "Motors Plus Individuality." It tells of an ancient artificer in iron and steel who manufactured a surpassingly good sword which he presented to the king and then draws a comparison between this admirable piece of work and the Continental Motors which the manufacturers pronounce "superlatively good." We understand that one of these little booklets will be sent without charge to any interested reader who writes for it and mentions the Automobile Dealer and Repairer.

A Good Garage Book.

Mr. A. L. Dyke of St. Louis, Mo., of Dyke's Automobile and Gasoline Engine Encyclopedia, has added 96 new pages to book. Many new subjects are treated. It also includes a simplified treatise on all the 1915 electric starting, generating and lighting systems. This book now contains 1,200 illustrations or 334 full-page charts, 732 pages and 46 instructions. The further description of this book, together with the price, will be found in our advertising columns.



Efficiency Ed

"Piston Rings Are to a Motor What Jewels Are to a Watch."

—Efficiency Ed.

STA-TITE Piston Rings give perfect Compression—cut Carbonization to a minimum, and offer a way of getting highest possible Power from your fuel supply.

Their six points of contact make them resilient and flexible,—make expansion equal and absolutely stop all leakage.

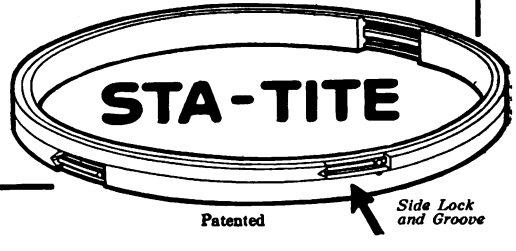
Used on Ported Engines without Pinning. Rings in all Sizes.

Special Inducements to Dealers and Jobbers.

Write for Particulars.

STA-TITE PACKING RING CO.

3037 Olive St., ST. LOUIS, MO.



Patented *Side Lock and Groove*

Interesting to Inventors.

Undoubtedly there are many readers of this magazine who are engaged in experimental and inventive work. The Eagle Manufacturing Company, 1831 Blue Rock Street, Cincinnati, Ohio, makes a specialty of doing work for inventors. They manufacture special machinery and patented metal specialties of all kinds. Also electric articles, hardware, etc. They do a great variety of work, including milling machine work, metal spinnings, castings, plating of all kinds, enamelling, japanning, tinning and blue print work. Those who are interested should send sample for expert advice, also for free book containing useful and valuable information.

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It took 90 Days to Dominate the Field

90 days ago, the market offered over 20 starters for Fords.

90 days ago, the GENEMOTOR was hardly known outside the engineering sanctum of the GENERAL ELECTRIC COMPANY.

Today it is known wherever Ford cars are sold.

Today it is the fastest selling starter for Fords.

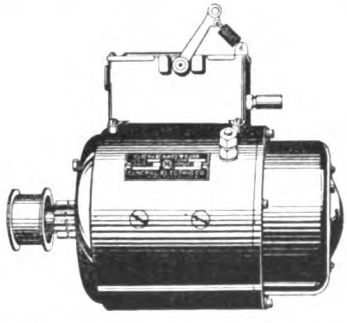
Today the GENERAL ELECTRIC COMPANY is shipping more starters for Fords than all other manufacturers combined.

Today the GENEMOTOR commands the field — dominates it.

In 90 days' time it has assembled through sheer merit, the strongest and ablest group of accessory distributors in America. These distributors form a vast, nation-wide jury. They weighed the evidence of more than 20 starters for Fords, and rendered a decisive verdict in favor of the GENEMOTOR.

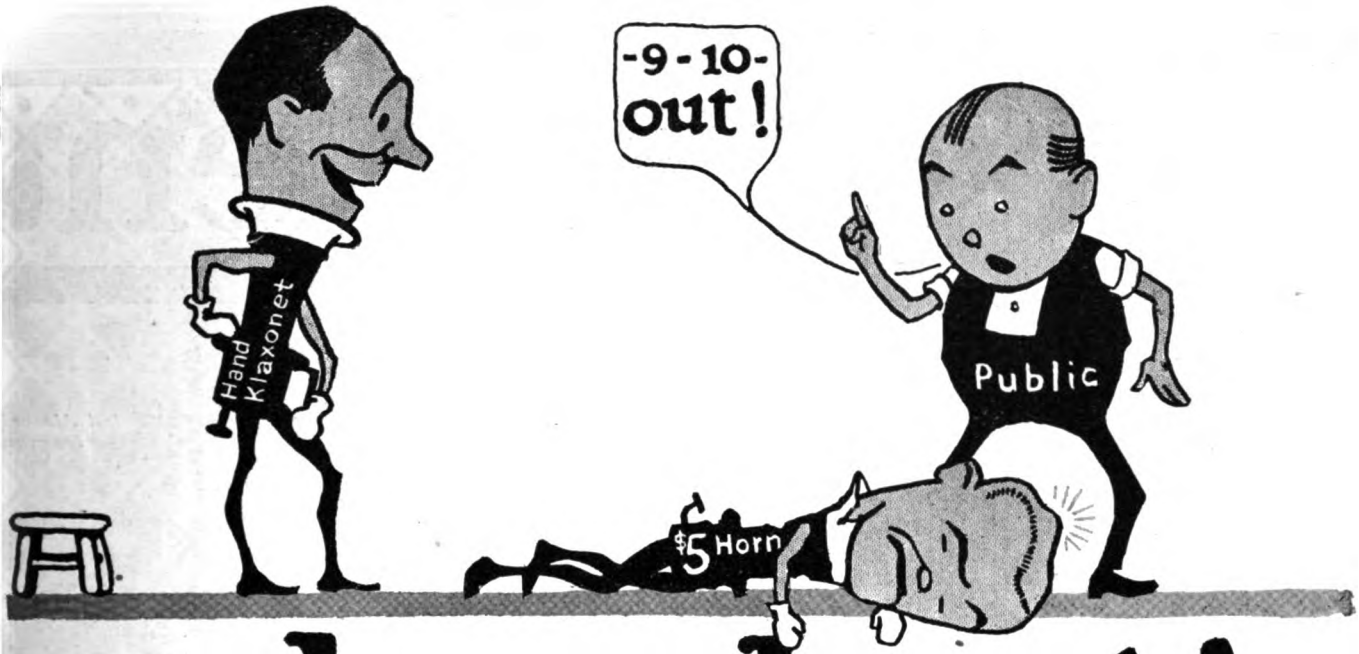
A. J. Picard & Company, *Sole Distributors*,
1720-22 Broadway, New York

$75

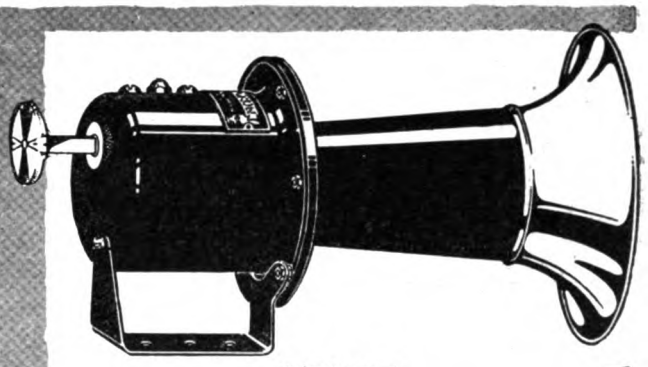


**F. O. B.
Lynn, Mass.**

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a knockout!



The Hand Klaxonet

Operates on an entirely new principle. The short-stroke plunger produces a long, loud note. The slightest touch gets immediate response—never catches nor sticks. Projector is brass (not steel); bell is oval, not round. Klaxon quality is built into it; Klaxon reputation is behind it; guaranteed *permanently*.

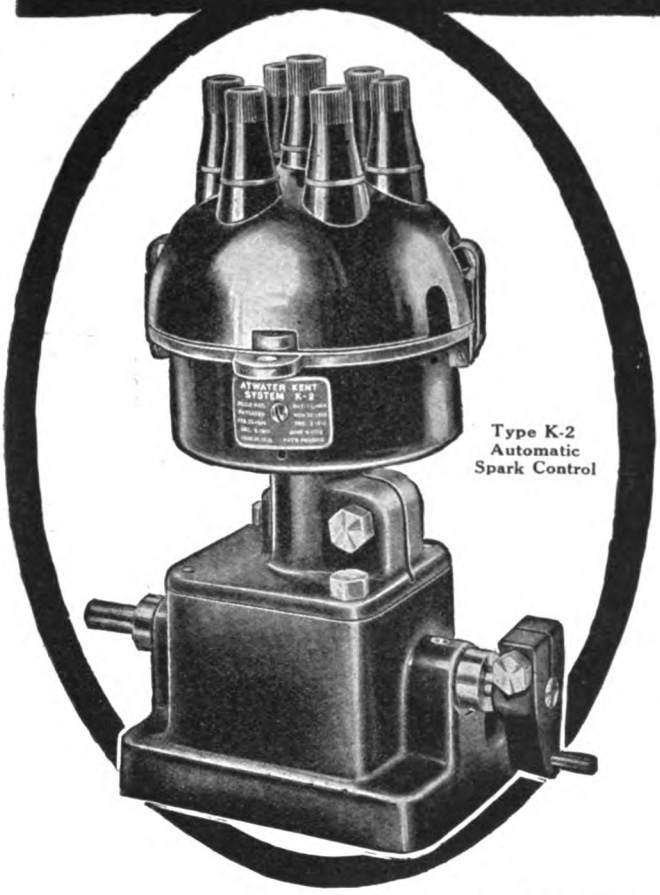
Deliveries May 1st.

LOVELL McCONNELL MFG. COMPANY
NEWARK N.J. U.S.A.

This advertisement planned, written and set up entirely in the Klaxon factory. Type composition by the Klaxon Press with Klaxon type specially designed by Goudy

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Atwater Kent



Type K-2
Automatic
Spark Control

John Scott Medal awarded by the Franklin Institute



to A. Atwater Kent for improvements in ignition devices.

MAGNETO REPLACEMENT

TO meet the demand of car owners and dealers wishing to bring their cars up to date and to replace their magneto with Atwater Kent Ignition, we are now furnishing our Type K-2 System with automatic spark control and our type H System (for use with regular spark lever) mounted upon a universal Magneto Base.

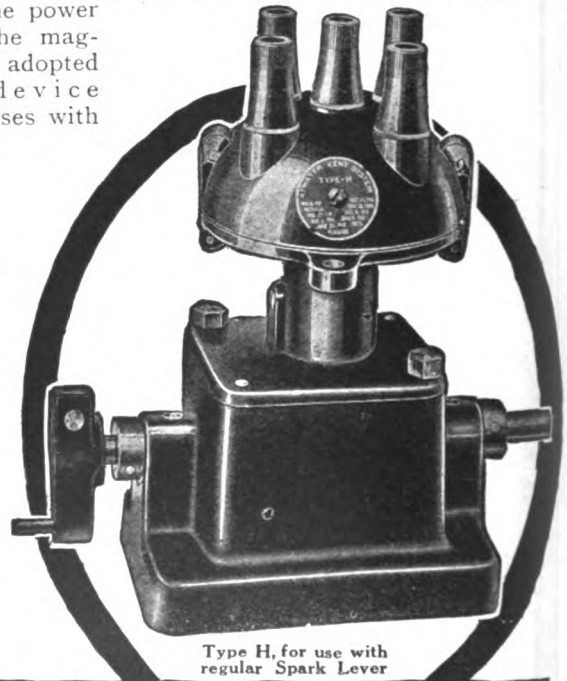
By means of this arrangement the Unisparker may be easily installed in place of any standard magneto.

Owing to the fact that this system requires but a small fraction of the power needed for the magneto, we have adopted a coupling device which dispenses with the necessity for special couplings and fittings.

The car owner who has put up with the limitations of magneto ignition can not only improve the starting and slow speed qualities of his car, but can enjoy all the advantages of automatic spark control, flexibility and better acceleration now being experienced by a hundred thousand other enthusiastic Atwater Kent users.

When your car is Atwater Kent equipped you have the satisfaction of knowing that money can buy no better ignition equipment—and that your judgment is upheld by a large number of the foremost automobile engineers in the country.

Used as regular equipment by one-quarter of all 1915 U. S. A. built cars exclusive of Fords.



Type H, for use with regular Spark Lever

OWNERS
DEALERS
REPAIRMEN
JOBBERS
MANUFACTURERS
} Interesting Information for all.

FORDS: A Special Atwater Kent system that makes the Ford engine a revelation. Send for interesting booklet.

Atwater Kent Mfg. Works

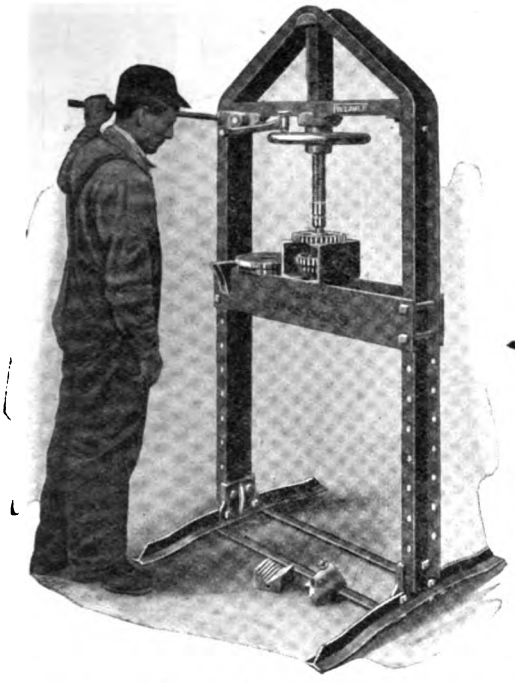
4933 Stenton Avenue
PHILADELPHIA, PA.

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Increase Your Profits

With WEAVER

Garage Equipment



Install This Press NOW

And Let the Profits on THESE JOBS

pay for it in THIRTY DAYS

Forcing Transmission Gears.
Forcing Fly-wheels from Crank Shafts.
Pressing Piston Pins in or out.
Pressing Bushings on Connecting Rods.
Forcing Starter and Generator Gears.
Pressing Ball Bearings in Wheels.
Forcing Ball Bearings from Crank Shafts.
Straightening Rear Systems.
Straightening Frames.
Forcing Hubs in Wheels.
Straightening Shafts.
Straightening Axles.
Forcing Drive Shaft Gears.

With Vice Block Attachment

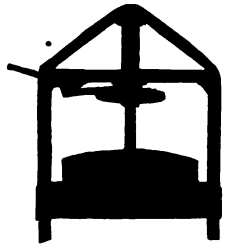
Holding Differential Housings and other awkward work.
Holding Pipes and Rods for Cutting Threads.
Holding Axles and Shafts against twisting strain.

WEAVER GARAGE PRESS

20-TON CAPACITY

THE time and labor you are now wasting with improvised methods in **Forcing Gears and Ball Bearings, Strengthening Axles, Pressing Hubs, etc., etc.,** will pay for a Weaver Garage Press in thirty days.

This Press will also attract to your shop the difficult and delicate jobs which other shops are not equipped to handle.



Designed for Garage Service

This Press is built to accommodate all classes of garage work. Note that it has sufficient width to permit it to receive the largest automobile wheel for pressing hubs, bearings, etc., in or out. (See cut.)

Crank Shafts and similar **Bulky** pieces may also be readily handled by reason of the divided bolster as shown herewith.



Wonderful Leverage

The lever construction supplies a leverage of 1500 to 1 so that the maximum pressure of 20-tons can be developed by one man with ease.

Construction

The frame is of one piece of heavy 5-inch channel steel; hand wheel is 15 inches in diameter, carried upon ball bearings. The thrust of the screw is directed against heavy bronze thrust bearings. The screw does not revolve. Width between frame 32 inches; height of frame 74 inches; floor space 36x36 inches; weight crated for shipment, 450 lbs.

Net Price, $48.00

WEAVER AUTO AMBULANCE

"FOR CRIPPLED CARS"



No repair man need dread the task of "pulling-in" a disabled car if he is equipped with this simple but scientifically designed Auto Ambulance.

A Weaver Auto Ambulance, one man and a runabout, can accomplish a task in half an hour which would ordinarily require three men a half a day to perform without this equipment.

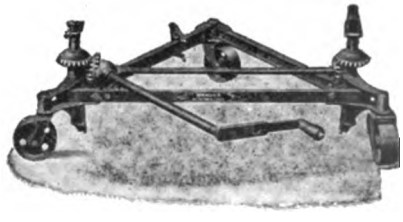
Quickly attached to either front or rear axle of the car, full range of adjustment to meet all conditions; high, broad, CAST STEEL wheels, will stand the service on the city pavements or country roads. Telescoping tongue of double strength steel tubing, roller bearing 1¼-inch steel axle; weight 140 lbs.

PRICE (complete) $30.00

WEAVER AUTO TWIN-JACKS

No Garage, Paint Shop, Repair Shop or Storage Room is complete without an equipment of these combination Turn Tables, Lifting Jacks, Transporting Trucks and Tire Rests. Each Set will save one man's time and 50% of the floor space.

Ball and Roller Bearing Casters and Lifting Mechanism; will apply to either front or rear axle of the car; safe screw hoist; enormous lifting leverage; convenient to handle.



MADE IN TWO SIZES

Regular Type, capacity ..... **4,000 lbs.**
Per Set (Two) $20.00
Singly (As shown above) $12.00

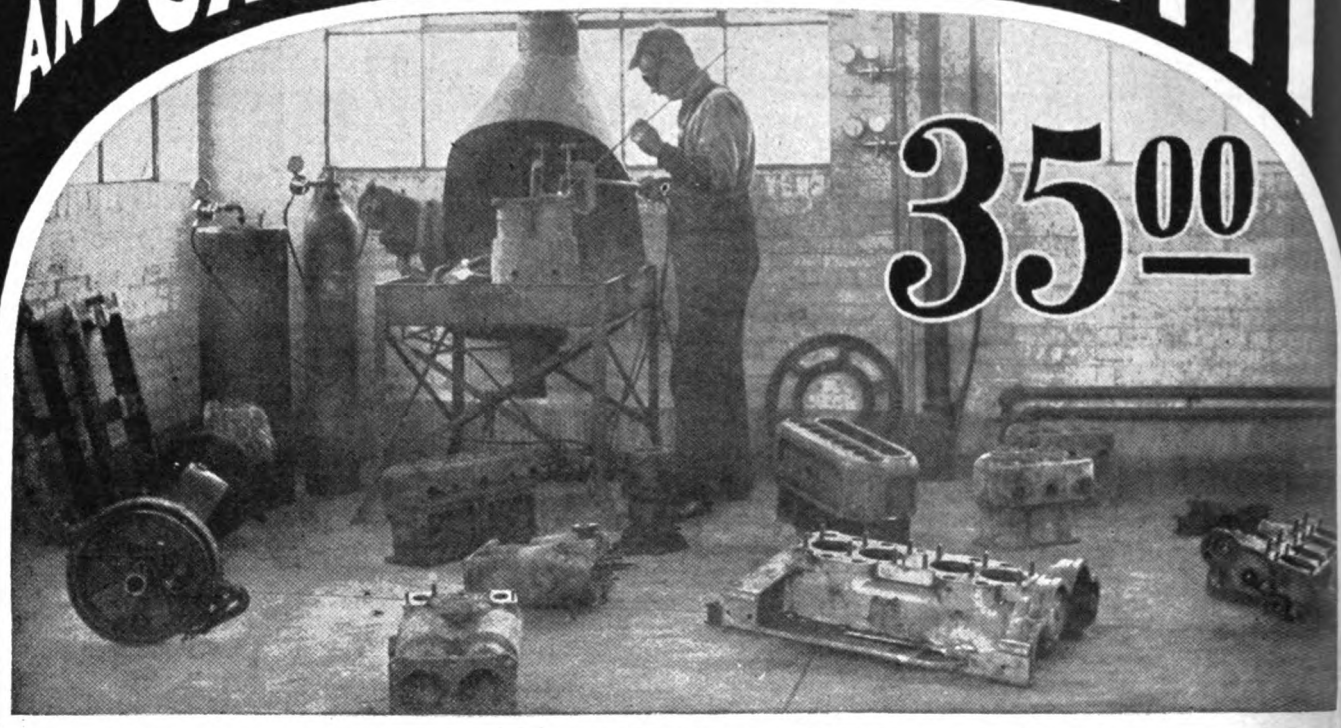
Extra Heavy, capacity ..... **8,000 lbs.**
Pet Set (Two), $36.00 Singly, $20.00

WEAVER MANUFACTURING COMPANY

2175-79 SOUTH NINTH STREET, SPRINGFIELD, ILLINOIS

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OXY-ACETYLENE WELDING AND CARBON REMOVING OUTFIT



35.00

Guaranteed Suitable for any Welding Job That is at all Practicable. This Outfit Has Just as Wide a Range as the Highest Priced

A few of the many different jobs it can be used on—

Building up Worn Parts; Straightening Frames, Crankshafts, Axles or Bent Parts; Hardening and Annealing; Brazing; Tightening Loose Rivets; Hot Riveting; Soldering; Expanding Frozen Fits and Carbon Removing.

With this outfit a bent gooseneck of the standard chassis can be straightened in 20 minutes and we estimate that four such jobs will pay in gross profit the cost of the outfit.

Ordinary gas, oil and gasoline heating outfits usually sell for more than the price of a DYER, and the latter furnishes 6300° of heat in a very local flame which is most essential in 99% of heat applications.

Gases are mixed in tip, thereby eliminating any possible danger of flash-backs.

Over 1500 of the different styles of DYER OUTFITS in operation in practically every industry where metals are worked or machinery used is sufficient evidence of their reliability.

Shipped to any point in the United States, subject to examination.

If you have a carbon remover we can furnish apparatus necessary to make a complete welding outfit for $25.00.

Write for Catalogue on Apparatus and Welding Materials.

STYLE D
Outfit Complete Consists of

1 Steel Carrying Case.
1 High Pressure Acetylene Regulator with 150 lb. Line Gauge.
1 High Pressure Oxygen Regulator with 150 lb. Line Gauge.
1 Welding Torch with Knurled Handle.
10 Torch Tips, No. 0 to No. 9.
2 10-feet Lengths of Hose with Connections.
1 Connection for Prest-O-Lite Tank.
1 Pair Goggles.
1 Carbon Removing Gun.
1 Set of Instructions.
1 Can Each, Aluminum, Steel, Brass, Cast Iron Fluxes.
2 lbs. Each; 3/16", 1/4", 5/16" Cast Iron, 5/16" Aluminum and 5/16" Special Steel Wire.

THE DYER APPARATUS CO.

155 BROOKLINE STREET **CAMBRIDGE, MASS.**

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Mr. CAR OWNER



SAVE YOUR BACK

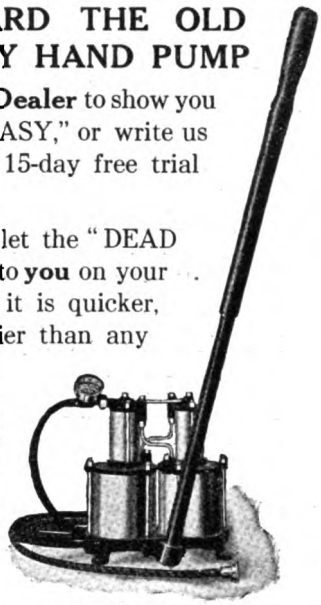
DISCARD THE OLD LEAKY HAND PUMP



Ask Your Dealer to show you the "DEAD EASY," or write us direct for our 15-day free trial offer.

At Our Risk let the "DEAD EASY" prove to **you** on your own car, that it is quicker, safer and easier than any other tire pump, either engine drive or hand power.

WRITE FOR PRICES TODAY



A Boy Can Operate The

"DEAD EASY"

tire pump and not tire himself in the least.

Watch the gauge—you cannot tell by "the feel" when the tire has all the air it needs because it still works "dead easy" after the tire is filled to its rated pressure.

POWERFUL RAPID DURABLE

GLOBE MANUFACTURING CO., Battle Creek, Mich., U. S. A.

GARAGE OWNERS-REPAIRMEN-JOBBERS

A HIGH QUALITY AIR COMPRESSOR AT A LOW PRICE

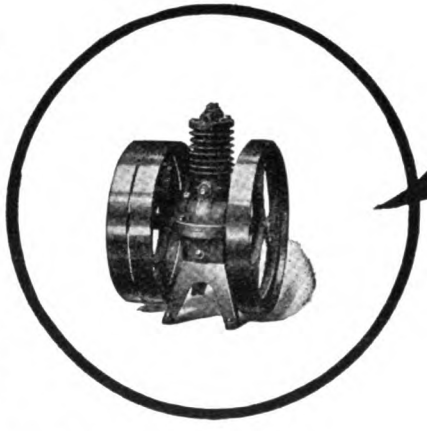
Why Pay an exorbitant price for an air compressor when you can buy this one for $25.00?

Strictly first class in every detail of design and construction. Our guarantee against defects in material and workmanship has no time limit. Be sure to read the description carefully.

DESCRIPTION

TYPE D COMPRESSORS are single-stage, air cooled, of very superior design and construction. All bearings are anti-friction, conveniently adjustable to take up wear, and self-oiling. All working parts are enclosed. The valves are hardened tool steel, arranged for vacuum as well as pressure.

EQUIPMENT D-26: Cylinder 3" bore with 3" piston stroke. Capacity 3 cubic feet per minute at 250 R.P.M. Ample for the average garage or tire repair shop. Will develop 150 pounds pressure and requires 1 to 1½ H. P. 16" heavy fly wheel and 16x2" inch tight and loose pulleys. Height over all 21". Floor space 16x16". Shipping weight 125 lbs.



Write today for our garage compressor bulletin with prices.

GLOBE MANUFACTURING COMPANY

BATTLE CREEK, MICH., U. S. A.

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Auto Directories Lists

A NEW DEPARTURE

WE PUBLISH OUR AUTOMOBILE OWNERS' LIST IN PRINTED FORM, COVERING THE STATES OF NEW YORK AND NEW JERSEY : : : :

We will sell the few copies we have left of our complete and up-to-date United States

1914 Lists

AT GREATLY REDUCED PRICES

If you want lists for your Spring circularizing, better write us at once. Even with our increased list business the complete United States registrations are so heavy that we can no longer publish them in manuscript form.

Our subscription list has become so large that we now publish in our weekly magazine, the Automobile Digest and Register, the auto registrations of

New York and New Jersey for Ten Dollars Per Year

which for 12 years we have sold for eighty-four dollars per year in manuscript form without advertisements.

Don't Forget to write us at once for your list requirements, as we are going to make an extra effort to close out our remaining 1914 auto owners' lists, except New York and New Jersey, within the next thirty days.

ADDRESSING SOLICITED TO

AUTOMOBILE OWNERS, DEALERS, GARAGES, AGENTS, REPAIR SHOPS, JOBBERS, MANUFACTURERS, ETC.

100% Postage Guaranteed

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Lists of Fords, Overland, and All Makes At Rock Bottom Prices

PROMPT SERVICE

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Telephone, 6600 Columbus

1735 BROADWAY **NEW YORK CITY**

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"I Told You Tire-Doh Would Fix It, Dad"



The boy knows what he is talking about—what thousands of grown-up car owners know—what you should know. If you are disgusted with the trouble, inconvenience and expense of tire repairs, just try

TIRE-DOH

Once you try it, you will never take your car out again without a Tire-Doh outfit in your tool kit. Whether an innertube has a pin-point puncture, or a tear as long as your arm, Tire-Doh will repair it. Best of all, anyone can use it—anywhere—on the road—in the garage—without heating—without tools—and the average puncture repaired with Tire-Doh costs less than 2 cents.

When you have made a Tire-Doh repair, you can forget all about it, and be sure that it will stay repaired, for

Tire-Doh Repairs are Permanent Repairs

Tire-Doh is not an experiment. An ever-increasing sale for six years proves that it does the work.

Tire-Doh is not a tire filler, but an innertube and casing repair.

Use it to fill cuts and sand blisters in casings, to keep out the water and dirt that rot and wreck the fabric.

Tire-Doh also mends other articles of rubber—rubber boots, gloves, hot water bags, etc.

WE MANUFACTURE
18 Other Tire-Doh Products
All As Good As TIRE-DOH
Silver Quick
Stop That Radiator Leaking
Day Tire Valve
Nomore Rust Rim Paint
Blac-Namel
Sunshine Metal Polish
Everwear Nickel Polish
Metal-Lac
Renew-O Leather Dressing
No-Leak Top Dressing
X-Ray Top Dressing
Nu-Stain Top Lining Dye
Preserv-O Tire Paint
Destroy-O Carbon Remover
Sta-On Engine Paint
See-Kleer
Chemico Blowout Patch
Body Gloss

AT YOUR DEALER'S, OR DIRECT FROM US—$1.00

DEALERS—Tire-Doh is a staple, because it is the standard repair—it is a repeater—it is advertised. All jobbers who handle automobile supplies sell Tire-Doh.



ATLAS AUTO SUPPLY CO.

3204 W. Lake St. Chicago, Ill.

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GOUIN'S ANTI=RATTLER
FOR AUTO DOORS



"The Biggest Little Thing in the Automobile Business"

Car Owners Have Long Been Looking for this Device

The greatest annoyance to a motorist is the continual rattling of doors.

This rattling will wear your locks and bolts very rapidly, and if neglected will ruin them.

Gouin's Anti-Rattler

Can be applied by anyone in a few minutes, and instantly puts a tension on your door so that rattling is absolutely impossible. They act the same way on the hoods and keep them from rattling. Simply rivet under hood ledge and radiator ledge.

The Biggest Seller in the Automobile Field

Ask your dealer for a set of four, $1.00, or they will be sent direct, providing you send us your dealer's name and your check. Money back if not as represented.

Dealers and Jobbers—Write for our liberal quotations. State and County distributors wanted, some good territory open, but it will not last long, so write at once.

Secure this fast selling article at once.

Address all communications to

THE L. J. GOUIN CO.

14 Roosevelt Avenue **Poughkeepsie, N. Y.**

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UTILITY



PRICE $10.00
Complete with
Pneu-Meter

THE ONLY TRULY AUTOMATIC TIRE PUMP ON THE MARKET

The Pneu-Meter installed on the hose line prevents over inflation as well as under inflation. Connect your pump, set your Pneu-Meter at the right pressure, start your engine and forget it.

You don't have to watch your pump—the Pneu-Meter does it for you—when your tire is properly inflated, it becomes a **Safety** blow-off valve, using excess pressure to sound a continuous signal. **So simple a woman can work it.**

UTILITY Jr.



PRICE $6.00
Complete with
Pneu-Meter

PRICE $2.00



WHISTLING PNEU-METER

Sold separately and can be installed on the hose line of any other spark plug or gear driven pumps, garage air tanks, etc.

Absolutely accurate and cannot get out of order. Whistles loudly and can be heard fully a block away, and will continue until the engine stops.

Over and under inflation decreases the life of your tires. This is due to the use of tire pumps which are equipped with ordinary dial gauges and which at the best are inaccurate. This trouble and expense can be absolutely avoided by using **Utility Pumps equipped with Whistling Pneu-Meters.**

Smallest and fastest—simplest and best constructed pumps ever made—**absolutely safe.**

Built of rust-proof bronze, brass and nickeled steel. **LASTS A LIFETIME.**



7', 6' and 5' Long Respectively

The UTILITY Socket Wrench Set

A New Principle With Many Advantages

Has all the advantages of socket wrench sets consisting of fourteen wrenches, with none of their faults. Instant in adjustment. No screws to manipulate, or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench.

SOME NEW FEATURES

Will grasp any nut instantly and requires no further effort to hold wrench in place.

In removing, the jaws hold nut firmly at all times, so it cannot fall or become lost. On the other hand, nut can be placed in jaws and applied to bolt or screw when same is inaccessible to the hands.

Unequalled for use in Garages and Machine Shops, in fact, wherever nuts and bolts are used.

Will take all nuts from 3/16 to ½ inch, inclusive.

Will take all nuts used in auto work.

Will take hexagon nuts, square nuts, wing nuts, cock nuts, and nuts rounded or distorted by use of other wrenches.

Cannot slip and bruise fingers of workmen, as jaws have rigid bearing on four sides—the harder you pull, the harder the jaws grab the nut.

Look at its wonderful advantages and then look at the price.

Utility Wrench Set Complete, $2.50

Packed in neat canvas bag.

Write for Our Dealers' Proposition.

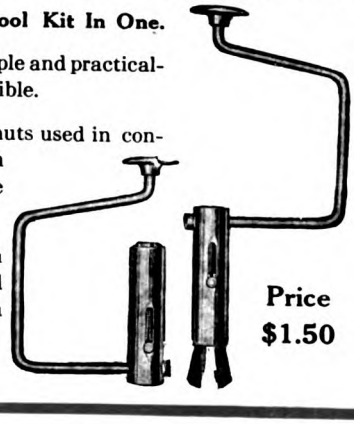
THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

Small, simple and practically indestructible.

Takes all nuts used in connection with demountable rims.

Wrench can be folded when not in use.



Price $1.50

THE HILL PUMP VALVE CO.

18-22 EAST KINZIE STREET CHICAGO, ILLINOIS

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A POSITIVE GUARANTY

THE STRONGEST EVER MADE

Guaranty

Every part of the Hoosier Tandem guaranteed absolutely for one year. This includes the contact points. Any necessary replacements will be made, free of charge, at the factory, the user paying simply the transportation charges.



HOOSIER TANDEM MASTER VIBRATOR

Dealers and Jobbers can now assure their customers of continuous satisfaction.

The Only Vibrator Which Cannot Stall The Car By Sticking.

The Hoosier Tandem has TWO PAIRS OF CONTACT POINTS—instead of one, as have all other vibrators.

Sticking points have always been the cause of vibrator troubles—of vibrator-equipped Ford cars stalling.

The heat produced by the sparking of the points is what makes single-point vibrators stick.

It's the tandem points that make the Hoosier different.

No other vibrator has them.

The kick switch has a removable key, preventing tampering with the car.

The case is solid mahogany, highly polished, 7 inches high, 4 inches wide and 3 inches deep.

The Hoosier Tandem points cannot heat to the sticking point—because they alternate the work of sparking. Neither operates long enough at a time to make sticking possible. The two sets of points are constantly automatically relieving each other under service.

Write us now, today, about your 1915 vibrator requirements. We have a proposition that means more vibrator sales and bigger profits to jobber, dealer and garageman.

If you dealer does not carry the Hoosier Tandem in stock, MR. FORD OWNER, order one direct from the factory. We guarantee it to you on a "money back" basis.

THE HOOSIER COIL COMPANY

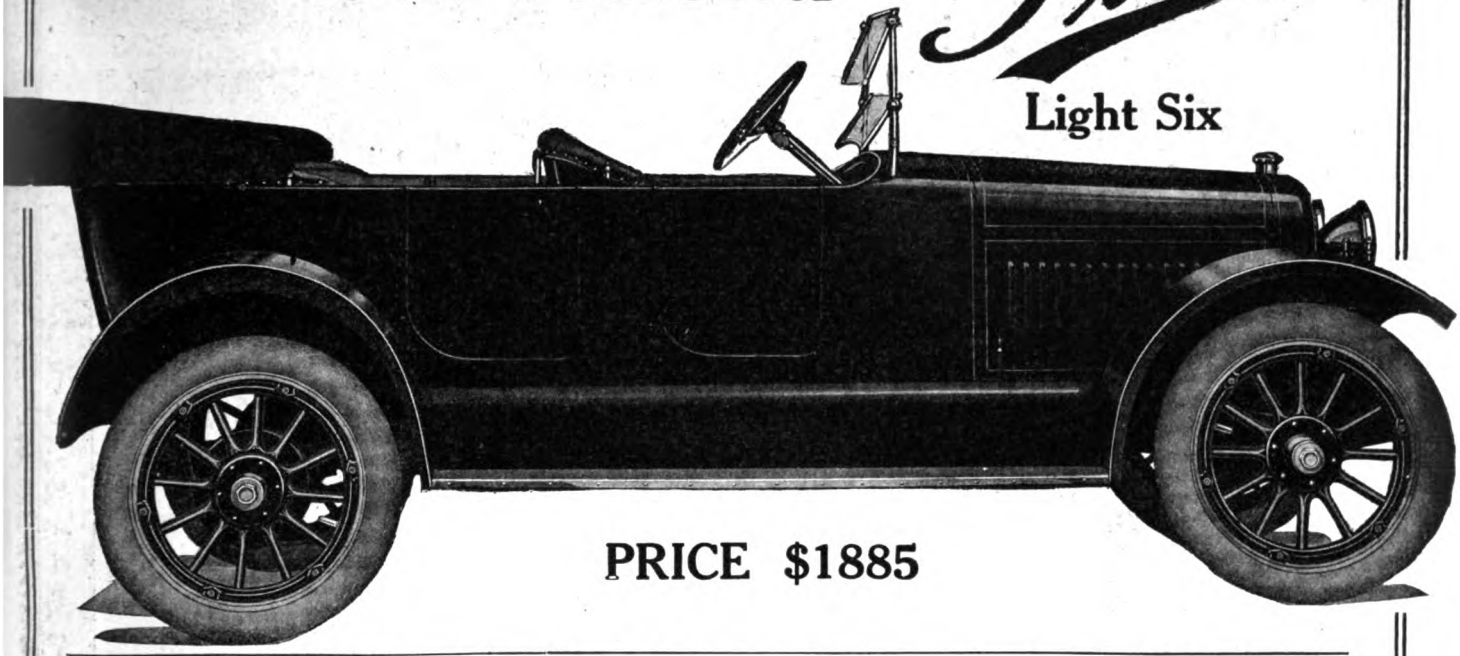
118 EAST JEFFERSON BLVD., SOUTH BEND, IND.

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The Car Ahead

Pilot

Light Six



PRICE $1885

Pilot Light Six

Weight, 3150 lbs. 126" Wheel Base
63 Horse Power

Condensed Specifications:

Teeter T head motor, bore 3⅞ inch, stroke 5¼ inch, 63 H.P., 16 miles to the gallon of gasoline, 126-inch wheel base, 7/32 inch pressed steel frame with 5-inch channels, 3½-inch flanges. Propeller shaft and universal joints for 90 H.P. car. Warner Gear Co. transmission. Cone clutch. Large size front axle with extra large size roller bearings in front wheels. Rear axle has 7/33-inch pressed steel housing, ribbed and riveted reinforcement. Chrome nickel steel drive shafts 1½ inches in diameter, with flange drive and spline end differential connection. Nickel steel alloy gears in differential with extra large size ball bearings. Rear wheels are carried on double row ball bearings with a guaranteed safety load carrying capacity of 7800 pounds. (We doubt if there is a car in the country that can show such a margin of safety.) Cantilever rear spring suspension. (They will all have them in 1916.) 34x4 wheels. Internal expanding cam brakes. Ventilating Windshield of special design. CENTER CONTROL, LEFT-HAND DRIVE. Westinghouse electric lighting and starting system. Gravity feed. 19-gallon tank for gasoline. Exclusive Pilot dimmer design for headlights. One-man top optional. Quick-acting inside curtains. Foreign design in upholstering. Seven-passenger body with extra size tires $100 additional.

Nothing left to be desired by an automobile owner. A hill climber and a road car BUILT TO WEAR—NOT JUST TO SELL Guaranteed for ONE YEAR.

The Standard Six for 1915

It takes pages to describe the power, construction features, beauty, luxuries and refinements which characterize the above beautiful Light Six. It contains every automobile feature of recognized standard value and many new and exclusive features which in 1916 will be found on many other cars. Its long, racy appearance, its beautiful French streamline body with long tapering hood and special design of radiator, its long running board, its special fender design—give it a distinguished and original outward appearance that cannot but please the most critical car buyer.

Our new Teeter Motor, 3⅞x5¼, 63 Horsepower, makes the Light Six the most powerful Light Six in America.

A study of the accompanying features and essentials will show the mechanic, the dealer and the buyer the most remarkable automobile value ever offered.

SIX CYLINDERS 4½"x6" 132" WHEEL BASE —PILOT 75— 90 HORSE POWER WEIGHT 3850 LBS.

CHAMPION OF THE ROADS AND HILLS

PRICE $2885

A car with power, luxuries, and refinements found only on the millionaire's car. A standing challenge to all stock pleasure cars regardless of size, weight or price, or number of cylinders to a hill-climbing or road contest. If you can afford the price, Pilot 75 represents everything to be desired in an automobile by the most critical buyer.

Care in Purchasing On account of the flood of flimsy, cheaply constructed Light Sixes which are being offered broadcast this year, buyers should exercise great care before purchasing their cars. It's so easy to build a cheap automobile and the buyer unfamiliar with car construction is easily induced to part with his money through a short ride on some boulevard, no criterion by which to judge permanency of service. The agent who in the most glowing terms pictures to the buyer the wonderful car he has to offer at a low price should be asked by the buyer before parting with his money, to sign an agreement guaranteeing free service on the car for a year and then let the buyer make sure that the agent is financially able to back up his guarantee. If the agent is so certain of the intrinsic merits of the car he has to offer, he will sign this guarantee without hesitation. If he does not, do not buy his car. Pay $200 or $300 more and get a real automobile. Keep out of the repair shop and have your car service when you want it. Get some enjoyment from your purchase—not an expense account. Our Light Six circular tells you all about this. Don't fail to send for it.

AGENCY: Let us send you the name of our nearest agency; get a demonstration of road and hill-climbing ability such as you never dreamed of before as possible in an automobile, and if there is no agent in your vicinity, get our proposition for new territory. Our terms, co-operation, and assistance, behind such wonderful cars, insures a successful business for Pilot representatives.

PILOT CAR SALES CO., Richmond, Indiana

BE SURE TO ADDRESS THE SALES DEPARTMENT

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Champion

"Toledo Made for the Whole World's Trade"



CHAMPION
TWO-PIECE
HEAVY STONE
all sizes
Price $1.25
For High Powered
Automobiles,
Trucks and
Stationary Engines



CHAMPION
X
Special
½ inch
Price 75c
Factory Equipment on FORD cars since 1911

FINALLY SELECTED

By The Engineer

THE BEST PLUG FOR YOUR CAR

Know why we make so many different kinds of spark plugs ?

Because motors vary and the slightest variation often calls for a different spark plug.

The men who built your car might have said, "We'll use the cheapest."

But they did say, "We will have to use the best."

And they didn't take our word for it.

We had to take their particular motor and design and develop a spark plug to get the best results in that motor.

Other spark plug manufacturers were doubtless called upon to do the same.

But the Champion Plug was the final selection of the engineers who represented the builders of your motor

At least such is probably the case, as 75% of all gasoline motors, for every purpose, are equipped by their builders with Champion Spark Plugs.

When you replace your plugs remember that there is a Champion especially designed and developed under severest tests to get the best results in your particular motor.

Your dealer will tell you which Champion to buy.

To accept a substitute is to disregard the most definite expression of scientifically determined expert opinion.

Insist on Champions.

Dealers :—Our 1915 Profit-Sharing agreement is sure to interest you. **Write for it today.**

CHAMPION SPARK PLUG COMPANY
2001 UPTON AVENUE TOLEDO, OHIO

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C-C SHOCK ABSORBER



THIS IS IT

The C-C Shock Absorber for the Ford. Sold with an absolute guarantee of satisfaction or money refunded.

This is the proposition. They must make good or we do not want the money. Thousands of them are in use daily—and they are making good. Why? Because they are constructed of the best material obtainable for the purpose on correct scientific principles—the result of years of experience building Shock Absorbers for all types of cars, from the 1000 pound Roadster to the 5000 pound Limousine. Every feature incorporated in the C-Cs; (steel cushion springs, steel spring cage, grease lubricating bolts, adjustment, rebound spur) is essential, and the fact that it is not necessary to remove the drop-forged steel spring perches from the Ford to attach the C-Cs is sufficient to turn the sale in favor of the C-C Shock Absorbers. In short, they are a quality product at a quantity price. This is only possible through the enormous production. The Ford car can be equipped with C-Cs without removing the wheels.

If you are a live dealer looking for a big selling proposition, write today for folder and discounts.

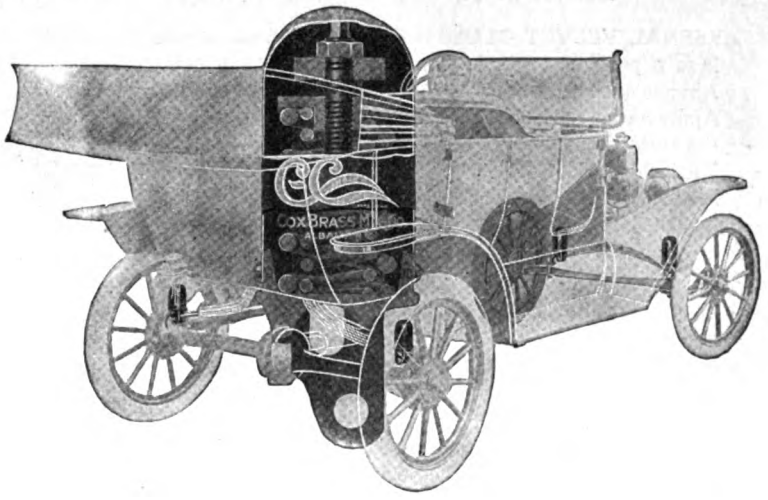
Heavy Car Type

$10.00

Set of Two, Complete For the Rear

✣ ✣ ✣

Write for Information



COX BRASS MFG. COMPANY

ESTABLISHED 1872

ALBANY, N. Y.

8.00 for set of four

4.50 for set of two

BRANCHES:

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DISTRIBUTORS:

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COX & CUMMINS, 3124 Locust St., St. Louis, Mo.
ACCESSORY SALES CO., 708 Oneida Building, Minneapolis, Minn.
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Pacific Coast

WEINSTOCK-NICHOLS CO., San Francisco, Los Angeles, Oakland, Cal.

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PAINT YOUR CAR YOURSELF!



You Can Do It and Save $25.00 to $75.00

Anyone Can Use Our Materials
You Don't Need Previous Experience

FORD SPECIAL OUTFIT is for a high gloss finish in two coats, and is furnished either in Battleship Gray or Black only. Can be applied in an unheated garage. Car out of commission only four days. This outfit includes all materials for repainting Ford T—either touring car or roadster. Together with dressing for top and upholstery and Liquid Gun Metal for lamps, etc. Price complete, $6.50.

ARSENAL VELVET GLOSS is the new dull finish which is so popular for roadsters, toy tonneau and torpedo cars. Anyone can satisfactorily paint a car with Velvet Gloss. Apply a coat today, another to-morrow, and use the car the third day. Velvet Gloss is made only in French, Battleship and Cadet Gray, Apple Green and Ebony Black. No. 1 Outfit, for small roadsters, costs $5. No. 2, for 30 H. P. roadsters and touring cars, $6. No. 3, for larger cars, $7. Top dressings, etc., extra.

THE ARSENAL SYSTEM of repainting motor cars (for novices) should be used by those desiring a high gloss finish. It is in three coats ready mixed for use, together with proper brushes and full instructions. The Arsenal System is made in the following colors: Cadet Gray, Napier Green, Red, Maroon, Brewster Green, French Gray, Battleship Gray, Orange, Cream, Apple Green, Black, two shades of Blue and Brown. There are three sizes of outfits: No. 1, for small runabouts, costing $7; No. 2, for Model T Fords and small touring cars, costing $8, and No. 3 for large touring cars, costing $9. If two colors are desired—that is, the body one color and the wheels another—add 75 cents to cost of each outfit. Hundreds of car owners have saved thousands of dollars by doing their own painting with the Arsenal System.

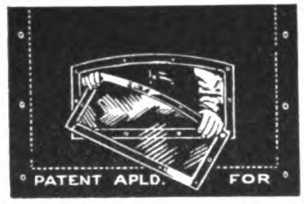
HOOD AND FENDER OUTFITS. A great many cars have the hood and fenders enameled black regardless of the body color of the car. We make outfits for this purpose in two coats and one color only, black. No. 1 is $2.75; No. 2 is $3.50, and No. 3, $4.00.

ARSENAL LIQUID GUN METAL is the best known brass enamel on the market for lamps, radiators, etc. 50 cts. a can. Pints $1.00.

TOP DRESSINGS for Mohair, Leather, Pantasote, etc., Quarts $1.25, pints 75 cts.

COMPLETE OUTFITS for repainting the chassis only, revarnishing the car, Tire Paint, Body Polish and other materials for improving the appearance of your car.

Replace Your Broken Curtain Light Yourself



THE REPLACE CURTAIN LIGHT is a complete unit and can be installed by anyone without experience. No sewing is necessary, and no tools required. Each light is complete with fasteners for applying. Curtain lights break easily and must be replaced from time to time. If no carriage trimmer is available and a light is to be replaced, the curtain must be taken off and shipped to some repair shop or factory. Heretofore the celluloid lights have of necessity been sewed in the curtain until the REPLACE CURTAIN LIGHT was invented. Now it is only necessary to order the lights from us and you can put them in yourself without taking off the curtain.

Back Curtain Lights for 1912, '13 or '14 Ford touring cars, prepaid, each, $1.50.

Overland touring cars, 1913-14, each $2.50. Others in proportion.

Order a light today and put it in yourself.

NOTE—Patents are pending on the Replace Curtain Light and infringements will be vigorously prosecuted. REPLACE CURTAIN LIGHTS are fully described in our booklet "The Car Beautiful." It is FREE. Send for your copy today.

Our booklet, "The Car Beautiful," describes these materials in detail, and is the only work of its kind published. It tells how to repaint and modernize the old car and how to care for a new one. It's free. Send for it to-day.

ARSENAL VARNISH CO.

2501 Fourth Avenue SPECIALISTS FOR MOTORISTS ROCK ISLAND, ILL.

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JITNEY BLACK

A Durable One Coat Black Finish for Jitney Busses, Taxicabs, Livery Cars, etc.

Dries with a high gloss, and colors and varnishes in one operation. Can be used on body, hood, fenders and running gear. Dries over night.

JITNEY BLACK protects and beautifies the taxicab without taking away from its earning capacity and is easily applied by anyone.

JITNEY BLACK should be in every garage.

Put up in quart cans at $1.00 each; 1 gallon pails at $3.00 each; and 6 gallon cases at $16.50, cash with order.

Shipping weight: quarts, 4 lbs.; gallons, 13 lbs.; 6 gallon cases, 100 lbs.

ARSENAL VARNISH CO.
2501 Fourth Avenue
Rock Island, Ill.

S.O.S

Trade Mark Registered

Storage Batteries

No other starting battery now on the market can give the satisfactory service and long life that the S. O. S. battery will give—bar none

Aside from their high voltage maintenance, we guarantee the S. O. S. battery plates **positively will not buckle or sulphate during** the life of battery, under any conditions of use or abuse. They can be **overheated** and **overcharged** and **entirely discharged without injury.**

Dead short circuits will not harm them.

They can stand idle for months without care or attention, and upon being charged will operate to their full rated capacity. They will deliver full rated capacity during their entire life.

They are more nearly fool proof than any other lead plate battery now made.

Any S. O. S. dealer will be glad to make a dead short circuit test for you. Ask him to burn up a 20 penny nail by holding across terminals. Or he will weld a pair of steel files together for you in the same manner. This short circuiting causes ordinary plates to buckle. S. O. S. batteries can be entirely discharged in this manner without buckling of plates. **BEFORE YOU BUY ANY BATTERY INSIST ON THIS TEST.**

CAR OWNERS: The S. O. S. costs no more than any high grade battery. It is positive insurance against battery trouble. Send for our free battery book.

S. O. S. Storage Batteries for Starting, Lighting, Ignition, House Lighting, Railway Signal Service, etc.

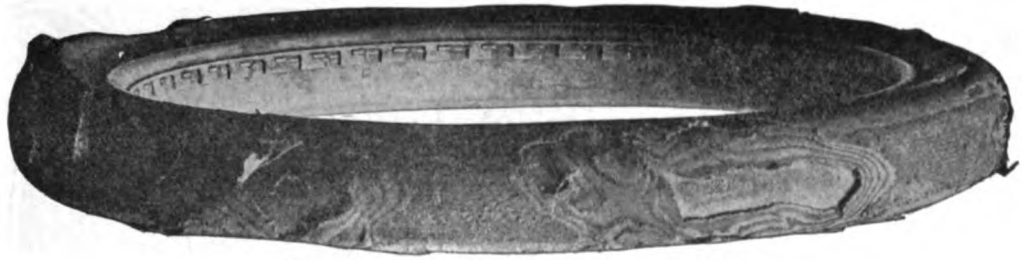
Catalog on Request.

ARSENAL VARNISH CO.

2501 FOURTH AVENUE ROCK ISLAND, ILL.

Selling Agents

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Your tires may often be worn down like this without danger of blowout or tire trouble.

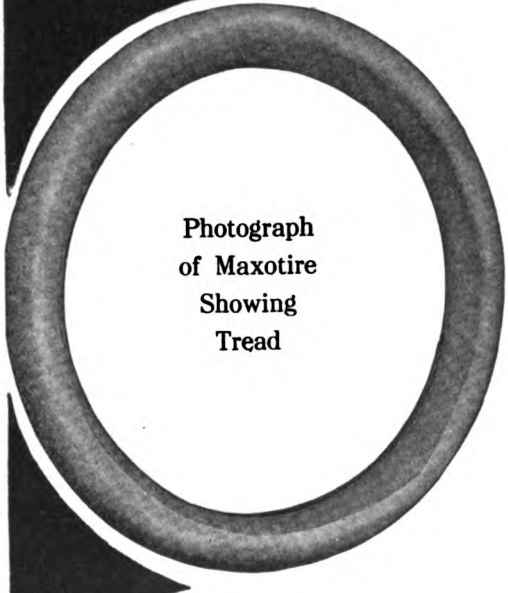
You may now run your tires until there is little left of the outside shoe.

The secret of it all lies in the MAXOTIRE which is in reality a perfect tire having a rubber tread, fabric and bead. The MAXOTIRE is so scientifically constructed that it fits the inside of your tire perfectly. It leaves ample space for your inner tube and protects it from being damaged in any way.

The layer of very tough rubber covering the tread surface of the MAXOTIRE acts as a cushion between the MAXOTIRE and the outside shoe.

When the tire strikes a stone or is put to any great strain, this elastic rubber between the two fabric bodies of the tire and the MAXOTIRE equalizes the strain of both and prevents fabric breaks as well as blowouts.

·MAXOTIRES·



Photograph of Maxotire Showing Tread

Nothing like the MAXOTIRE has ever been sold before

Rubber-treaded MAXOTIRES make your tires practically puncture-proof. Tacks cannot reach the tube, while spikes or nails are invariably turned aside.

When MAXOTIRES are placed in tires this tough rubber tread comes in contact with the inner surface or fabric of the tire. This rubber tread clings to the tire like an overshoe to the sidewalk. There is, consequently, no friction; no heat generated; and no chance for the MAXOTIRE to slip and injure the inner tube.

Smaller inner tubes are not required for use with MAXOTIRES; however, they can be used with success at a saving to you of about 25% of their cost.

USE MAXOTIRES

HAVE TWO TIRES PROTECTING YOUR INNER TUBES

Take No Chances This Spring. Equip your tires with MAXOTIRES before taking your car out. While your car has been standing idle during the **winter,** your tires have deteriorated. They are in much worse condition than the outside appears. Tires blow out in nearly every case before the tread is hardly worn. This is due entirely to internal weakness which no one is able to discover.

MAXOTIRES will make your tires **trouble proof** during the coming season and enable you to get the full wear out of every tire. They are not an experiment but the result of seven years' experimenting by the people who invented the first reinforcements for automobile tires.

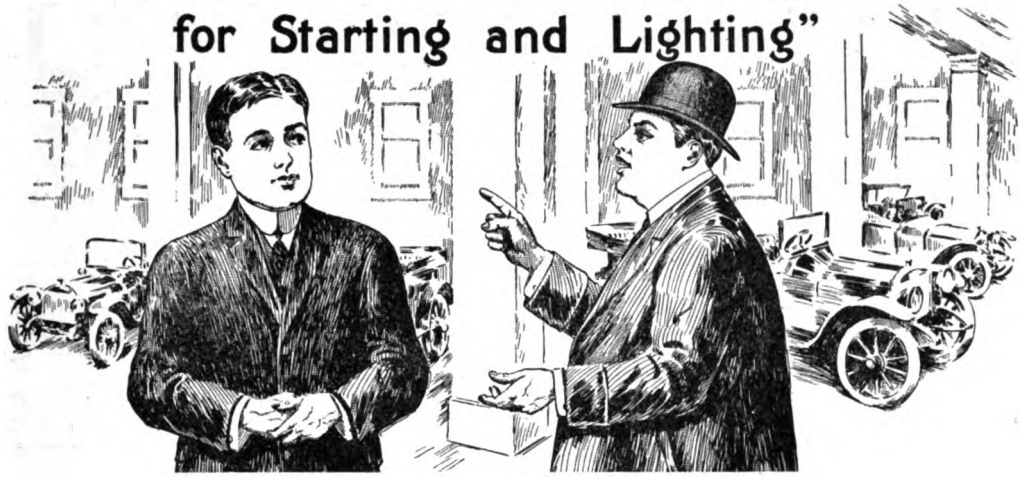
AUTO OWNERS: See your dealer, he may have MAXOTIRES in stock (for many have), however, if he hasn't—write for our complete free illustrated catalog and prices, express prepaid.

K & W RUBBER COMPANY

8-20 3rd Street, Ashland, Ohio

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"I'LL BUY on condition that you equip with GOULD BATTERY for Starting and Lighting"



WHO HAS THE BEST JUDGMENT, "A" OR "B"?

"A" took the starting and lighting battery that was handed him. Mr. Dealer made a fine profit, but soon Mr. A noticed that his cranking power would die down suspiciously quick. In winter the battery had to be "boosted." Acid crept out and corroded the terminals. One cell wouldn't equalize with the others, and like a weak chain link, pulled down the whole capacity. During the trouble periods, Mr. A found that hand cranking was no lost art.

"B" said "none but a *Gould* Battery goes on my car, even if the cost is a little more." Three years later he was able to conscientiously tell a friend: "My battery still works as well as when I bought it and I've never yet used the crank. Battery troubles simply don't exist with me."

Gould Storage Battery

The question of judgment here is intensely practical.

A good battery is essential to motoring comfort and assurance that your car is always ready.

Batteries built to sell at a price can't be expected to give service. We prefer to build for service—and Gould battery users agree that we do it.

Gould Storage Battery

DEALERS! Cut or tear along this line after filling blank and mail

Gould Storage Battery Co.

Genl. Offices, 30 E. 42nd St. New York



Boston—347 Newbury St. Philadelphia—613 Lincoln Bldg.
Cleveland—1761-5 E. 18th St. Detroit—Kerr Bldg.
Chicago—225 E. 22d St. Los Angeles—118 E. Pico St.
San Francisco—1448 Van Ness Avenue

Agents in Washington, Rochester, Buffalo, Pittsburgh, Milwaukee, Minneapolis, St. Paul, Kansas City, Omaha, Denver, Topeka, Seattle.

CANADIAN REPRESENTATIVE: R. E. T. Pringle, Toronto, Montreal, Winnipeg, Vancouver.

Full stock of parts, plates and repairs carried by all offices and agents. 145

Please advise me about your agency proposition and quote price on

Starting and Lighting Battery for..... car (State make, model and year of car).

Renewal plates for battery driving..... electric car (State make, model and year of car or truck).

Name..... Address.....

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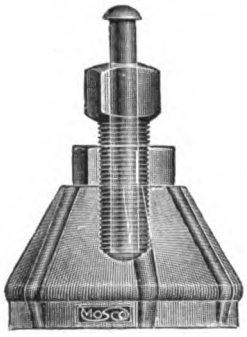
MOSCO SPECIALTIES



FOGG HORN FOR FORD AND METZ Cars

Still going. Still blowing its clear, mellow signal on thousands of cars throughout the land. Some of the skeptics tell us that the electric horn has supplanted exhaust whistles, but we notice that the old reliable FOGG continues to sell. The reason? Because it is the horn located between the engine and the muffler where it gets the full blast of the gas. Also because it has a cut-out in the body so that in buying the FOGG you get two devices in one—a signal and a cut-out.

Price with Cut-Out, $5.00 Without Cut-Out, $4.50



MOSCO (Loose Plunger) Wheel Pullers

Nos. 2, 3, 4, 5 and 6

Patented March 24, 1914. Dec. 15, 1914.

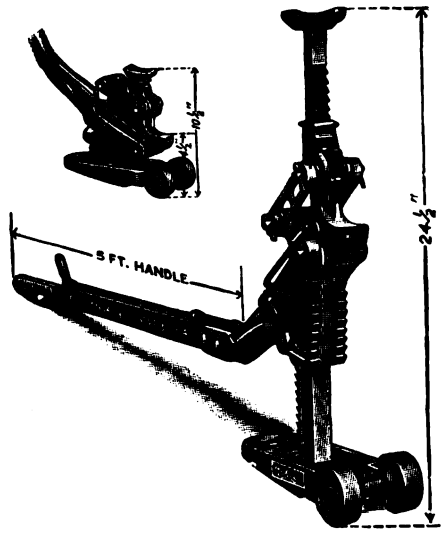
No. 2 Fits all Fords, Model T having tapered rear axles. **Price $1.00**

No. 3 Fits all Overland models as follows:
1912 Models 60F and 60T.
1913 " 69R, 69RE, 69F, 69T and 69TE.
1914 " 79R, 79RE, 79T, 79TE.
1915 " 80RE, 80TE, 81RE, 81TE.
Price $1.25

No. 4 Fits all Buick Models 10, 32, 33, 34, 35, 36, 26, 27, 24, 25, B24, B25, C24, C25. **Price $1.25**

No. 5 Fits all Buick Models 16, 17, 19, 21, 28, 29, 30, 31, 41, B36, B37, B38, C36, C37. **Price $1.50**

No. 6 Fits all Maxwell Models, 25 of 1914 and 1915. **Price $1.25**



"EXCEL" GARAGE JACK

A Heavy, Powerful Tool for Rapid and Easy Handling of Large or Small Cars

In the Garage, in the Repair Shop, on the Wash Stand, at the Tire Service Station, for Wrecking Crews, for Applying Tire Chains for the thousand and one purposes of business establishments where Power and Time Saving are the main consideration this heavy duty device alone fills the requirement. No other Jack embodies the features of quick action and powerful leverage found in the Excel.

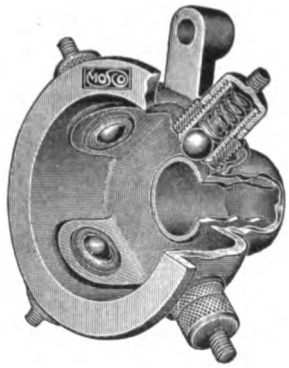
Liberal Discount to Garages and Dealers.

Price, East Mississippi River, - - $16.00
Price, West Mississippi River, - - $18.00

The New BEMUS TIMER

FORD CAR TYPE

Bemus Timer Patents
Sept. 24, 1907
Dec. 17, 1907
Feb. 16, 1915
Others Pending.





TIMER SHAFT EXTENSION



BEMUS BALL CONTACT TIMER

Every practical man who knows the Ford car recognizes the fact that this short stroke, high-speed engine requires a Timer capable of rapid, snappy action in the making of contacts and yet having durability sufficient for thousands of miles of running without loss of efficiency.

THE BEMUS IS BEST FOR THE FORD *BECAUSE*

CONTACT is made by a hardened tool-steel brush engaging steel balls with short, glancing impacts, both the brush and the balls turning each time so that fresh contact surfaces are continually engaged.

MOUNTING is direct on the time shaft by means of an extension piece. This brings each of the balls equi-distant from the brush. Result—absolute precision of timing.

STARTING is facilitated in cold weather because these contacts do not hold a body of oil to prevent passage of current.

DURABILITY of unlimited extent is due to a construction which eliminates all wear of the insulation. The roller brush is reversible, and when worn on both sides may be replaced by the user together with new contact balls at an expense of a few cents.

PRICE $2.25

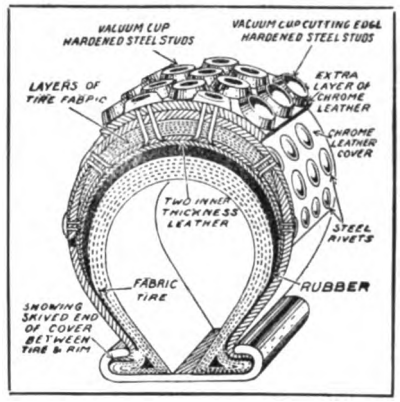
MOTOR SPECIALTIES COMPANY
MANUFACTURERS, WALTHAM, MASSACHUSETTS

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10,000 MILES GUARANTEE BACKS THIS TIRE



TRY Brictson Pneumatic Tires at our expense. Don't pay until you are satisfied. At our risk find out for yourself what wonderful service Brictson Tires give—how resilient and easy riding they are. Get rid of punctures, blowouts and rim cuts. Brictson Tires are rut proof, oil proof and gasoline proof. They are sold under a specific 10,000 mile written service guarantee.



Read What One User Says

"Several months before beginning my trip from Detroit, Mich., to Detroit, Fla., I thoroughly investigated tires of several well advertised kinds. I finally decided for my trip that the Brictson was the most economical and durable tire that I could find.

I am daily asked if I have many punctures. I reply that I do not know what a puncture is. I am driving on all kinds of roads under all kinds of conditions and never have a thing to worry about.

I have been on the road since the 8th day of last October, and if all goes well will begin my Florida trip again about October 1st next. I consider the tires worth almost their weight in gold. I would not do without them at twice the price.

W. J. BREWSTER,
August 10, 1914. 236 Jefferson Avenue, Detroit, Mich."

Your Tires Rebuilt the Brictson Way

If the fabric in the tires you are now using is in good condition, we can take them, make them proof against rim-cutting, punctures, blowouts, side-wall breaks, skidding, ruts, oil, and give thousands of miles of additional service.

Sign and send back coupon for full information and details of our liberal Free Trial Plan.

THE BRICTSON MFG. CO.

145 BRICTSON BLDG., BROOKINGS, SO. DAKOTA

Mail Back This Coupon

Brictson Mfg. Co.,
145 Brictson Bldg.,
Brookings, So. Dak.

Please send me full particulars about Brictson Tires, explain your free trial plan, also explain how my own tires can be rebuilt the Brictson Way.

Size of Tires.....

Name.....

Address.....

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NON-SKID "COG" TREAD WRAPPED TREAD

Patented Feb. 16, 1915



"There is More Fabric in Miller's Tires"

"The One Cure Wrapped and "Cog" Tread Tires"

SIZE	No. 1 Un-Guaranteed Wrapped Tread	No. 2 Standard Guarantee and Quality Wrapped Tread	No. 5 5000 Mile Guarantee High Grade Ex. Heavy "COG" Tread Best Quality	No. 7 High Grade Extra Strong Red Tubes
28x3	$8.30	$8.50	$11.55	$2.50
30x3	6.75	9.00	12.35	2.60
32x3	7.15	9.90	13.10	2.80
34x3	7.60	10.45	....	2.90
29x3½	8.75	11.10	16.05	2.95
30x3½	9.05	11.60	16.60	3.00
31x3½	9.35	12.15	17.10	3.05
32x3½	9.70	13.35	17.65	3.10
33x3½	10.05	14.20	18.20	3.20
34x3½	10.40	14.90	18.70	3.30
36x3½	10.95	15.65	19.75	3.45
30x4	12.15	17.15	22.30	4.00
31x4	12.65	17.95	23.15	4.10
32x4	13.05	18.25	23.95	4.20
33x4	13.55	19.05	24.80	4.35
34x4	14.10	19.40	25.65	4.45
35x4	14.55	20.20	26.50	4.55
36x4	15.05	20.50	27.30	4.65
37x4	15.45	21.30	28.20	4.80
34x4½	18.95	26.00	34.75	5.55
35x4½	19.55	27.00	35.85	5.65
36x4½	20.15	27.35	36.90	5.80
37x4½	20.70	28.35	37.90	5.90
35x5	22.75	30.75	41.65	6.75
36x5	23.45	31.15	42.90	6.90
37x5	24.15	32.30	44.20	7.80

Caution:—Be sure to specify type, i. e., Regular, Q. D. or Straight Side; also style of tread, i. e., Wrapped, Non-Skid or "Cog," when ordering.

NOTE:—If you dealer does not handle our tires, deduct 5% for cash with order. **Express charges prepaid.** This offer is good only until an agency is established in your vicinity.

DEALERS:—Write for exclusive agency.

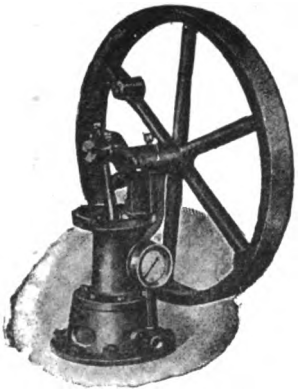
MILLER Extra Heavy "Cog" Tread TIRES

Do Not Blow Out Until They Are Worn Out. This is what the *Extra Fabric* does to make motoring more pleasant.

Buy the **"Cog" Tread** for **"All Season"** driving. They *eliminate* the use of chains. The extreme wide *traction surface* is more than double that of the ordinary non-skid tire and gives greatest efficiency.

MILLER'S High Pressure Air Pump

Made in Four Styles



MILLER'S HIGH PRESSURE AIR PUMP is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. presure.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers; adjustable sectional vulcanizers; inner tube vulcanizers; inside vulcanizers; retreading vulcanizers; adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Rubber Instruction Book
Price Prepaid, $1.00 Net

MILLER'S REPAIR MATERIALS

Common Tread Stock, per lb.	$0.50
Standard Tread Stock, per lb.	.70
High Grade Tread Stock, per lb.	.85
Cement Stock for Casings	1.25
Cement Stock for Tubes	1.75
Inside Tube Patching Rubber, cured one side, per lb.	1.50
No-Cement Patches, per dozen packages	2.50
No-Cement Patching Rubber, sheet form, per lb.	2.00
Fabric Sea Island Cotton, 17½ ounces, one or two sides	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides	.65
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, Net,	2.00
*Miller's Three in One Repair Stock	1.20

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 10 lb. lots or over, 10 and 5 per cent. On 20 pound orders, 25 and 5 per cent for cash.

MILLER'S IMPROVED ADJUSTABLE SECTIONAL VULCANIZERS



That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 28 Bead Molds and 7 Tread Molds.....$95.00 Less All Models.....$42.00

MILLER'S SPRING SPREADER

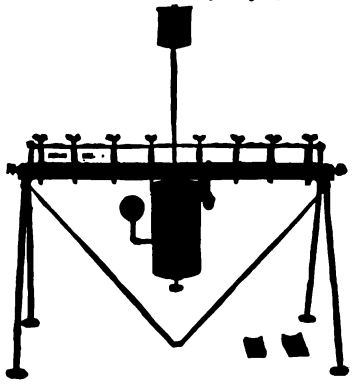


Quickly adjusted to any width of spring and when adjusted all that is necessary to open up a space between the leaves for insertion of oil is to tilt cam lever.

Many a good automobile has been condemned as a hard rider, simply for the want of oil between the spring leaves. It is a fact, that if the springs are not oiled occasionally that they will rust and stiffen, nearly equal to a solid bar of iron.

Price $1.00

Miller's Inner Tube Vulcanizers
Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

MILLER'S SECTIONAL VULCANIZER

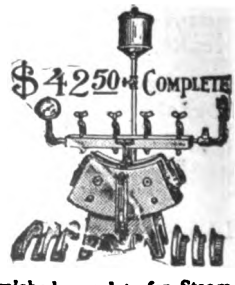
with Tube Attachment

Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Cog" Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*

CHAS. E. MILLER

Anderson Rubber Works

ANDERSON, IND., U. S. A.



Furnished complete for Steam Line, Gas or Gasoline Burner.

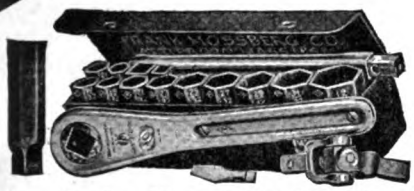
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$3.00

Socket Wrench Set No. 7

Socket Wrench



Socket Wrench Set No. 16

$6.00

Sets of



Socket Wrench Set No. 10

$8.00

All Sizes



Socket Wrench Set No. 14



Absolutely

TRADE MARK

Guaranteed

MOSSBERG

Socket Wrenches Are The Logical Wrenches

$12.00

If you cannot obtain from dealer, we will ship direct on receipt of price.

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

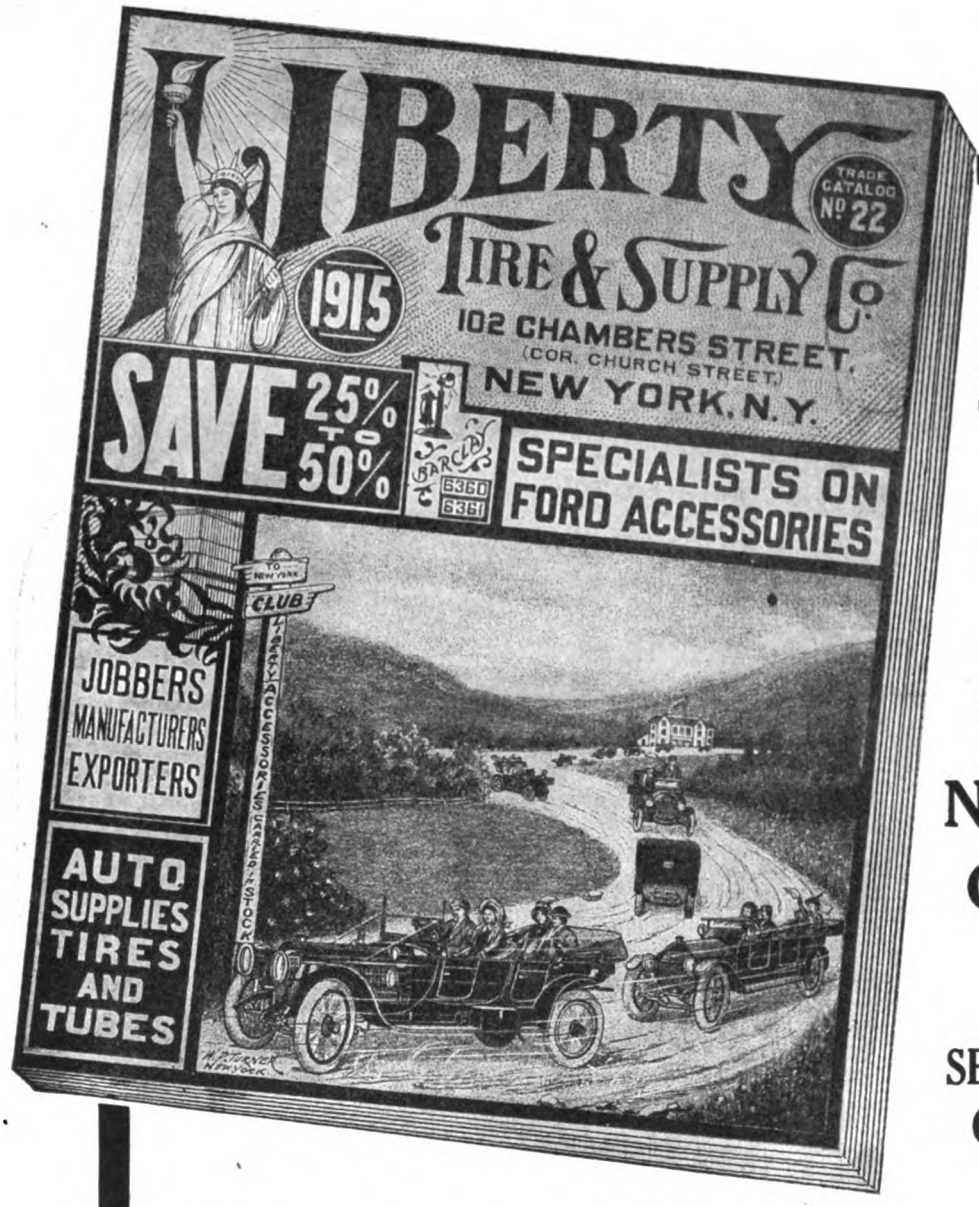
Catalog No. 171-B will tell you more

Save—

time
money
delay
replacing
"cussing"

Make MOSSBERG Prove It

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FREE

EVERY AUTO OWNER NEEDS THIS CATALOGUE

SEND FOR YOUR COPY TO-DAY

Auto Owners and Dealers—Attention!

Get our new 1915 Catalogue before placing your orders.

Every page is full of bargains at the lowest prices ever offered the trade.

A Complete Line of Ford Accessories.

All our goods are of the highest quality obtainable and we stand back of every article sold.

WRITE TODAY FOR FREE COPY.

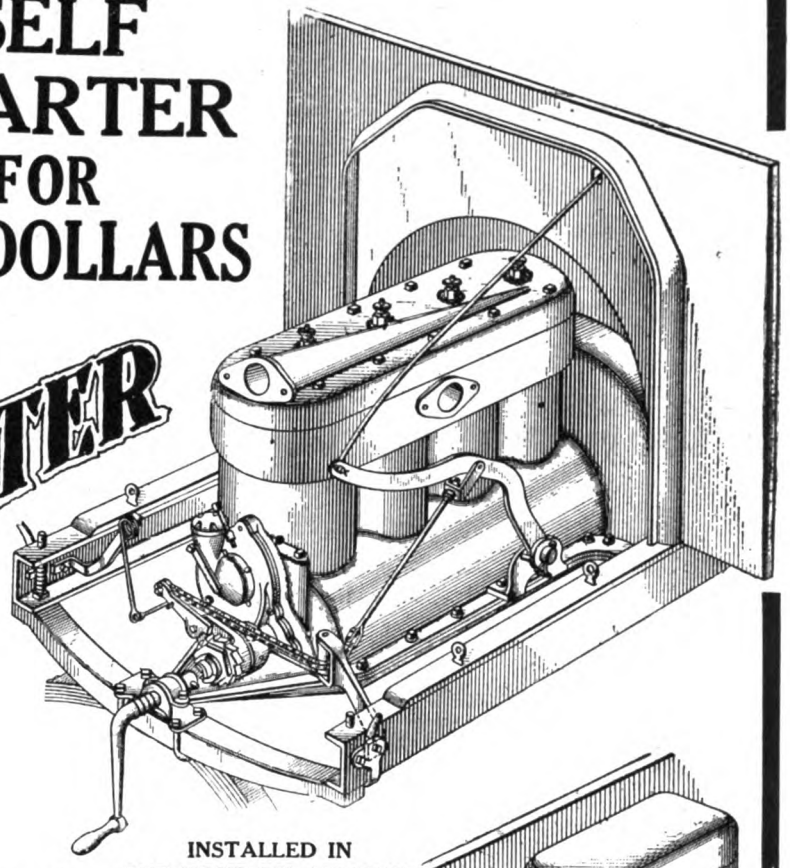
LIBERTY TIRE & SUPPLY COMPANY

102 CHAMBERS STREET, NEW YORK CITY

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$10 Think of it!

A SELF STARTER FOR 10 DOLLARS



The HUNTER

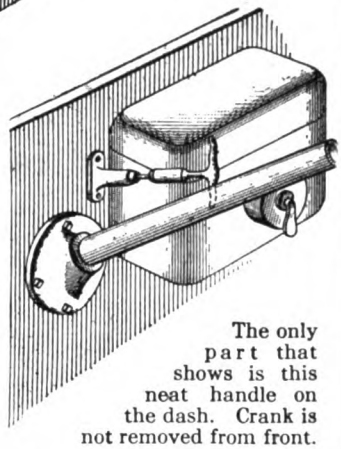
Complete with all attachments and instructions

JUST WHAT THE FORD OWNER HAS BEEN LOOKING FOR

At Last Mr. Ford Owner!

Your wish has come true. The best starter for a Ford car ever devised and costs less money. It gives you every convenience of the bigger, costlier cars (as you can use electric headlights on your magneto current).

INSTALLED IN ONE HOUR BY ANYONE



The only part that shows is this neat handle on the dash. Crank is not removed from front.

INCREASES THE VALUE OF A FORD THREE TIMES

Note the Advantages

Powerful—The straight pull and powerful leverage enable a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

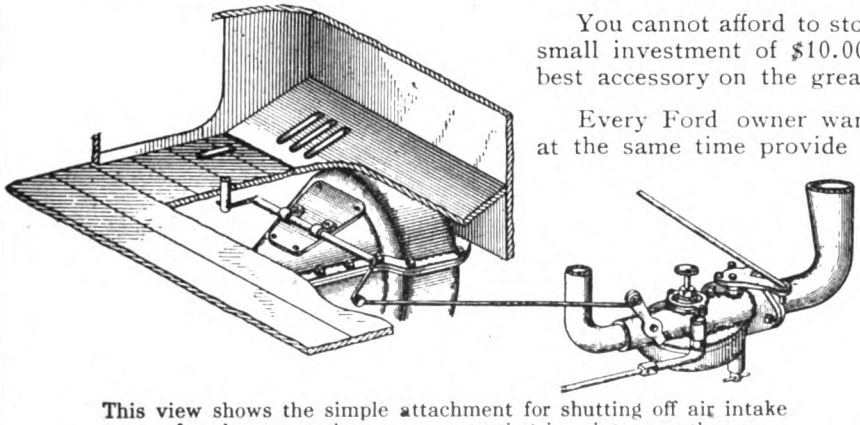
Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

You cannot afford to stop at the small investment of $10.00 for the best accessory on the greatest automobile on the market.

Every Ford owner wants to make his car up-to-date and at the same time provide for comfort.



This view shows the simple attachment for shutting off air intake of carburetor to insure easy starting in winter weather.

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS for FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. Price, $1.00. Quickly installed. Sold by leading dealers.

THE HUNTER AUTO SUPPLY CO.

HUNTER BUILDING 337 W. MADISON STREET CHICAGO, ILL.

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TWITCHELL AIR GAUGE

The Positive Lock Stop
TWITCHELL AIR GAUGE

The Standard Tire Pressure Gauge for 1915

The Best Gauge to Use

Consequently the best gauge to *sell*—

The best way to secure the stocking of your goods by dealers everywhere is to make an article so satisfactory and so perfect that the demand for it will be universal.

Our experience during 1913 and 1914 has convinced us that we are manufacturing such an article in the

Positive Lock Stop TWITCHELL

Both this year and last year, we had difficulty in satisfying the demand.

Don't waste your time and strength trying to push something that is anchored and can't move.

Stock Goods for which there is a demand.

Our advertising in the Trade and National Magazines will be increased this year in order to stimulate this demand still further.

We can make immediate deliveries now. We may not be able to do so in June.

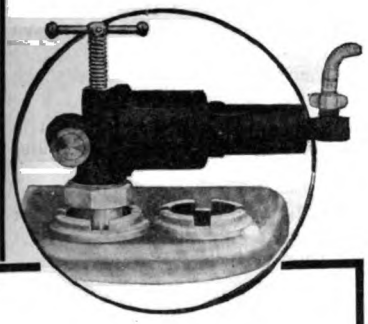


Tire Insurance for $1.00

For Sale by Jobbers, Dealers, Garages Etc.
THE TWITCHELL GAUGE CO.
1213 Michigan Ave, Chicago.

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Try One Free On Your Car For 30 Days



If you want the very latest in a permanently attached tire pump, always ready for instant service—install a reliable

MAYO VALVE CAP PUMP

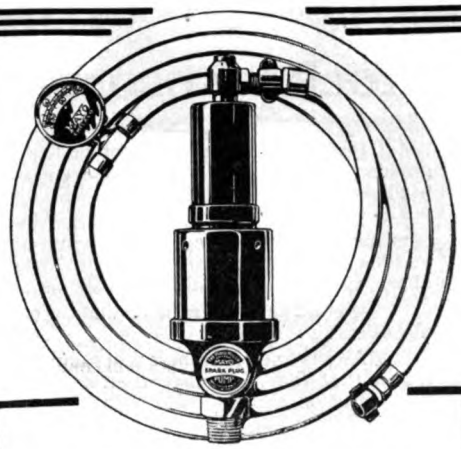
To operate: Without stopping the motor, simply press down the handle, give it a quarter turn and the pump starts working.

Readily installed into one of the valve caps on any 4-cycle motor.

All the unequalled advantages of the MAYO Spark Plug PUMP principle **plus** the permanent attachment feature. No gears to grind and become noisy. Pumps a tire in 3 minutes instead of 10. Complete with 14 ft. hose, gauge and all connections—

$15

None of the disadvantages of gear pump installation and upkeep expense.



If you are touring to the coast this summer or are only driving to the next town—or about the boulevards—you need a

MAYO SPARK PLUG PUMP

—to take care of tire emergencies

A flat tire, with a MAYO to do the pumping, is but a pleasant incident in the drive. Without a MAYO, it is a back-breaking, pleasure-spoiling job, that means pumping 80 lbs. pressure by hand.

The MAYO Spark Plug Pump is the oldest and best known power pump on the market. Pumps pure, fresh air only. Adapted to any car. Instantly substituted for any spark plug. Built with rings like your motor—and lasts as long. Complete, 12 ft. hose, gauge and all connections—

$10

The MAYO is the lowest priced **quality** tire pump. Investigate.

The Pioneer of all Power Pumps —World Famous



Whether you are using your Ford for transcontinental touring this year—or simply touring about home—complete your equipment with a

MAYO FORD PUMP

It takes all the work out of tire pumping.

It gives your Ford the greatest convenience of highest priced cars, and it is a tire economy you can't afford to overlook.

The MAYO Ford Pump is made especially for Ford cars, and as perfectly as the largest MAYO. Attached and operated exactly like standard MAYO Spark Plug Pump.

Complete with 10 ft. hose, gauge and all connections—

$8

The first quality Pump at a price consistent with Ford cost.

You Will Need a MAYO Pump on that Tour to the Coast this Summer



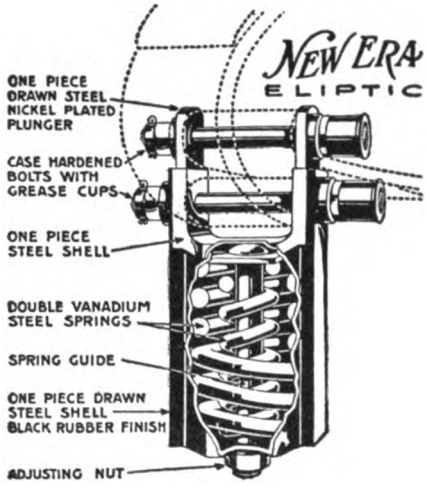
Mayo Mfg. Co.
63 East 18th Street
Chicago, Illinois

Write Us For Full Information

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A Sensational Shock Absorber Achievement

A HISTORY MAKING ABSORBER



$10 $12.50 $15

Light Cars Medium Cars Heavy Cars

Designed and priced right at the start to create the largest sales of any such device (as did the Ford manufacturers) and to become the best known and most used shock absorbers.

The NEW ERA Eliptic Shock Absorber for light, medium and heavyweight cars, having simplified construction and handsome design that will appeal to the vast number of owners needing more comfort and desiring to save the car from excessive abuse, yet without paying $25 to $50 for such advantage.

If **good cars** can **now** be had for one-third former price, **Why** not **Good** shock absorbers?

Any user of absorbers will readily state they **are almost** a necessity, and it **is a fact** that they will more than save their cost in a season on **tires** alone, and frequently on springs.

The efficiency of the NEW ERA gives great resiliency and absorption of constant vibration of all small depressions and by its double spiral Vanadium Springs of scientific apportionment and adjustment for the weight of car intended, produced **the ideal** shock absorber at a price all can easily afford to buy.

A most handsome design and rich finish in beautiful black enamel and nickeled trimmed.

Why the High Grade NEW ERA Eliptic Shock Absorber at $10, $12.50 and $15?

Modern designing, eliminating machine work and construction labor, but **one** size, with interchangeable bushings for different width car (leaf) springs and sizes of spring bolts, **and** large factory production, sure to follow at such low selling price.

If the best materials obtainable can be used in the cheapest priced popular automobile **why** not in reliable Shock Absorbers, that the low price will sell rather than immense advertising and added selling expense.

The widest range of cars can be supplied or fitted by dealers with NEW ERA Eliptic Shock Absorbers by the quick and simple change of bushings of different sizes, bolt holes and varying thickness. Sold on a 30-day trial by purchaser, or full purchase price refunded if not satisfactory.

Guaranteed Permanently Against Defects

CAR DEALERS—Don't you want to increase the comfort of your car owner—and your profits? Dealers supplied through most jobbers or us. Ask for nearest one.

NEW ERA SPRING & SPECIALTY CO., (Smalley Daniels)

871 Woodward Avenue, Detroit, Mich. **69-73 No. Washington Street, Boston, Mass.**

P. S.—Our 1916 Models of Ford Absorbers at $10 for 4—are ready—one sample set will get your further business.

31 MILES

PER GALLON FOR MODEL "T"

FORDS

Most FORD Cars are driven on the average 18 miles per gallon; but Ford engineering and manufacture have built a possible 31 miles per gallon and more into these cars—but it takes a

WHITTELSEY CARBURETOR ADJUSTER

To Bring It Out

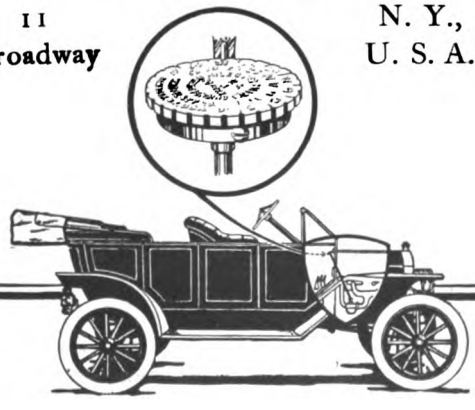
Also makes a man master of his carburetor. Easier starting, better running and less carbon.

PRICE, $1.00

Write Dept. 2 for Special Dealers' Proposition.

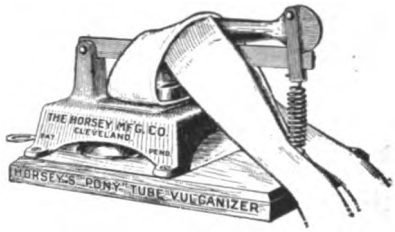
WHITTELSEY COMPANY

11 Broadway N. Y., U. S. A.



HORSEY

Pony **Pony**



Vulcanizer

For Inner Tubes

THE HORSEY Pony Vulcanizer is specially made and constructed to demonstrate that **Horsey No-Cement Tube Patches** can be vulcanized after applying according to directions **without** the use of any cement. Is built on the **principle** of large vulcanizers. Is the **only** small Vulcanizer that **has a spring** tension on tube during vulcanizing. Is the **only small** Vulcanizer that can be handled without danger of **burning** your **hands** and the **tube.** Is the **only** Vulcanizer that is **heated** with **denatured** alcohol, giving a **steady** uniform **heat** without flaring up, and is safe and **not dangerous** like gasoline. Denatured alcohol is sold everywhere.

Vulcanizer is 5x6 in., and all parts nickel plated, and is mounted on 8x10 in. board protected with galvanized iron. It is the safest, the most complete, the most practical, the most perfect and the best value of any small Vulcanizer **sold.** Will repair 90% of punctures and blowouts. It is built on **scientific principles,** and is **indispensable** to automobile owners and garages. HORSEY Pony Vulcanizer is packed in a substantial box with one box containing 12 assorted (**large** and small) **Horsey No-Cement Patches,** sandpaper and instruction sheets all complete. **Price $3.00.**

Will vulcanize any vulcanizing gum stock.

Be your own repairmen with this outfit,—it is a great money saver, and you should not be without it. **Satisfaction guaranteed.**

MANUFACTURED BY

THE HORSEY MANUFACTURING CO.

6104 EUCLID AVENUE **CLEVELAND, OHIO**

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Firestone Hook-On Boot

LIKE all Firestone Accessories, this is a little thing which staves off big troubles.

Equipped with hooks which fit under clinch of rim. Inflate tire and go on your way—secure. The boot will "stay put."

The Man Who Sells Them

can be sure of the profits and prestige which follow when troubles are easily met and emergencies are foreseen. Firestone service builds good will.

Repair Materials in Air-tight Packages
Write for Catalog with Description

Firestone Tire & Rubber Company
"America's Largest Exclusive Tire and Rim Makers"
Akron, Ohio—Branches and Dealers Everywhere

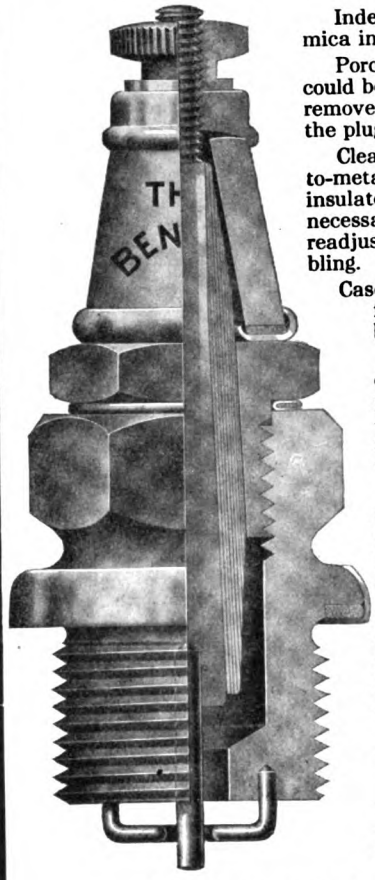
Firestone Accessories

Protect your customers and get their good-will by selling

BENTON CASE-HARDENED SPARK PLUGS

Motorists who want something good and appreciate constantly-efficient spark plug service, pick Benton plugs every time if you point out the numerous features explained in our literature.

Briefly, some of these are as follows:



Indestructible wound sheet mica insulator.

Porcelain only a sheath, and could be cracked or even entirely removed without short-circuiting the plug.

Cleaned by unscrewing metal-to-metal gasketed joint, washing insulator with gasoline (or if necessary, scraping with a knife), readjusting points and re-assembling. **Joint always gas-tight.**

Case-hardened wrench surfaces and threads prevent battering.

Spark well out in path of gases and between opposed cylindrical surfaces—ideal for sure ignition, quick cooling and preservation of electrodes.

Semi-circular outer electrode—wide selection for spark gap without disadvantages of multiple points.

Slow to foul and overheat, because little gas gets into the plug, and the shape of inside passages makes exploding gas blow carbon away from insulator.

Liberally guaranteed for life.

Sizes for all automobile, motorcycle, motorboat, aeroplane and stationary gas engine requirements.

PRICE, all sizes, $1.00

Our booklet, "Spark Plugs and How to Make Them Give Perfect Service," would open your eyes to the possibilities from Benton Plugs—a subject which no aggressive dealer can afford to neglect.

Mail the coupon so we can submit our attractive sales proposition and explain why Benton Plugs always make pleased customers.

(Tear Off Along This line)

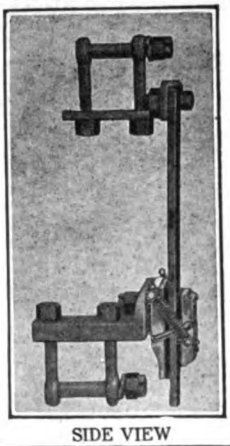
L. F. BENTON CO., VERGENNES VERMONT

Send booklet, "Spark Plugs and How to Make Them Give Perfect Service."
Also send particulars about your agency proposition.

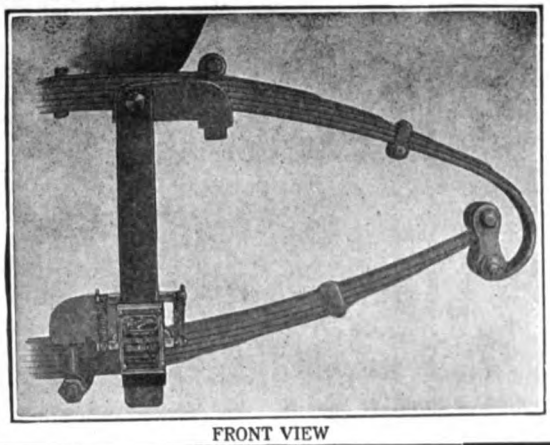
NAME.....

ADDRESS .....

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SIDE VIEW



FRONT VIEW

The Friction

MANUFACTURED BY

FRICTION SHOCK ABSORBER Co

KINGSTON, N.Y.

Construction

A taper steel bar with a leather faced shoe on both sides and a link set at an angle which draws the shoes tight on the up movement and acts as an automatic brake on the spring to prevent rebound and does it perfectly—makes easy riding over rough roads.

Simpler, more reliable than any other shock absorber. Requires no care. Money back guarantee. Send for Catalog C.

AGENTS WANTED EVERYWHERE

A Blower and Tuyere Iron that Stand Without a Single Comparison for Producing a Strong Blast

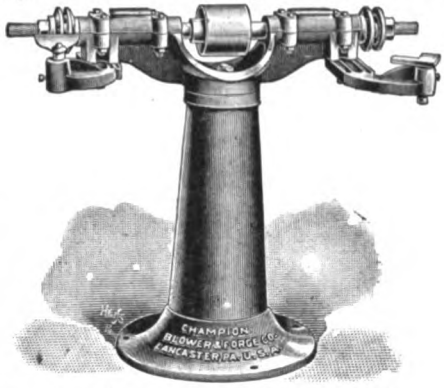
BE PROGRESSIVE, USE A No. 400



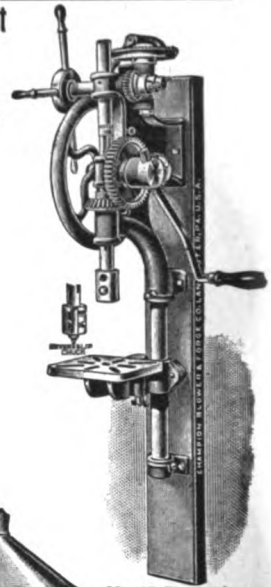
FAMOUS 400 Crank turns either way.



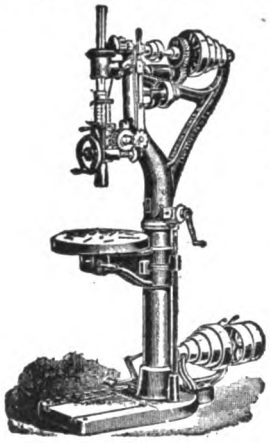
No. 408 Steel Blacksmiths' Forge.
Over one-half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.



No. 1 Champion Upright Column Grinder.
Capacity Two 18x3 inch wheels.



No. 97 Champion Hand-Feed and Quick Return Self-Feed Blacksmith Post Drill.



20-inch Drill.

20-inch Double Back Geared Upright Power Drill is furnished with three complete feeds and is suitably adapted for machine shop and garage use. If you are in need of a power or hand driven Drill write us for full information concerning our complete line.



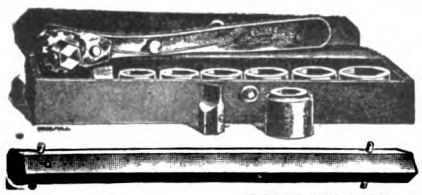
Screw Plates made in four Styles, cutting from ¼ inch to 1¼ inch.

Before purchasing a **Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower or Electric Blower, write for our free catalogue,** which always shows the greatest variety of improved blacksmith tools built under one control in the world.

THE CHAMPION BLOWER & FORGE COMPANY, LANCASTER, PA., U. S. A.



No. 440 Electric Forge.



LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U.S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.

Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.

Price, in leather case, - - - - $3.00

Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER, **180 N. Dearborn Street, CHICAGO, ILL.**

The Trade Is Cautioned Against Selling Infringements On My Patent.

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SAMSON TIGER HAND HORN

The Popular Model For 1915

LOUD – SIMPLE – STRONG – GUARANTEED



Operated by simple turn of handle or elbow. Can be mounted so that the handle is on inside of closed car, or when curtains are down.

Liberal proposition to the trade with no arbitrary sale restrictions.

$5.00

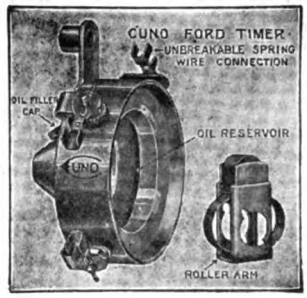
Most Extensive Line of Horns on the Market.

MOTOR–VIBRATOR–HAND HORNS

Styles and Finishes for Any Type of Car.

AMERICAN ELECTRIC COMPANY

State and 64th Streets **Chicago, Illinois**



PRICE $1.50

MISSING in your FORD Will be STOPPED BY A Cuno Ford Timer

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

Attractive Jobbers' and Dealers' Proposition.

CUNO ENGINEERING CORPORATION, 80 So. Vine Avenue MERIDEN. CONN.

FORD OWNERS!

Why pay fancy prices for Shock Absorbers when you can get a set of

"TASCO" SHOCK ABSORBERS

FOR $6.00 PER SET

Built of Steel ***Designed for Service***



They do not raise the car or change the suspension as designed by Ford engineers.

Made of the finest material, properly designed and have real springs—strong, lively and flexible. Springs are adjustable. Easily attached without even taking off the wheels.

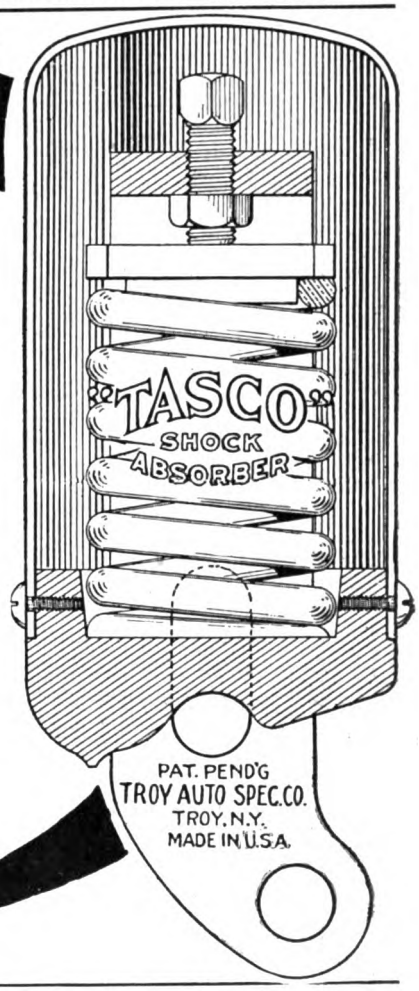
10 Days' Trial---Money Refunded

DEALERS—We have a good proposition to make you. "Tasco" Shock Absorbers are the best sellers of their kind on the market.

We Want Live Demonstrators in Every Town. **Write Us Today.**

TROY AUTO SPECIALTY CO.

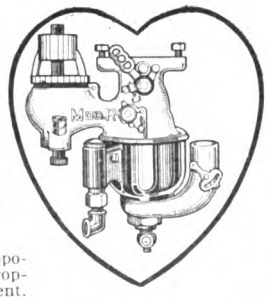
TROY, N. Y.



SCHEBLER CARBURETORS

equipped the Stutz Car winner of second place in the

VANDERBILT AND GRAND PRIX RACES



This was the first American car to finish in both races and was of course

SCHEBLER EQUIPPED

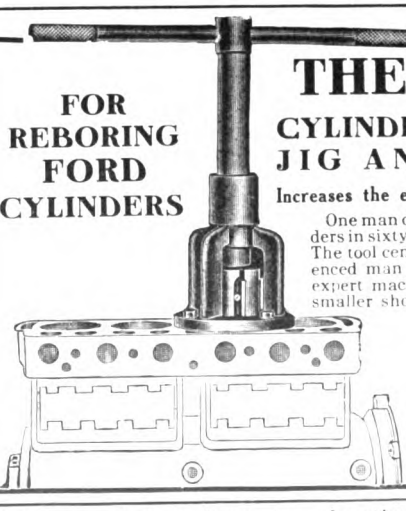
Why not have a SCHEBLER yourself?

Ask us about our remarkable exchange proposition on new Model "R." Get our special proposition and particulars for Ford car equipment.

JAMES C. NICHOLS, Inc., Direct Factory Distributor

1673 BROADWAY Tel., 6161 Columbus NEW YORK CITY

FOR REBORING FORD CYLINDERS



THE DAVIS CYLINDER REBORING JIG AND REAMER

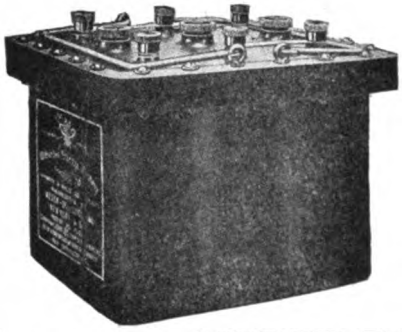
Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

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WITHERBEE STORAGE BATTERIES



For Starting—Lighting and Ignition

Types and sizes for all equipments and any replacement.

Investigate our exchange proposition.



MEDER-STAUDT CO., Inc., Sole Manufacturers

1876 BROADWAY, NEW YORK, N. Y. Factory: SPRINGFIELD, MASS.



Badger Gear Compound stops that noise and makes your rear axles and transmissions keep quiet. It's the very acme of perfection in a lubricant and is guaranteed to give absolute satisfaction.

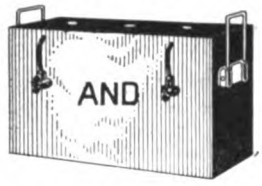
BADGER Gear Compound

"Always On The Teeth"

It clings to the teeth of the gears, no matter what the speed. Does not run thin and never packs onto the sides of the gear case. Users affirm they never knew before what a difference there was in lubrication. We also make the well-known F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. Dealers! Ask for Territory on the Best Seller Known. **Wadhams Oil Co., Milwaukee, Wis.** Coast Dist'r: Wadhams Oil Co. of Wash., Seattle, Wash., & Vancouver, B.C.

PLATES JARS SEPARATORS SOLUTION
TERMINALS SEALING COMPOUND

STORAGE BATTERY

REPAIR  AND ASSEMBLY



PARTS
IN WIDE VARIETY



WALTER L. THOMPSON, 655 W. 43d St., New York

MAKE $250.00 A MONTH



REPAIRING AUTOMOBILE TIRES

Sounds like a lot of money—IT IS—A WHOLE LOT of MONEY to be earning CLEAR every month—yet it's what hundreds of men we have established in the Automobile Tire Repair Business are making. You let down the DRAWBRIDGE for SUCCESS to enter into your career by getting into business for yourself. The business for you is one where the investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase.

A HAYWOOD TIRE REPAIR EQUIPMENT

answers to all of these requirements of Old Dame Fortune—the certainty of success in this business is as sure as anything in this world can be—Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

HERE IS YOUR OPPORTUNITY!

Be first to enter this new, big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I have made as high as $18 in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as a side line in connection with auto business—garage, or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

THIS MAN IS MAKING MONEY

Repair Tires at Home!

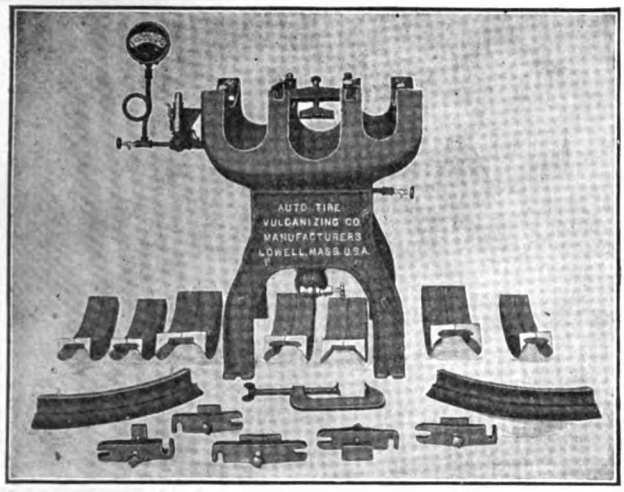
Young men and boys! repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business. **Auto owners**—repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow, investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.

The New Money-Making Business—Start Now.

HAYWOOD TIRE & EQUIPMENT COMPANY

528 North Capitol Avenue
INDIANAPOLIS, INDIANA

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As a Progressive Business Man You Should Stop and Consider Our

NEW No. 8 ADJUSTABLE SECTIONAL VULCANIZER

simply and solely because we are now offering the best vulcanizer in the market at any price. The price isn't much, the operation is easy and the profits are exceptionally large.

Our vulcanizer is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted. **Write us today.**

AUTO TIRE VULCANIZING CO., Lowell, Mass.



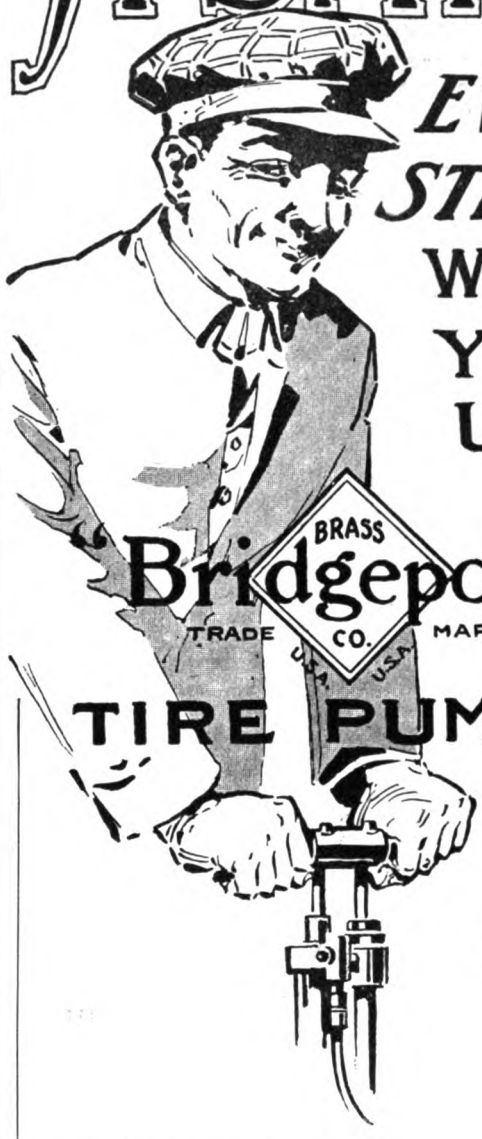
Guaranteed One Year
(We Really Mean This)

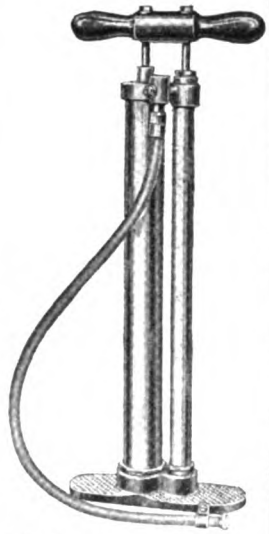
BY actual test against all other advertised top materials, we know none is better, and some are not as good. Rayntite Top materials are made both single and double texture, both are Fabrikoid, guaranteed not to leak for one year. Washable, greaseproof, not affected by heat or cold.

Rayntite Tops can be supplied by any auto-top maker.
INSIST ON HAVING A RAYNTITE TOP.
SAMPLES OF MATERIAL FREE.

DU PONT FABRIKOID CO., Wilmington, Del.
Canadian Branch: TORONTO, ONT.

A SMILE EVERY STROKE WHEN YOU USE "Bridgeport" TIRE PUMPS





A Bridgeport Pump is the pump your customers will be willing to pay a good price for—because it saves them work and trouble.

The "Aeolus," here illustrated, is a powerful compound pump that makes inflation of tires an easy task. It is substantial and long-lasting. The pump cylinders are made of **seamless brass tubing** (not steel) and will not rust. Joints are positively non-leakable.

All Bridgeport Pumps are built to give good service and withstand hard usage.

It will pay you to carry and push the Bridgeport line.

Send for 1915 Catalog

BRIDGEPORT BRASS COMPANY
BRIDGEPORT CONNECTICUT

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WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts,
Crank Cases, Housings, Frames,
Axles, any metals of any shapes or thicknesses, including

ALUMINUM PARTS

All work absolutely GUARANTEED

¶ Write for estimates.

¶ Complete Oxy-Acetylene Welding and Cutting Plants installed.

OXWELD ACETYLENE COMPANY
646 Frelinghuysen Avenue, Newark, N. J. - 37th Street and Jasper Place, Chicago, Ill.

BROWN SUB-BASE OILER
FOR FORD CARS



PAT. DEC. 8, 1914

The hit of the shows. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.



You're Never Cornered with a Starrett Ratchet Wrench

It will turn any standard nut or bolt in all sorts of difficult places—places where the ordinary monkey wrench is useless. For working about an auto, there's no tool like it. The ratchet permits rapid action with only a short arc swing. The extension reaches into otherwise inaccessible places. With this wrench you need never be stalled because of a breakdown that requires a drill, for the drilling attachment furnished with the wrench takes any square shank twist drill from ⅛" to ½" and makes repairs of this kind easy. A reversible screwdriver makes it handy for turning screws of various sizes, too.

Send for catalog No. 20 D C and see the whole Starrett line of fine tools. It's worth while.

BY INVITATION MEMBER OF

Starrett Tools are sold at all good hardware stores throughout the country.

THE L. S. STARRETT COMPANY

World's Greatest Tool-Makers - ATHOL, MASS. 42-59

THE PRACTICAL GAS ENGINEER.

A Manual that tells what a Gas or Gasoline Engine is. How to Purchase a Gas or Gasoline Engine. How to install the Engine. How to Operate it. How to care for it. What to do when it gets Stubborn and How to do it.

This is a complete, plainly written work, containing the practical points needed by a purchaser, owner or operator of a Gas or Gasoline Engine. Written by Dr. E. W. LONGANECKER, a gasoline engine expert of ten years' experience, now Secretary of one of the largest gas engine factories in America. You cannot afford to be without it. Sent by mail, postpaid, to any address, upon receipt of price, $1.00. Address

MOTOR VEHICLE PUBLISHING CO., 71-73 Murray St., New York.

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ZENITH

Ford Carburetor

Adjusts Itself

Every Other Car Is A Customer For You

The No-Adjustments Carburetor

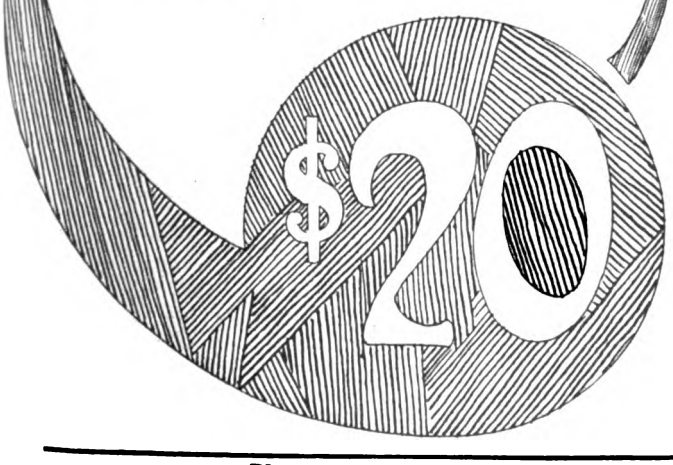
The Compound Nozzle does it. Always a perfect mixture for every range of speed from high to low, with guaranteed infallible precision. The Maximum of Power, and all tinkering eliminated.

Never any trouble, or money back. Its extreme simplicity means no repairs. We guarantee that. 65% of European Cars use the Zenith Carburetor. They know and You know. This is the first time the Zenith Carburetor is offered to Ford owners.

Over 600,000 Fords in daily use in the United States. It means that Every Other Car Is A Customer For You, because Ford Owners have told us they want it.

We are the sole producers of the Zenith Ford Carburetor in the United States. We are appointing a representative dealer in every town, to help take care of nation-wide demand. Write now for a sample and information about our profit sharing discounts.

MOTOR PARTS COMPANY
818 No. Broad Street Philadelphia, Pa.



Tuthill
Titanic Unbreakable
Spring

WRITE TODAY FOR

"Best Sellers" Assortment

TUTHILL Titanic Springs

Guaranteed against Center Breakage

No Center Bolt

If the Tuthill Titanic had a center bolt like the ordinary spring, we would not dare guarantee it forever against Center Breakage – because 75 out of every 100 center bolt springs break in the center.

A Tuthill Patent Device takes the place of the bolt through the center--and a more resilient, longer lasting spring can not be made--it's the spring with no "come backs."

Big stock unnecessary

The object of our Quick Service Department is to make it unnecessary for you to carry an over-stock.

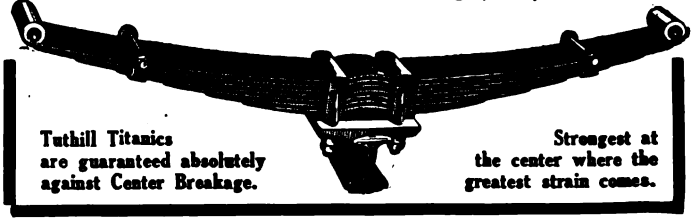
Regular orders shipped same day received—any special orders within 48 hours—enabling you to do a profitable replacement business on a small investment.

Just wire or write your jobber—or send to us direct. No matter what make or model—there's a Tuthill Unbreakable Titanic for every car.

Tuthill Titanics can be easily adapted to any axle construction and quickly mounted without any extra expense.

TUTHILL SPRING CO.

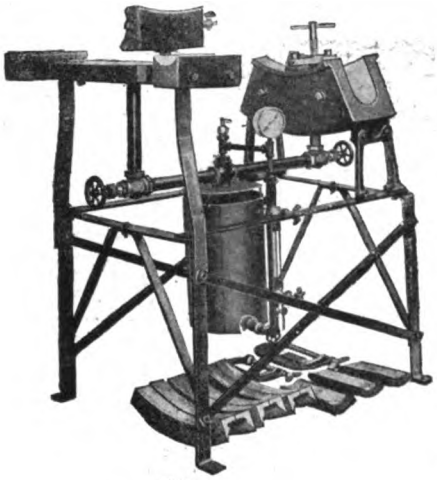
758 Polk Street Chicago, Ill., U. S. A.

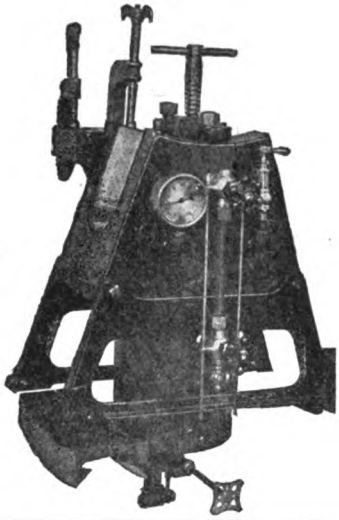


Tuthill Titanics are guaranteed absolutely against Center Breakage.

Strongest at the center where the greatest strain comes.

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VANDERPOOL VULCANIZERS

SATISFY

Read What Others Say:—

Pleased with the Vulcanizer got from you. —*O. W. Jordan, Beeville, Texas.*

Vulcanizer is working fine.—*Earl Grey, Saskatchewan, Canada.*

Vulcanizer received and doing good work. —*Dixie Garage, Dalton, Ga.*

The Vulcanizer does very nice work, am well pleased with it.—*J. F. Merino, Winkleman, Arizona.*

We are doing nice business and good jobs with your Vulcanizer.—*Browning & Otto, Wheeling, W. Va.*

After giving the Vulcanizer we bought from you a fair trial we find it to give absolute satisfaction. Have you another at the same price equipped with gas burner? —*A. W. Childress, Richmond, Va.*

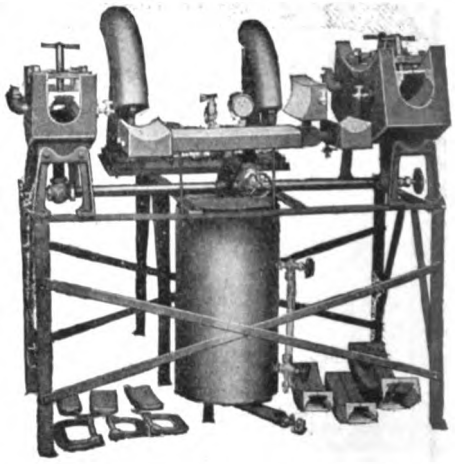
Shipped Mr. Childress another Vulcanizer, March 23, 1915.

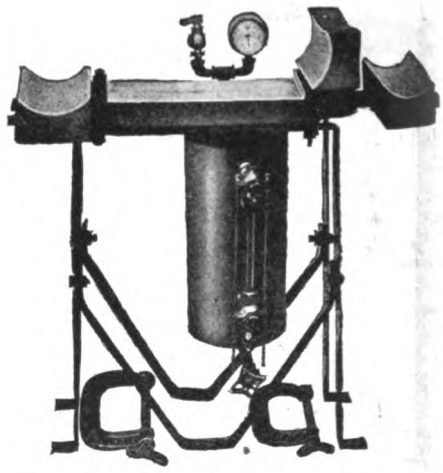
Your Vulcanizer is a wonder. I couldn't get along without it.—*H. Getman Chaumont. 3-23-15.*

Vulcanizer which we had from you is working fine.—*Russell Co. E. Sumner, Me. 3-15-15.*

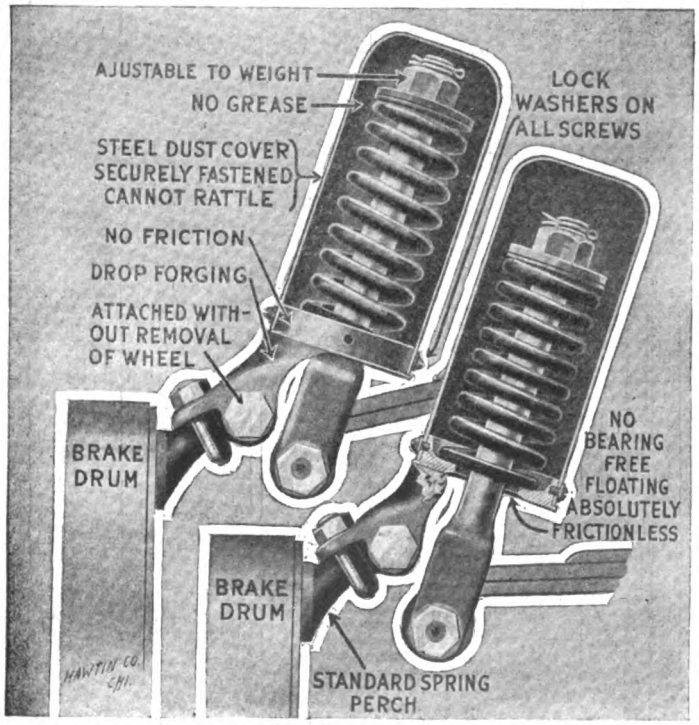
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VANDERPOOL COMPANY
SPRINGFIELD, OHIO





HALLADAY FRICTIONLESS SHOCK ABSORBERS



Backed by Maker's Guarantee

248,000 Sold in 1914

DROP-FORGED CASING and VANADIUM STEEL SPRINGS

Just what FORD OWNERS are looking for—a Shock Absorber that anybody can attach without special tools, in 20 minutes. Needs no machining or drilling; no adjustment, oiling or attention of any kind. Once attached it is on the job for life of car. The Halladay Shock Absorber has

NO FRICTION NOISE OR WEAR

because it is hung at such an angle that the free downward and outward thrust of the spring combine to pull in direct line with the axis of the shock absorber. The photograph explains this clearly. The Halladay is the only ***Frictionless*** shock absorber on the market. This feature is fully protected.

Our New 1915 Improved Model to sell at only - - $12.00 A SET OF FOUR

WRITE FOR PARTICULARS

L. P. HALLADAY CO.

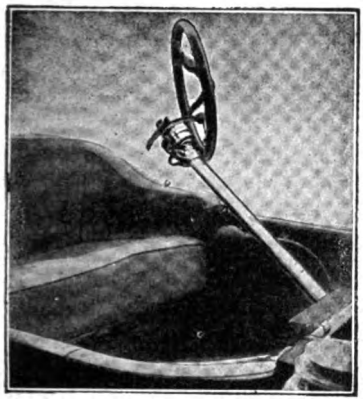
Dept. D STREATOR, ILL.

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and Southwest, Gray-Heath Co., Chicago; For New England, Post and Lester Co., Hartford, Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvania, Asch & Co., New York

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HALLADAY ADJUSTABLE STEERING WHEEL

The greatest convenience yet invented for the OWNER who drives his own Ford. Stout people MUST have it.

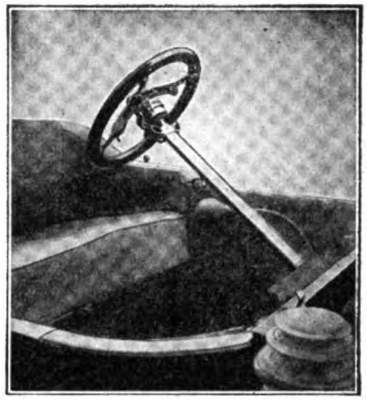


Patents Pending

Wheel lifts instantly, enabling driver to get out with perfect ease, even with two on the seat. Locks automatically. Beautiful Black Japan finish.

Attached by simply removing nut on end of steering column.

14-inch, Spider only . . .	**$3.00**
Same with Rim	**4.00**
16-inch Spider with Rim . .	**5.00**
Corrugated Rim, extra . . .	**1.00**



People using Fords get in and out of them many times daily. They appreciate the extra room and convenience this Adjustable Wheel gives.

Manufactured by L. P. HALLADAY CO. (Dept. D), Streator, Ill.

Write today for particulars on this and other fast-selling Ford Specialties.

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and Southwest, Gray-Heath Co., Chicago; For New England, Post & Lester Co., Hartford Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvania, Asch & Co., New York.



Patent applied for

AUTO CYLINDER BORING BAR

What every garage and repairman should have in his shop. Guaranteed to rebore any single, twin or block of four cylinders, accurately, subject to micrometer test.

Price is within the reach of all.

Made in two sizes:
A rebores from 3" dia. to 5¼x12" deep.
B rebores from 3" dia. to 8x16" deep.

For information, write

D. ANDERSON & BRO.

946 Burr Street - - St. Paul, Minn.

Trade Mark

"NO-LEAK-O"

A Scientific Oil Packing Piston Ring

A RING WITH A REASON

There's no mystery about "NO-LEAK-O" rings. A simple, plain, mechanical fact.

Piston movement, uneven expansion and contraction, makes perfect fitting impossible. It's the OIL that forms the seal, prevents escape of gas and lubricates.

It is only a question of how to keep a volume of oil between the rings and cylinder-wall, without waste. There's but one way; that's our way. Make oil grooves around the rings; simple, isn't it?

The grooves convey enough OIL to form the seal, which means perfect compression without WASTE; maximum power with less GASOLINE; perfect lubrication without CARBON, smoke, and oily plugs.

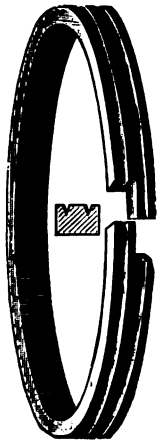
We absolutely guarantee each ring for QUALITY, ACCURACY, and satisfactory service.

One Piece, Low Cost, High Efficiency.

Carbon Eliminated by Controlling the Oil.

AUTOMOBILE ACCESSORIES CO.

816 W. North Avenue Baltimore, Md.



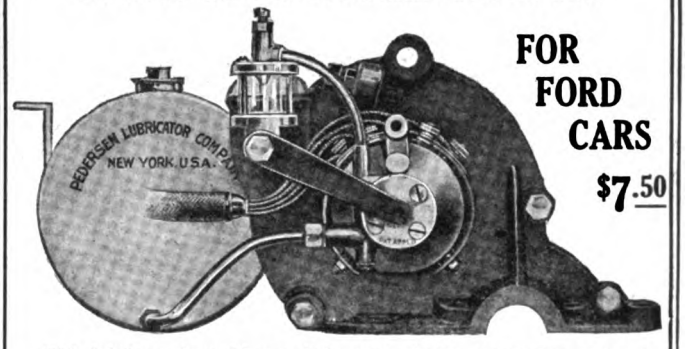
Patent applied for

A NEW FORD CAR

EQUIPPED WITH A

PEDERSEN LUBRICATOR

WAS RUN OVER 6000 MILES WITHOUT REGULATION.
Fill the Oil Tank and the Lubricator Does the Rest.



FOR FORD CARS

$7.50

This lubricator is positive, entirely mechanical in its working and not depending on gravity and pressure. It has no belts, cams or rods to become deranged, but is attached direct to the engine, *starting and stopping with the motor.*

It insures proper lubrication of the motor, with longer life, smoother running, more power and fewer repair bills. It has a half-gallon oil tank, and allows the car to be driven for hundreds of miles with one filling of the tank.

Applied to the car by anyone in 15 minutes.

THE "UNITED TERMINALS"

as illustrated in above cut are the greatest convenience and trouble saver for Ford users. They bring all the wires on top, easy to get at, preventing them from getting oil soaked, twisted or strained at their connections. Should be on every Ford car.

Easily Applied ***Price 50c.***

Dealers write us, you can make money in handling these goods.

PEDERSEN LUBRICATOR CO.

638 FIRST AVENUE, NEW YORK

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WHY REPAIRMEN SHOULD USE Marko STORAGE BATTERIES



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

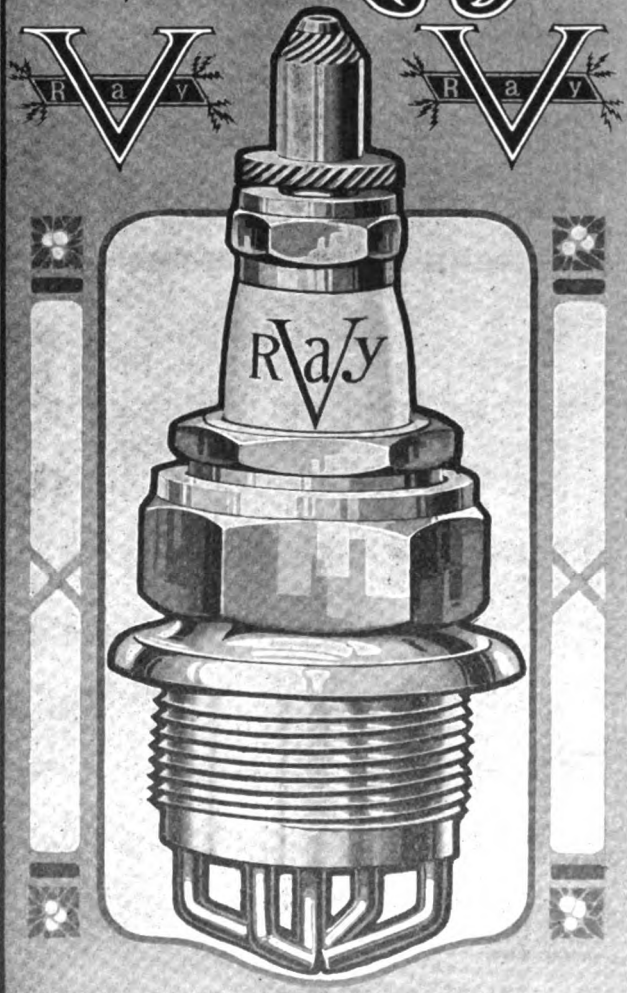
Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

"Marko" batteries lead because of their great efficiency and reliability.

Write At Once for Our Proposition to Repairmen and Dealers.

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.

The V-Ray



1 AMERICA'S 9 PIONEER 1 4-POINT 5

The V-Ray Co. Marshalltown, Ia.

NEW YORK CHICAGO SEATTLE SAN DIEGO WINNIPEG, Can.



This is the open season for long distance touring—touring to the California Expositions. Tours of this character—running day in and day out, over mountains and through desert sand which makes motors subject to overheating—this sort of touring calls for the best in motor lubricants.

The motorists who make the transcontinental trip on **HARRIS OILS** are the ones who will not be held back by lubrication trouble, for HARRIS OILS are **pure** oils. They preserve and prevent wear of moving parts. These lubricants will not "gum up" or "break down"—they are satisfaction producers.

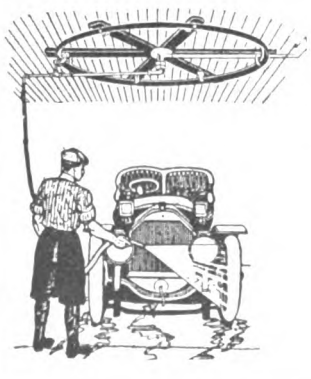
Dealers will act wisely in recommending them to customers. HARRIS products are the cheapest in the long run, for

"A Little Goes A Long Way and Every Drop Counts."

Write for Our Dealers' Discounts.

A. W. HARRIS OIL CO.

326 S. Water Street Providence, R. I.
Branch: 143 No. Wabash Avenue Chicago, Ill.



KEEP YOUR CAR CLEAN
WITH A
"PERFECT"
VEHICLE WASHER

SAVES LABOR,
WATER and HOSE

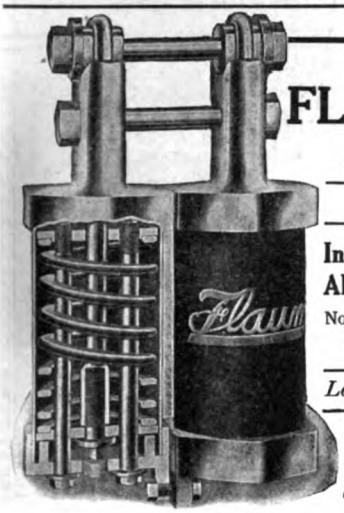
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PERFECT
MANUFACTURING
COMPANY
ALBANY, N. Y.

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HEADQUARTERS FOR
All Kinds of
RADIATOR CAP ORNAMENTS
And Limousine
Bouquet Holders
GUS. BALZER
1777 Broadway, New York



THE
FLAUM SHOCK ABSORBER

Simple and Effective

Instantaneously Adjustable to All Road and Load Conditions

No wearing parts or friction surfaces; consequently, no oiling or packing in grease is necessary.

Lasts the Lifetime of the Car

Flaum Shock Absorber Corp.
Motor Mart Bldg., 1876 B'way, N.Y.C.



More Shock Absorbing Efficiency for less money.

The
RIGHT Shock Absorber

has a resilient movement of **two inches,** a degree not attained by any other Shock Absorber.

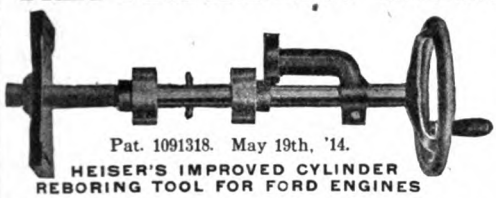
$15.00 Per set

This high factor of resiliency is the Acme of Shock Absorber Perfection and is absolutely necessary to absorb **all** the road shocks.

DEALERS: But two sizes to carry in stock to take care of 500,000 cars!
ASK FOR DETAILS.

Right Motor Specialties Co.
1320 Michigan Avenue CHICAGO, ILL.

REPAIRMEN! MAKE MONEY REBORING CYLINDERS



Pat. 1091318. May 19th, '14.
HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

This tool accomplishes results the same as grinders costing several hundred dollars and a few jobs enables the machine to pay for itself, besides giving the customer service which it would be impossible to give otherwise.

It requires an expenditure of $6.00, and 90 minutes energy to make the cylinders and pistons as tight, true and new as the day they left the Ford Factory. Reboring and fitting oversize pistons is the most important repair that can be given a worn motor, and this is the most important tool you can buy for your shop, for the low price of the tool together with the low price of the pistons makes it an attractive proposition for the repairman who wants to make his shop popular.

Do it now: **The first job of reboring means $ $ $ $ $ to you, if it is done in your shop.**
Write for Full Particulars and Proposition
We furnish the oversize pistons, $1.50 each, net.
HEISER SPECIAL TOOL CO. - - - Kingston, Missouri



You can make anywhere from $1,500 to $3,000 a year above expenses. Your investment to start is small, returns are quick and income cash. Profits are large on every job. The tire repair business is growing every year. Every city and town offers **opportunity for you.** Buy only an

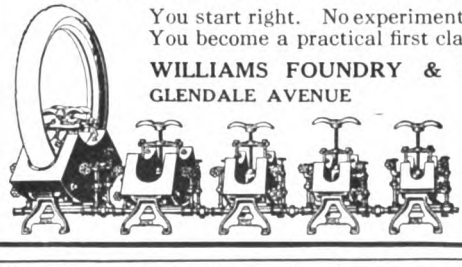
AKRON-WILLIAMS TIRE REPAIR EQUIPMENT

The better your equipment, the better your work, and the greater your volume of business. Start right. Use equipment which is

Endorsed by 30 Leading Tire Manufacturers

We are making an unusual offer to everybody who buys our equipment. You can become a tire repair expert by our plan.

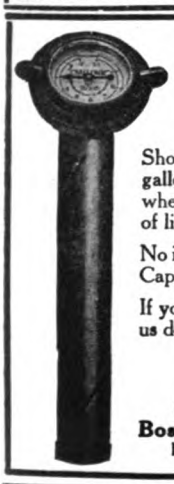
SEND FOR OUR 30 DAY SCHOOL PLAN



You start right. No experimenting. No failures. You become a practical first class repair man.

WILLIAMS FOUNDRY & MACHINE CO.
GLENDALE AVENUE AKRON, OHIO

SEND FOR CATALOG No. 121



The "CHALLENGE"
A PERFECT Combination Gasoline Gage and Filler Cap
For FORD CARS

Shows accurately at all times just how many **gallons** of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

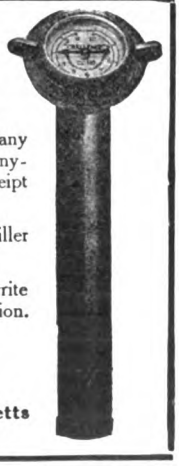
No installation required. Takes place of Filler Cap.

Dealers

If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.
Quality Counts

BOSTON AUTO GAGE CO.
Boston **Massachusetts**
DETROIT OFFICE: 1231 Woodward Avenue



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Fuller
TRADE MARK
HARTFORD

FOUNTAIN AUTOMOBILE WASHER



SAVES ½ THE TIME

REQUIRED IN WASHING CARS BY OTHER MEANS

Used in up-to-date garages for cleaning cars. It is attached to a special nozzle which permits the flow of water being regulated from a spray to a straight, hard stream which carries the dirt away. A cloth, or even a sponge, rubs the grit in. Washes thoroughly, without soap, in half the time. Well made, durable, no loose bristles, won't scratch varnish. You need this and some of the other special auto brushes and dusters we make.

Brush complete---China Bristle, - $2.00
With extra Palmyra Fibre Brush, $2.50
Soft Cotton Washer, - 50 cents extra

WRITE FOR FOLDERS

THE FULLER BRUSH CO., Hartford, Conn.

ENGINE SALE

REDUCED ENGINE PRICES FOR QUICK SALE

BRAND NEW STOCK MODELS

Carrying our regular guarantee

will be SACRIFICED to save moving from our Peru, Indiana, factory to our new plant at Pittsburgh

SINGLE ENGINES OR QUANTITY

MOTORS ONLY OR UNIT POWER PLANTS

4 CYL.—4 CYCLE

3⅝x4½	4¼x5½
4x5	5x6

WRITE OR WIRE

Pittsburgh Model Engine Co.

HOMEWOOD STATION

PITTSBURGH, PA.

ENGINE SALE

REFLEX SPARK PLUGS



THIS Patent Baffle reflects the soot and dirt *away from* the interior and drives it *out through* the spark gap at every explosion.

The enclosed end is an original Reflex feature. It exposes the largest possible surface for sparking, always at the right distance from central electrode. It is kept clean by the action of Baffle.

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New or old, you can improve your motor—make it give more power, use less gas, less oil. We guarantee this absolutely—if you equip your motor with

BURD High Compression Piston Rings



Burd Rings are the only 98% efficient rings. They hold Compression no other rings can touch. There's nothing fancy about Burd Rings—no complicated series of interlapping parts. They're just plain, honest, old-fashioned piston rings, accurately made—the kind all engineers endorse. Only Burd Rings have the opening *guarded*—guarded so it can't leak. That's why they hold higher compression—save gas—save oil—give more power. And Burd Rings do the work. They make your motor buck up. They give you power you are paying for, but aren't getting. They save their cost in a few weeks. They are the only Piston Rings guaranteed to do this.

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"Since installing Burd Rings, my machine gets away quicker, is 50% better on hills, and I must say I get at least 25% more mileage on same amount of gas, and I have watched this carefully."

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"Since putting in Burd Rings, my car uses 60% less oil. During 9000 miles with your rings I have had no trouble with carbon and have never removed a spark plug."

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One-third More Power

"Since putting in Burd Rings, my car has at least one-third more power, and we find that we are saving about 10% on our fuel bill."

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WARRANTY

We warrant every motor equipped with Burd High Compression Piston Rings to produce Higher Compression and give More Power, using Less Fuel and Oil, than when equipped with any other piston ring made, and we will refund the full purchase price of Burd Rings if after 30 Days' Actual Service they fail to meet this warranty. This warranty does not apply to motors having scored cylinders, until after they are reground.



Send for Valuable Book on

"The Why of a Piston Ring."

If you want your motor to give more power, to run on less gas, you ought to have this book. It fully describes Burd High Compression Piston Rings, quotes prices, gives you lots of information you'll be glad to get. Write a postal for it *now*. Book will come free. Address nearest office.

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ROCKFORD, ILL., Christman & Poole, 307 South Main Street
INDEPENDENCE, IOWA, Raymond & Woodward, Gedney Hotel Building
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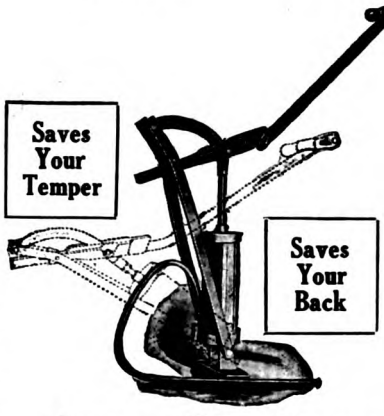


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No tire pump can equal the Jensen for general economy, simplicity of operation, excellence of results, and durability. A boy or woman can operate it as easily as a man. It does not leak, it has no parts to wear out, and it inflates 90 lbs. pressure with 75% less effort than the ordinary pump inflates 65 lbs. pressure. Every automobilist in the world ought to possess one.

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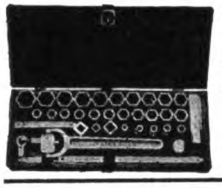


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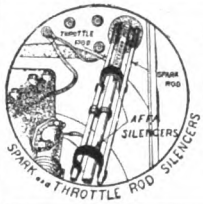
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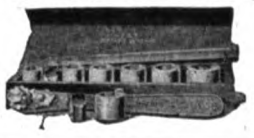


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FOR REVERSE and BRAKE PEDAL BANDS - FORD CAR 4564

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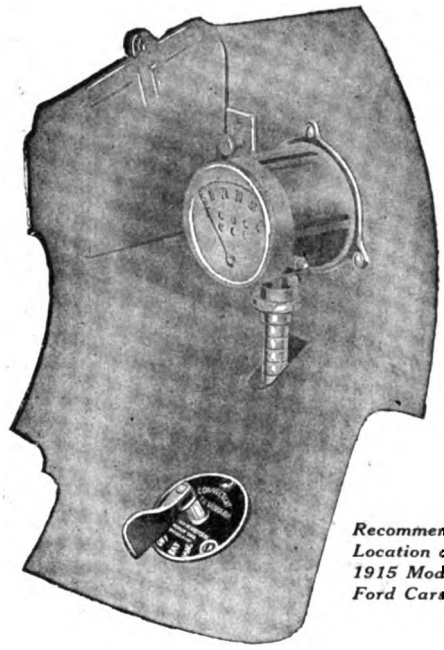
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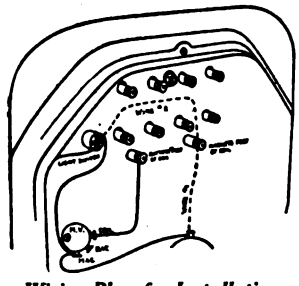
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Every CONNECTICUT MASTER VIBRATOR is guaranteed by the makers.



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In connecting the coil it will be necessary to run one wire from post marked "Coil" on the Master Vibrator to post marked "Battery" on the spark coil. Then remove wire No. 1 which runs from the magneto to the post on the coil marked "MAG", and bring it around to post on the Master Vibrator marked "MAG". Then remove wire No. 2 running from the lighting switch to post marked "MAG" on the coil and bring it around to post marked "MAG" on the Master Vibrator.

The Connecticut Telephone & Electric Company

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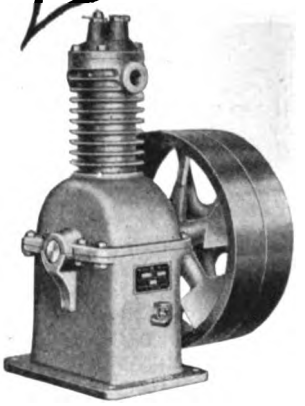
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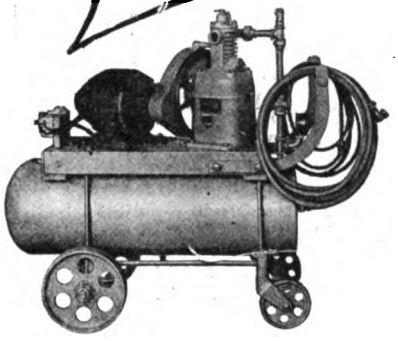
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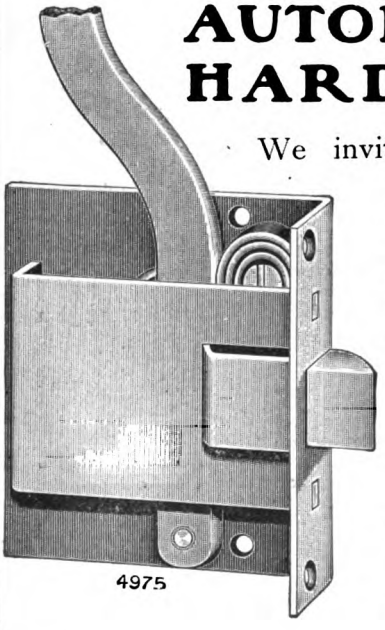
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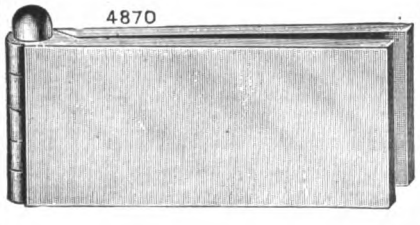
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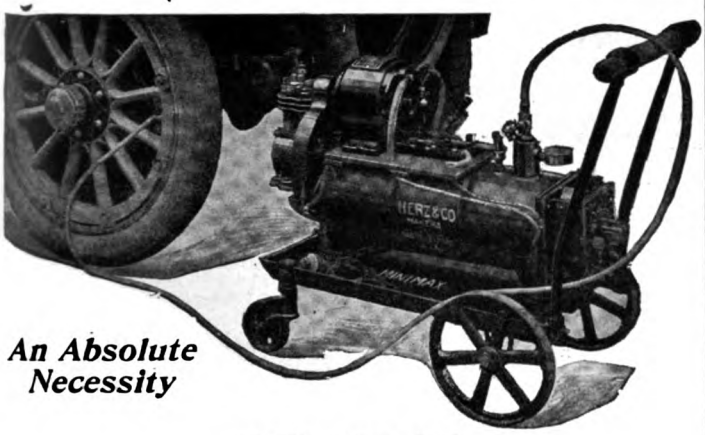
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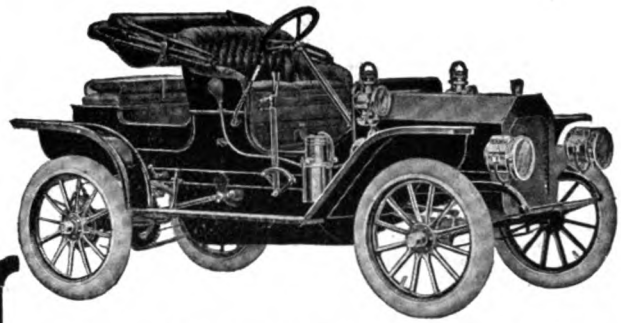
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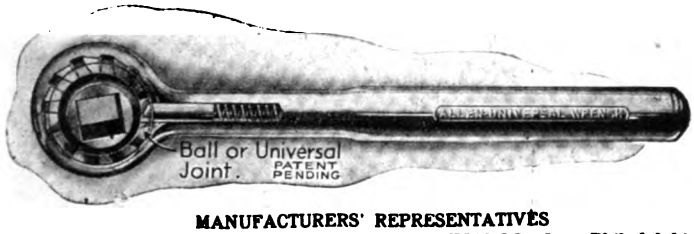
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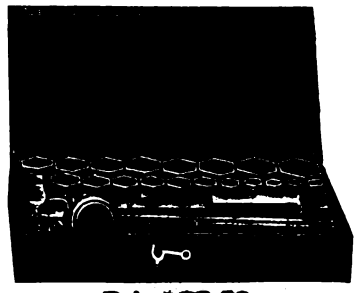
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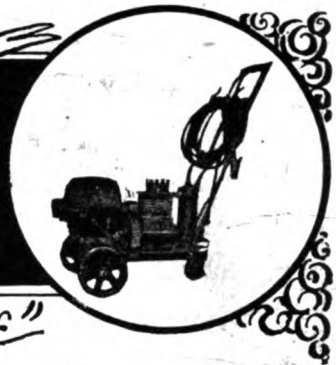
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"STRICTLY A QUALITY PRODUCT"

THE NEW NO. 66 BRUNNER PORTABLE TIRE INFLATOR



"For public or private garage"

SEVERAL GOOD REASONS WHY THE BRUNNER NO. 66 IS THE BEST SMALL PORTABLE AIR COMPRESSOR MANUFACTURED

First: Because it is the only small portable manufactured that is equipped with a compressor fitted with *three rings on each piston*, and with *GROUND RINGS AND PISTONS.*

Second: Because it is the only small portable air compressor driven by a special *REPULSION-INDUCTION TYPE A. C. MOTOR*, the most expensive and satisfactory A. C. Motor manufactured.

Third: Because the compressor is geared to the motor by means of a *NOISELESS CLOTH PINION* which reduces the noise of operation to a minimum.

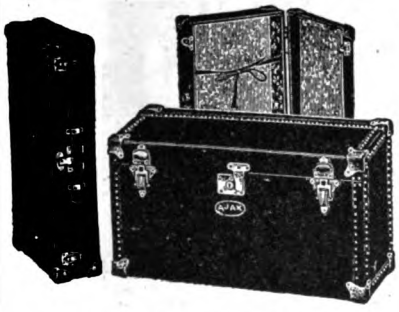
Fourth: Because it's a Brunner and can be bought at about the same price as an ordinary cheap outfit of this type.

NO GARAGEMAN COULD ASK FOR BETTER SERVICE OR GREATER VALUE THAN HE WOULD GET IN THIS No. 66 PORTABLE—IT SIMPLY BRISTLES WITH QUALITY.
WRITE FOR COMPLETE DESCRIPTIVE MATTER AND PRICES.

There is a Brunner Portable Electric or Stationary Motor or Belt Driven Air Compressor Outfit suitable for any possible garage requirement, *in stock ready for shipment*, and there is a Brunner "Airtite" Tank or fitting that will improve your service no matter how good you may think it is.

Write for Our New No. 12 Catalog, and the Name of the Brunner Jobber Covering Your Territory.

BRUNNER MANUFACTURING COMPANY, - UTICA, NEW YORK



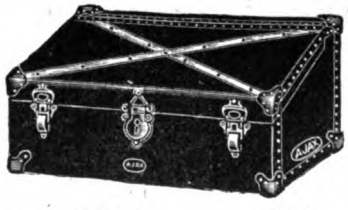
Buick Roadster C-24

Empty $11
With Two Suit Cases 17

AJAX TIRE TRUNKS

—

LUNCH OUTFITS



The First and Largest Mfrs. of AUTO TRUNKS in the World.

Monroe 1915 . . Price, $9

At All First-Class Dealers and Supply Houses
OR AT
AJAX TRUNK & SAMPLE CASE CO.
91-93 MERCER ST., NEW YORK
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Buick Fender
Fits Models C-25-36-37
Complete with Two Suit Cases $25

START YOUR FORD From the Seat With the *PRES-TOE STARTER*



The ONLY Guaranteed Ball-Bearing Starter on the Market.

Starts the motor every time. Will outwear the car. Every user a Booster. The greatest value and convenience offered the Ford owner. Out of sight. Easy to install. Turns the motor easily.

Agents Wanted Everywhere. Write Today.

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Cylinder and Crankshaft Grinding of Houpert Quality

Our grinding should not be judged by ordinary standards. It is not ordinary work and invariably gives satisfaction not obtainable elsewhere.

WE LEAD, OTHERS FOLLOW

You cannot afford to experiment with others. Send us your cylinders today.

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REPUBLIC STAGGARD TREAD
Pat. Sept. 15-22, 1908.



"Republics give uninterrupted sales mileage, too!"

Once a motorist tries Republic Tires he stops experimenting. Our dealers' records show that the vast majority of their business is **repeat sales.**

What better profit **assurance** could you ask for? Here is a tire so completely satisfactory that it builds up a **permanent** trade you can depend on—a tire that delivers uninterrupted sales mileage.

Don't you think you ought to investigate?

Write for detailed facts about the Republic Proposition.

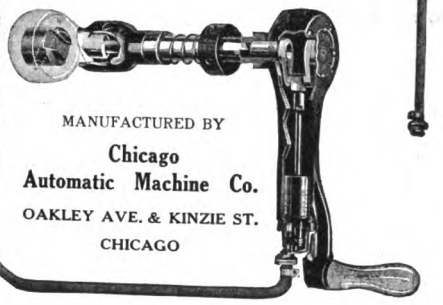
THE REPUBLIC RUBBER CO.
YOUNGSTOWN, O.

DE LAUNTY TIRE PUMP AND CRANK--Combined

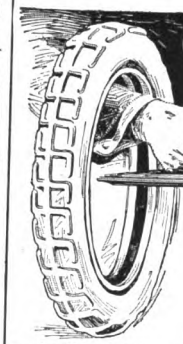
Pump is inside of Crank.

Can be put on in one hour—no machine work.

Sent on 30 Days' Trial



MANUFACTURED BY
Chicago Automatic Machine Co.
OAKLEY AVE. & KINZIE ST.
CHICAGO



GETTING THE MONEY

REPAIRING TIRES

The biggest money making field in the Automobile Industry today is in **repairing tires.** It is an enormous field and growing larger every year. Locations for good tire repair shops are open in every city and town in the country. You can make

$1500 TO $5000 A YEAR

if you learn by our system of instruction. We teach you every phase of **TIRE REPAIRING and TIRE CONSTRUCTION** by practical demonstration, in a school equipped with every necessary appliance. This is not a correspondence course. You get your training by actually using equipment and repair material. That's the only way.

WE TEACH YOU BUSINESS METHODS

Instruct you how to open your shop. How to take care of sales. How to retain your trade. How to make your shop pay.

WHAT OUR STUDENTS SAY

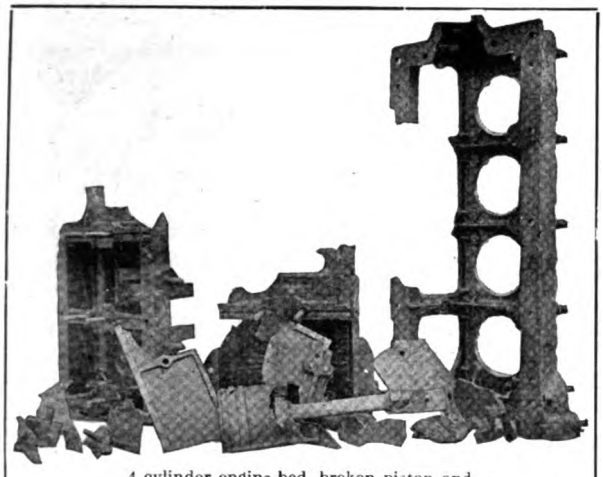
O. E. Bonnell writes, "I did a $15,000 business last season." **A. A. Robinson,** "Have been in business 30 days. More than doubling expenses. Did not know money could be made so easily." **C. E. Kurtz** says, "We are crowded with work." **C. M. Marsn,** "Business coming too strong, and I have not advertised a bit." Hundreds of others tell of similar successes.

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It tells all about our school, about our methods of teaching, what our students have accomplished. Be first to enter into this big paying business in your town.

CLOUSE TIRE REPAIR SCHOOL
Euclid Avenue and 90th Street, CLEVELAND, OHIO

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4 cylinder engine bed, broken piston and under side of crank case. Before welding.

Oxy-Acetylene Welding Pays Big Profits to Garage Owners

If you're not equipped to do this class of work in your own shop, you're losing good, legitimate profits.

The welding torch is almost as widely useful as a monkey wrench—almost as handy as an oil can. With it, you can save money for yourself by cutting repair costs. You avoid unpleasant delays, waiting for replacements. The "on the spot" immediate repairs that Oxy-Acetylene welding makes possible more than pleases patrons. Damaged parts can be quickly and easily made good as new at small cost. Most of these repairs would be impossible with any other method.

Even at the most moderate charges, the profits from this end of your business are too big to be neglected.

The daily use of the welding equipment requires that it be simple, efficient, portable and economical in operation. We can furnish this at low cost. We furnish a thoroughly high-grade welding aparatus for $60.00. The average user will also need acetylene cylinders, at an additional cost, and about $10 00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

If you use Acetylene for any purpose, you can secure added efficiency and wider scope of operations possible, by using

PREST-O-LITE

Dissolved Acetylene

(Ready-Made Carbide Gas)

PREST-O-LITE Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude acetylene in carbide generators. Besides, PREST-O-LITE Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

A Good Business Opportunity

Doing Oxy-Acetylene welding for others is a highly profitable business. The cost of equipment needed is slight. Immense and growing demand assures profitable operation right from the start.



Get Your Share of Welding Profits

Send your name and address on the margin of this page for highly instructive literature on Oxy-Acetylene Welding and Cutting. See what others have done—how you can add to your profits by adopting the up-to-date methods in your shop.

THE PREST-O-LITE CO., Inc.

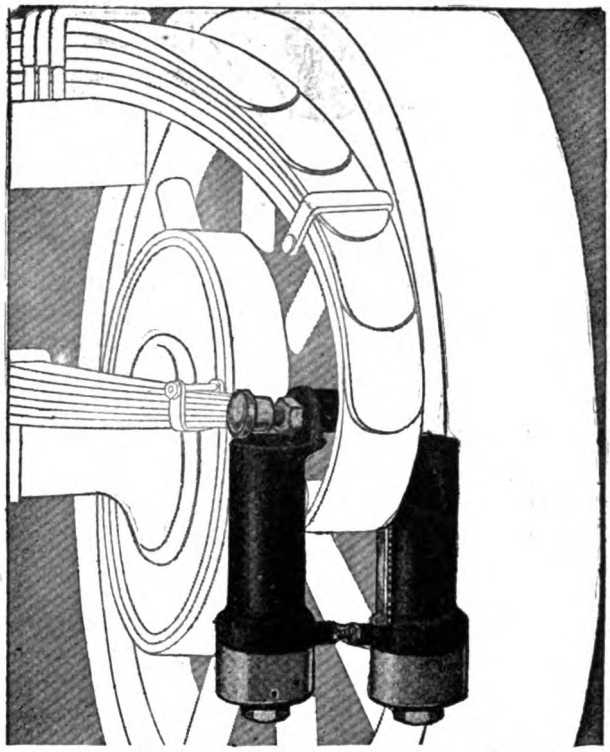
The World's Largest Makers of Dissolved Acetylene

820 SPEEDWAY INDIANAPOLIS, IND.

53 direct factory branches and charging plants in principal industrial centers

SAGER PRODUCT

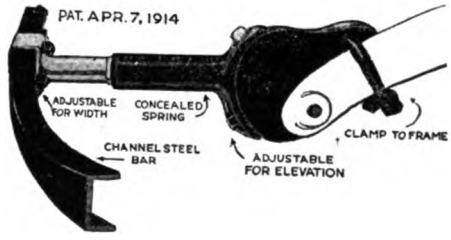
Endorsed by 20 Manufacturers and Over 250,000 Motorists.
Ten Years of Manufacturing.



J. H. S. For Any Car

Highest Standard of Quality. Minimum of Cost. Indispensable for Comfort and Economy of Upkeep. **Make Every Road a Boulevard**

Free Trial Offer. A Guarantee Worth While.



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Recognized as best and oldest in the trade. **Channel—Triangle—Square and Round Bars. List Price $5.00 and Upwards.**

Big discounts to the trade. Write also for a Bumper Rack.

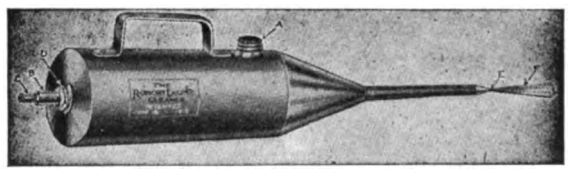
We have the best proposition on Ford Absorbers, Ford Bumpers, Ford Auxiliary Radius Rods and Ford Truss Rods.

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THE ROMORT ENGINE CLEANER

For Automobiles and Motor Cycles

PRICE $3.00 Delivered. We Guarantee Satisfaction or refund purchase price



Fill with two quarts common coal-oil, attach Cleaner to air supply (Power tire pumps or Storage air systems preferred). Cleans the dirt and grease from the machinery perfectly. Once a week will keep your car looking new. Full directions with each Cleaner. Ask your dealer or fill out Coupon below.

Romort Manufacturing Co.
1322-1326 Michigan Ave., Chicago, Ill., or 1810 Westlake Ave., Seattle, Wash.

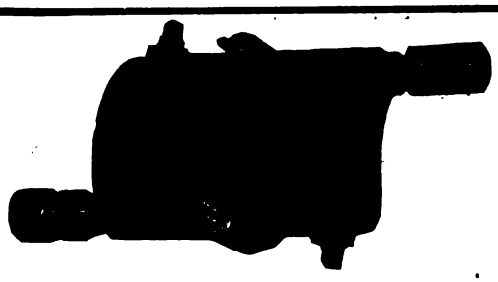
Gentlemen:- Inclosed find Three Dollars, please send me by Prepaid express or Parcel Post, One Romort Engine Cleaner, subject to your guarantee of satisfaction or refund.

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IN USING OUR

CARBURETTE VAPORIZER

For Ford Cars

Saves your gasoline and also acts as a filter at the same time.

Makes more power and a smoother running motor.

Simple and not complicated, as any owner can install it in ½ hour.

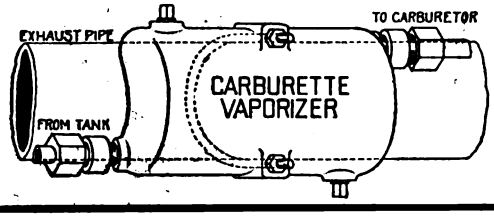
PRICE, only $2.50

AND IF NOT SATISFIED, MONEY REFUNDED

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PERKINS APPLIANCE CO.

589 Worthington St. Springfield, Mass.



The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,

"Worn Out Tires Made New."

Please mention the size of your tires.

TRIPLE TREAD MFG. CO.

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Factories: San Francisco, Chicago, Winnipeg

Brennan Standard High Grade Motors

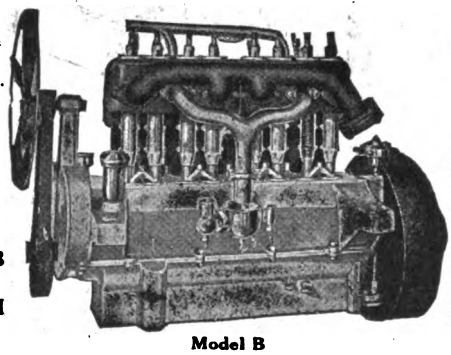
Large Bearings
Long Stroke
4 and 6 Cylinder

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Our Leaders

MODEL B
4½x5

MODEL M
4x5



Model B

High Grade 4 Cycle Motors for Elmore Cars, Warren, Corbin, White Steam Cars and standard makes of cars and trucks; also transmission gears.

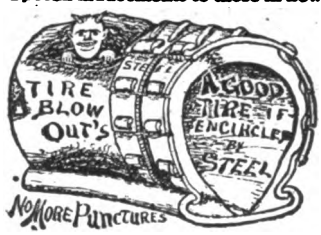
BRENNAN MOTOR MFG. CO.

115 Grape Street, - - Syracuse, N. Y.

Hang on to your old tires. They will last as long as you live if covered with steel.

The Kimball Steel Protector makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever.

Special inducements to those in new territory.





KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

NOW ACKNOWLEDGED AS A FORD NECESSITY



The Comfort Safety Steering Device

Ford drivers will agree that the Steering mechanism on a Ford is incomplete.

With the aid of THE COMFORT DEVICE, drivers can overcome the difficulty of steering a Ford and can be relieved of the strain and tension invariably experienced in driving over rough and sandy roads.

The possibility of wheels "doubling under" is reduced to a minimum. It saves tires by preventing the "side lash" of wheels.

Get ALL the pleasure of driving. **PRICE $5.50 DELIVERED.**

Agents Wanted in Unassigned Territory.

Special Introductory Price:—We offer a special discount to Ford drivers in territories where our Steering Device has not been introduced.

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THE COMFORT MOTOR MACHINE CO., Denver, Colo.





The Ideal Cut-Out

Simply Cut Notch in Exhaust Pipe and Clamp over it.

PRICES

No. 5B.	For Pipe,	1¼ in.	o. d....	$1.50
" 6B.	"	1¾ "	" ...	1.65
" 7B.	"	2 "	" ...	1.75
" 7D.	"	2¼ "	" ...	1.75
" 8B.	"	2½ "	" ...	2.00

Gray Lock Pedal

No. 3.	Black	$0.60
" 3.	Brass	.75
" 3.	Nickel	.80

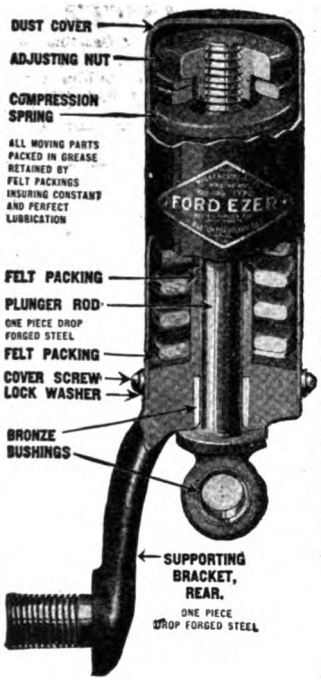
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with the

FORDEZER

Registered U. S. Patent Office

For improved riding qualities for which they are responsible are little short of wonderful. Their rapid action permits them to absorb—soak up—the vibration that makes long continued riding tiresome even over city pavements. On rough roads the improvement is even more noticeable. The springs are given a chance to act natural—the snappy recoil which is even worse than the downward bump, is entirely eliminated. The saving it effects in tire expense and car depreciation will more than repay their cost in a season.

Made To Fit All FORD Models

Either Touring or Roadster. They are easily applied. Their construction is the best of any Shock Absorber on the market—absolutely dust-proof; entire mechanism covered with a one-piece drawn shell cover, press fitted to the base. Once a year oiling is all that is required for average use. They will outsell and outwear any other Shock Absorber because all supporting parts are drop forged steel and all moving parts bushed with bronze bearings. The flat section, Vanadium Steel springs are guaranteed for life.

Price per set of four . . . $12.00

Manufactured by
WALKER-MOORE MFG. CO.
Racine, Wis.



UNIVERSAL WIRE WHEELS

Constructed of the very best material put together by the highest grade of workmanship.

Hubs are of special steel carefully designed as to weight and contour. They are machined to a perfect fit and may be quickly attached to any Ford hub without filing or cutting and the use of no tool except a wrench. Spokes are finest quality wire spokes—rims of heavy rolled stock, electrically welded and heat treated. Finish is black Japan thoroughly baked on—will not chip or rust.

Price per set, $20.00

Manufactured by
UNIVERSAL WELDING CO.
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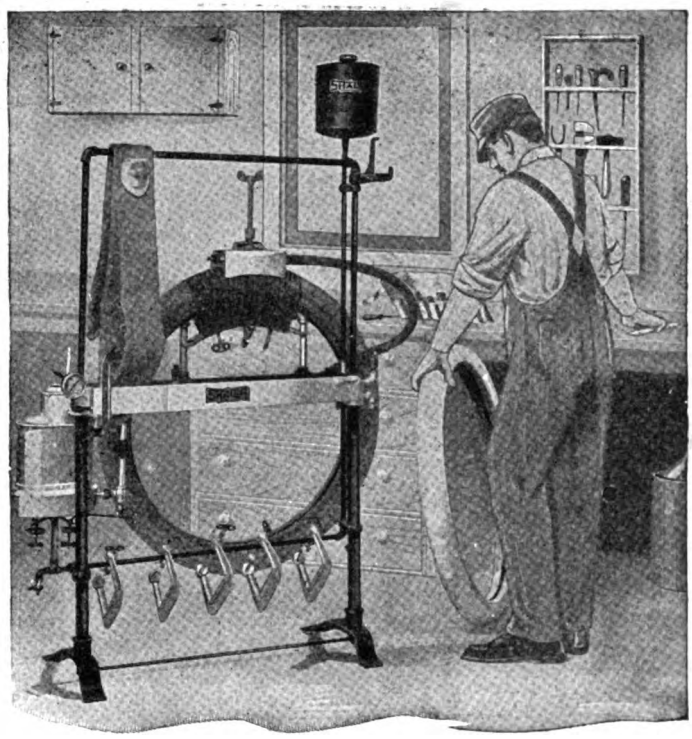
The Dewey Power Tire Pump

Save your tire trouble by getting a practical and efficient power pump. Nothing to break or wear out on the Dewey Pump. Every one tested before delivery. Furnished complete with 12 feet of hose, self-opening connections, dial pressure gauge and adapters for any thread spark plug.

Price . . $8.00

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FULTON-McCUTCHAN CO., 1508 Michigan Ave., Chicago, Ill.
(Sold through the Jobbing Trade Exclusively)



Make Money Like This Man

He is a garage man and is repairing tires for his storage customers. These cars need to have the tires vulcanized very often and he makes more money from this source than he does from the storage bill or sale of supplies. You can do the very same thing with a

SHALER Vulcanizing Plant

The auto owner, when he comes to you for supplies, gasoline, oil, etc., and knows that you can repair his tires, will gladly give you the job. Give your customers this complete service they like and be ready to repair their tires.

You can easily add $20 to $30 more to your daily revenue without adding to your pay roll.

Anybody who can clean or adjust a car can operate a Shaler, because of the simplicity of Auto- -ic Heat Control and

The Shaler W- -ethod

The Shaler System ha- -many years.

Auto-

This is an ex- -actly at the right po- -ing.

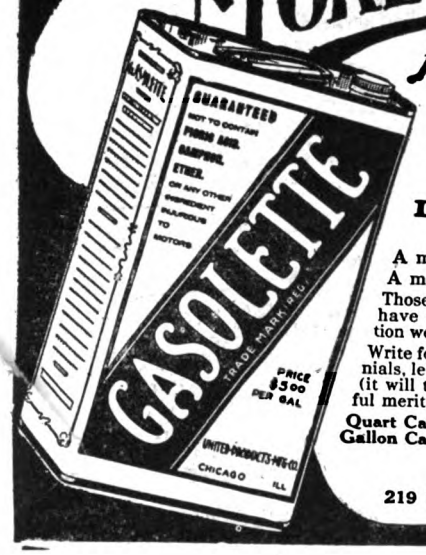
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MORE POWER AND A CLEANER MOTOR



Increases Mileage Per Gallon From 40 to 60 Per Cent

Decreases Fuel Cost of Operation In Like Percentage

A money saver for the user.

A money maker for the dealer.

Those who use it come back for more, and so, you Mr. Dealer, can have a steady income from its sale, if you will take up the proposition we have to offer you.

Write for FREE territory selling plans, etc. Also ask for testimonials, letters, or better still order a quart can "GASOLETTE" prepaid (it will treat 64 gallons Gasoline) and convince yourself of its wonderful merits.

Quart Can (will treat 64 gallons Gasoline)..... $1.35
Gallon Can (will treat 256 gallons Gasoline)..... 5.00
Never Sold In Bulk

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219 EAST 22nd STREET Dept. A CHICAGO, ILL.

GASOLETTE

Increases the efficiency of Gasoline without injury to motors.

Gives the motor greater pulling power, more speed and 100 per cent flexibility. sparks quicker and helps the engine to almost instantly pick up and to run smoother.

Prevents pre-ignition, pounding and over-heating of engine.

Removes and prevents carbon deposits on spark plugs, pistons, cylinders and valves, and thereby eliminates engine troubles.

Prevents carbon deposits on exhaust valves and seats, thus eliminating cutting and pitting, and consequent loss of power that can be remedied only by grinding valves.

Prevents carbon deposits on intake valves and seats, which deposits cause loss of compression, loss of power and back firing in intake pipe.

Prevents carbon deposits on pistons, gumming and sticking of piston rings, loss of compression, loss of power—and you avoid the trouble and expense of taking down the engine to clean.

Lessens smoke, odor and noise.

Leaves cylinder and valves in an oily condition and therefore adds life to the engine.

ELECTRIC STARTERS AND BATTERIES REPAIRED

We make a specialty of
DELCO STARTERS

Experienced battery and starter repairmen, formerly with the Packard Company. All makes of starters and batteries put into proper condition. *All Work Guaranteed.* Coils and magnetos repaired. Motors rewired.

Electric Self Starter Repair Co.
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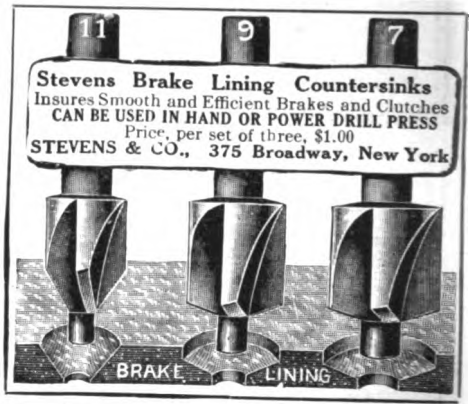


Two Air Seals

BOTH POSITIVE

No Tool or Caps necessary to seat or remove the Inside Valve. Interchangable with all Valves.

Double Seal Tire Valve Company
1790 Broadway - New York City



Stevens Brake Lining Countersinks
Insures Smooth and Efficient Brakes and Clutches
CAN BE USED IN HAND OR POWER DRILL PRESS
Price, per set of three, $1.00
STEVENS & CO., 375 Broadway, New York

EVERY FORD OWNER AGREES THAT

"UNIQ" RUNNING BOARDS



Improve the Ford more than any other accessory

Linoleum or aluminum top. Heavy wood base. Aluminum or brass moulding. Write immediately for Special Prices and Discounts. Ask also for circulars of other "UNIQ" Ford Specialties.

Mr. Dealer:—The "UNIQ" Line is *THE* Ford Specialty Line.

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It's LIVE—Get ACQUAINTED

THE C. SPIRO MANUFACTURING CO. NEW YORK CITY

The Neverout

RADIATOR AND GARAGE HEATER

PAT. 11-8-04

DIRECT HEATING SYSTEM

Applies heat directly where needed—No Waste
Address Dept. R. for literature
ROSE MFG. CO., 910 Arch St., PHILADELPHIA



THE LUND SHOCK ABSORBER

is the highest class absorber made, has been thoroughly tested and proven efficient. You cannot buy better if you pay $50.00.

Price $25 00

A very interesting proposition to dealers.

H. LUND SMITH
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The R. O. C. SUPERHEATER

MAKES

Your Carburetor Form a Vapor, Your Engine More Powerful, Your Fuel Bills Less, and Raises the Efficiency of Your Motor to the Nth Power. Send for Motor Efficiency.

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Atlas Valve Lifter—For Ford Cars

Price, 40c.



We make 15 different articles for the Ford. Write for circular and prices.
Atlas Machine Co., 111 West Exchange St., Providence, R. I.



Make all roads seem level after using—
HUSTLER
Valve Grinding Compound
10 and 25 Cent Sizes
S. C. LOW & COMPANY
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Write for Exclusive Agency Proposition

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Send for Terms and Territory at Once

THE CARBOGAS COMPANY
710 GARDNER BLDG. TOLEDO, OHIO



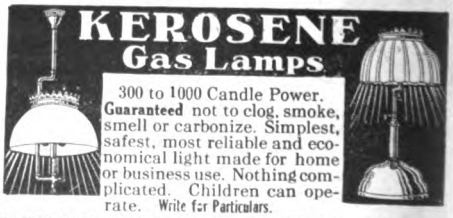
THE CATELAIN HOSE CLAMP

Can be attached or detached in a few seconds. Price is very low. Let us tell you more about it, if you are an automobile manufacturer or dealer.

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1446-48 Indiana Ave., Chicago, Ill.

Vulcan Vulcanizing Process



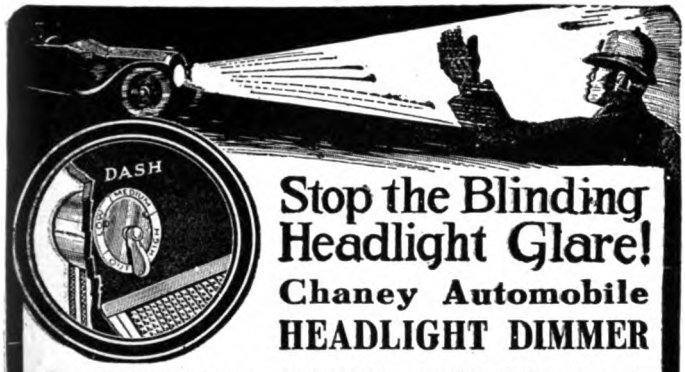


KEROSENE Gas Lamps

300 to 1000 Candle Power. **Guaranteed** not to clog, smoke, smell or carbonize. Simplest, safest, most reliable and economical light made for home or business use. Nothing complicated. Children can operate. Write for Particulars.

BRILLIANT GAS LAMP CO., 1009A So. Wabash Ave., Chicago, Ill.

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Stop the Blinding Headlight Glare!

Chaney Automobile HEADLIGHT DIMMER

It enables the driver to graduate the intensity of the light. It can be changed from high to low as you would turn down an oil lamp. Operated by moving the dimmer handle, it gives complete control of the headlights from the seat. In city driving the light is kept low with small current consumption—in the country where full power is needed a touch of the handle brings back the full searchlight efficiency.

DEALERS: Write us for prices and territory.

Manufactured By

THE L. F. CHANEY CO., Springfield, Ohio

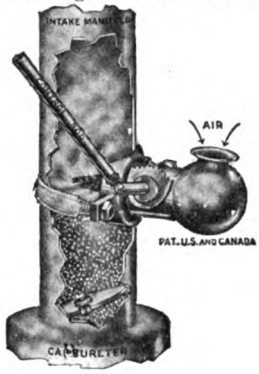
Start Right!

Give your engine a chance this year, to show you what it can do when it is not handicapped by the limitations of your carburetor. *Install a*

MICHENER

GASOLINE SAVER and PRIMER

The MICHENER is easily attached, and requires no change in the carburetor adjustments. It is so constructed that—by a mere turn of the wrist—you *instantly* have the correct mixture for every driving condition. Do you want a rich mixture for starting and heavy pulling? A turn of the handle gives it. Or do you want a lean mixture, for speed, easy running and economy of fuel? Another turn of the little handle, and you have it. In descending grades,—by just a touch—you can open the gasoline saver *full*, which allows the engine to act as a brake. This prevents wear on the brake linings, saves gasoline, cools the engine, scavenges the cylinders, and insures safety in case of accident to the brakes.



You need not take *our* word for it. *TRY IT!* Here is what you will get: maximum engine efficiency, perfect control, and a *GUARANTEED saving of from 25% to 40% in gasoline.* Sold on 30 days' trial. Money refunded if you are dissatisfied.

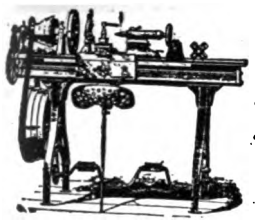
$5. Dash Control } Insured,
Steering Post Control } Postpaid

When ordering, state side of motor carburetor and steering post are on.

AGENTS! Here is a device that demonstration sells, and that makes a booster of every user. We have some good territory not yet allotted. Write for our agency proposition.

E. S. MICHENER, Jefferson St., New Castle, Pa.

Use Michener's Chain Carbon Remover, the "Carbon Chaser."



THE BARNES LATHES

9" swing
11" swing
13" swing

For Repair Work our No. 13 Lathe is right; has 13" swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with countershaft or foot-power.

SEND FOR LATHE CATALOGUE

W. F. & JOHN BARNES CO.

206 Ruby Street - - Rockford, Ill.

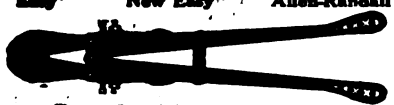


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Wrenches can be operated where no other wrenches can be used. Ask to be shown.

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Garwood, N. J.

PORTER'S BOLT CLIPPERS
"Easy" "New Easy" Allen-Randall



To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.

H. K. PORTER, EVERETT, MASS.



PERFECT HICKS FOUNTAIN BRUSH

WASHES YOUR CAR IN 15 MINUTES

ATTACHED TO YOUR GARDEN HOSE

FLOWS THE MUD AND SAND AWAY

Warranted Not to Scratch and Guaranteed Longer than Your Car

NO. 2. PRICE $4.50 DELIVERED

HOWARD W. HICKS BRUSH COMPANY, DENVER, COLO.

JUST SIMPLICITY VALVE GRINDER

Best for All Motors
Price, $3.00

At Dealer's or Factory.

Just Specialty Co.,
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M. & R. SOFT HAMMERS—Not common lead but special tough mixture. For Machinists, Tool Makers, Die Makers, Garages, Repair Shops, Etc.

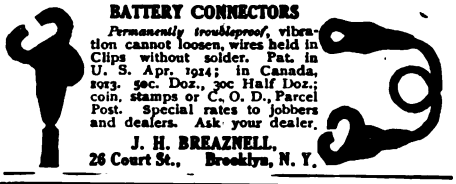


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Heads Interchangeable
Handle Indestructible
Durable Inexpensive

Mach & Rebele, Inc., 21 Whitehall St., N. Y. City

BREAZNELL CLIPS FOR SPARK PLUGS & TERMINALS AND BATTERY CONNECTORS



Permanently troubleproof, vibration cannot loosen, wires held in Clips without solder. Pat. in U. S. Apr. 1914; in Canada, 1913. 50c. Doz., 30c Half Doz.; coin, stamps or C. O. D., Parcel Post. Special rates to jobbers and dealers. Ask your dealer.

J. H. BREAZNELL,
26 Court St., Brooklyn, N. Y.

Standard Air Bags

Will last as long as your moulds.

Write for Descriptive Circular.

STANDARD TIRE & RUBBER CO.
104 Portland Street Boston, Mass.

40%
TIRE EXPENSE STOPPED!

INVINCIBLE INNER TIRES

Save 40% expense because:—

Tires wear out, instead of blowing out when half worn out.

Tires are not ruined by "stone bruise" or puncture.

INVINCIBLES are a pliable wall of strength on the *inside* of the tire. No change in tires or inner tubes needed to use them.

Write us for full data about how they are made and how to use them. We believe INVINCIBLES are the *only* tire interliners proven by nationally known users to save 40% tire expense.

Learn why INVINCIBLES excel any other interliners made. We *prove* our case.

Write Now for Proofs and 1915 Prices.

INVINCIBLE TIRE CO.,
53 SABIN STREET, PROVIDENCE

RIDE ON AIR—"THE WEAR IS THERE"

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Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

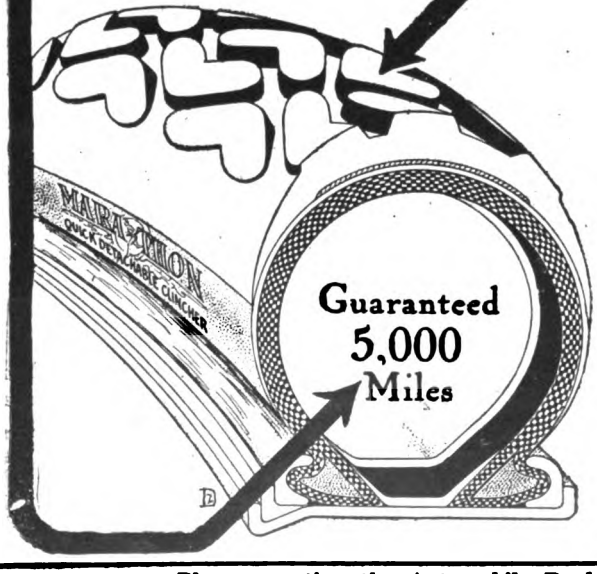
MARATHON TIRES

Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

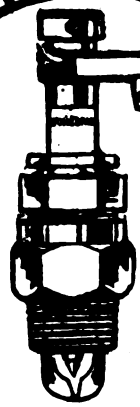
Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS,
OHIO



STONEBRIDGE



The Plug

THAT MAKES Both PROFIT and FRIENDS FOR YOU

The demand for this plug is headed your way Right Now. As fast as we explain it—we sell it. If you held one in your hand and looked it over carefully you'd understand why live dealers all over the country are stocking the **Stonebridge "Easy Clean" Spark Plug.** Its advantages are right where you can see them, for yourself.

DEALERS:
We pay your advertising bills—not in talk—but in Real Money!
WRITE US.

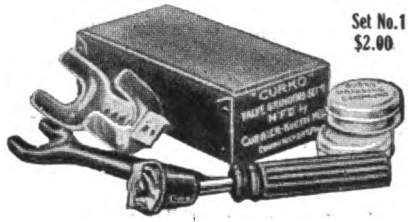
1. **The only plug that can be cleaned without removal from the car.**
2. **Never needs adjusting.**
3. **Entire porcelain can be removed and replaced while plug proper stays in motor.**
4. **Has special safety connection on terminal.**
5. **You can test out plug without the use of any tool.**
6. **Spring terminal always assures positive contact — not sometimes, but always.**

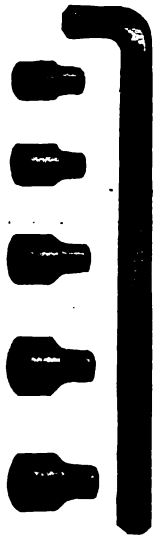
DEALERS: We have a proposition that is a wonder; it reaches right thru your front door and rings the cash register. It's a kind of co-operation you never heard about before. Write us now for particulars.

STONEBRIDGE SALES COMPANY
10 WALL STREET NEW YORK, N. Y.

"CURKO" Motor Valve TOOLS

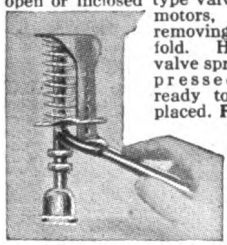
Cut down time, work and do a better job on valve repairs. They're simple, practical and accurate tools no autoist or garage man should be without.





"CURKO" Valve Grinding Set
Set No. 1 includes our fast grinding, non-gumming and non-magnetic compound—two grades—one for truing the seat, the other for fine finishing; one "CURKO" Valve Remover and one "CURKO" Valve Grinder—**Price $2 Complete.**

"CURKO" Valve Remover
compresses any valve spring on open or inclosed type valve spring motors, without removing manifold. Holds the valve spring compressed until ready to be replaced. **Price 75c**



"CURKO" Ford Socket Wrench
not "stamped" but turned from solid nickel steel bars, broached and case hardened, practically indestructible. Made especially to meet the needs of the autoist and garage man. Five socket sizes. In waterproof roll, **$1.50 per set.**

Also "CURKO" Valve Reseating Grinders, hand power, foot power and belt driven styles. Folder and prices on request.

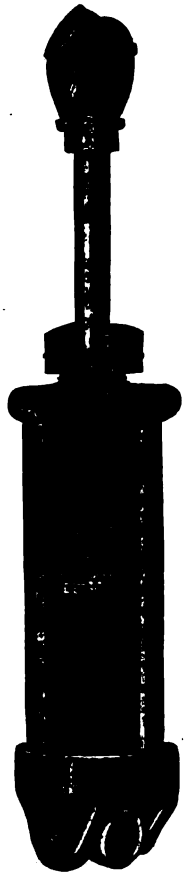
"CURKO" Guarantee Against any defects of workmanship or material in "Curko" Motor Valve Tools.

Sales Representatives

RALPH WALDT	C. E. LARSON	WETMORE-SAVAGE CO.,
1790 Broadway	2204 Michigan Ave.	79 Pearl Street
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CURRIER-KOETH MFG. CO., Coudersport, Pa.

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3 Big Hits at the New York and Chicago Auto Shows

Hydraulic Shock Absorber

A dust-proof cylinder with inside working piston attached by universal joints. Glycerine and air do the work. No springs to get out of order. Reduces wear on tires 50%.

Special Price for FORD Size

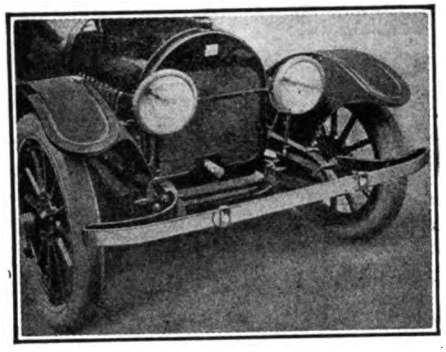
IDEAL
Transmission Band Assembly

A 3-Hour Job in 30 Minutes

Write for particulars regarding above and ask for our new Catalogue embracing 150 Accessories, including 50 Ford Specialties.

Lyon Resilient Bumper

Something entirely new.
INDESTRUCTIBLE



Other Bumpers cannot compete in Efficiency, Appearance, and Quick Sales.

Lists $6.00 to $10.50

All Finishes
Made of Spring Steel

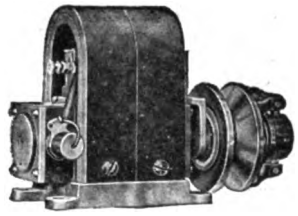
Metal Stamping Co. Long Island City, New York

THE LIGHT THAT'S RIGHT
EUREKA LITE

The fact is with our Eureka, you can light almost any old car as light as day, but you can't afford to light a Ford in any other way.

LOW COST—HIGH EFFICIENCY
Used with or without storage battery

¶ Special attachments for Ford, Maxwell and other cars. ¶ Prices $24.00 and up, according to capacity required. ¶ Large Profit to dealers.t ¶ *Write for particulars today.*



Ball Bearings Throughout

HENRICKS MAGNETO & ELECTRIC CO., 1499 St. Paul Street, Indianapolis, Ind.
Formerly HENRICKS NOVELTY COMPANY.



In All The World—No Plug Like This!

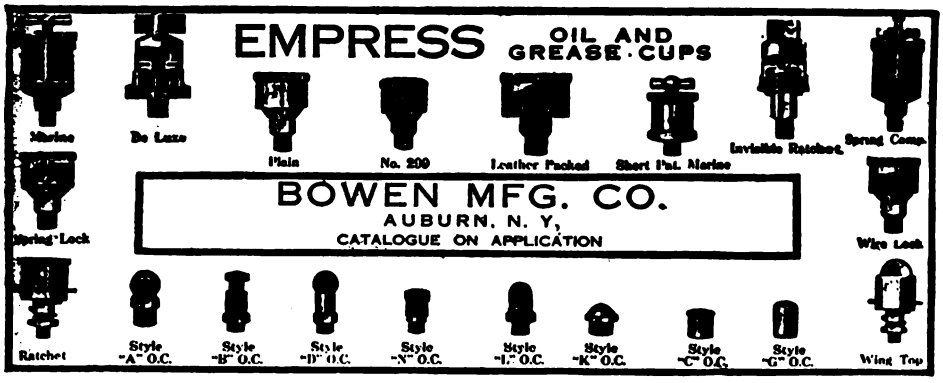
Peco Spark Plugs are constructed on an entirely new principle which adapts them perfectly to either Two-Point or Single Ignition. They eliminate waste by burning **all the gas.** Peco is the Plug of highest efficiency. **Try them—they're a revelation!**

"More Power to You"

—also greater economy—will come with the use of Peco Plugs. As there is no other Plug of the kind in existence, dealers are fast lining up. **Write for particulars.**

POWER & EFFICIENCY COMPANY, 137-139 East State Street, Trenton, N. J.

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LOCK YOUR FORD CAR.

Thieves are active and FORD cars are their prey. It will pay you to investigate the **Atlantic Positive Motor Lock.** Security is obtained by a new principle—by disabling the ignition system at the timer—the most successful locking method. It is simple to operate—yet very effective.

Write for Advance Circular.

ATLANTIC MACHINE COMPANY

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Coverall



This garment is made of close woven material, absolutely oil, dust and grease proof: will protect the clothes entirely when working around the car, garage or machinery.

Invaluable to Autoist and Machinist.

The only kind of garment that will keep the clothes entirely clean while working around a car. Made all in one piece. Easy to take off and put on. Comfortable and practical. Made of strong washable material.

Dark Tan Khaki	$2.00 each
Medium Weight Tan Khaki	2.50 each
Very Fine Weight Tan Khaki	3.00 each

Sent Parcel Post, Free. Remit with Order.

State size of chest when ordering.

Duster Coats at Special Prices

Tan Lineene	$1.25 per Coat
Tan or Slate Herringbone Stripe	2.00 per Coat
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DEALERS—Write for Trade Discounts.

AUTOMOBILE APPAREL CO.,

P. O. BOX 466 PORT CHESTER, N. Y.

Are You Satisfied?

to just get along or do you want to live better?

LEARN AUTO BUSINESS

$50 Traction Course FREE will be given with all enrollments received within the next 30 days.



Hundreds of successful graduates. Earn $75 to $150 per month. Become expert in six weeks. Run and repair autos and tractors by the "SWEENEY SYSTEM." Save $25 by writing today—tuition advances April 1st. 64-page catalog from the largest auto school in the world sent free to you. Here's your chance—write today

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Have You $1,000?

We Can Make It

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and pay you 6% per annum while doing it. For literature and full particulars, address the

Citrus Development Co.,

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For Cutting Headlights

"Red Devil" Circular Glass Cutter No. 033.

"It's all in the wheel"



Enameled wooden handle and base, "slip proof" bottom; steel rod and head. Pays for itself on the first headlight you cut. Mailed for 50c.

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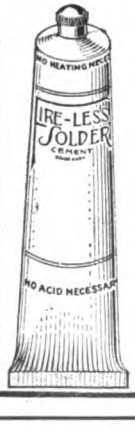
Retail, $25.00

Order a Set for a Try-out at

$12.50

AXWELL EQUIPMENT CO.

421 Wood Street, - Pittsburgh, Pa.



FIRELESS SOLDER CEMENT

For Repairing Cracked Water Jackets, cylinders and leaky radiators, and any kind of metal. Heat will not affect it. Solder hardens in the air. No heat or acid necessary. Supplied in collapsible tubes. No skilled mechanic is necessary to apply this.

Retail Price, 25 cents a tube

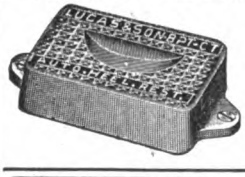
Weight of Tube, 2 oz.

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Standard Purchasing Company
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AUTO HEEL REST



Made of **POLISHED ALUMINUM**

½, 1, 1½ and 2 in. high.

A heel rest for brake or accelerator pedals.

75c. Post Paid.

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"CATARACT" Auto-Vehicle Washer

Attaches to your garden hose. Can't scratch or streak varnish. Cannot rust. Cataract Stop Cock Handle and Mop $2.00; plain handle and mop $1.50; short handle and mop $1.00; extra mops 50c. each, extension handle, making other handles longer, 50c.

Cataract Auto-Vehicle Washer Co., N. Belmont Ave., Topeka, Kansas

THE BEST BUY OF ALL

The 1915 HUDSON Six-40—at $1,550—costs less in the long run than even lower priced cars. For its repairs are fewest. It's cheapest to operate. It's long-lived. Besides, its every-day dependability means rare satisfaction and pleasure.

Information and name of nearest dealer sent on request.

HUDSON MOTOR CAR COMPANY

7712 Jefferson Ave. Detroit, Mich.

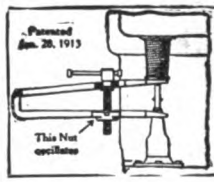


We manufacture LIFTING JACKS for all purposes. TIRE SAVERS, TIRE IRONS and other Auto Accessories.

Write for Catalog and Prices.

NATIONAL JACK & MFG. CO.

130 South Clinton St., Chicago, Ill.



"C. P." Improved VALVE LIFTER

Price, $1.00 by mail

It works like a vise and holds like a vise. It holds the spring rigid. Used on any car.

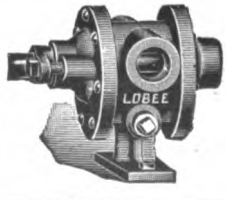
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DEALERS! WE SAVE YOU MONEY



NEW ERA OPTICAL CO. 123 W. MADISON ST.

MFGRS. OF GOGGLES CHICAGO, ILL.

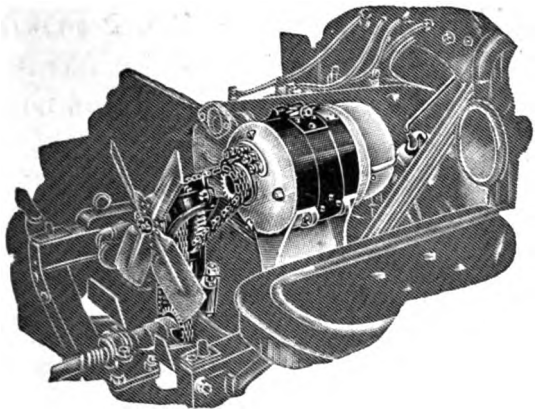


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Lobee Pump

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North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

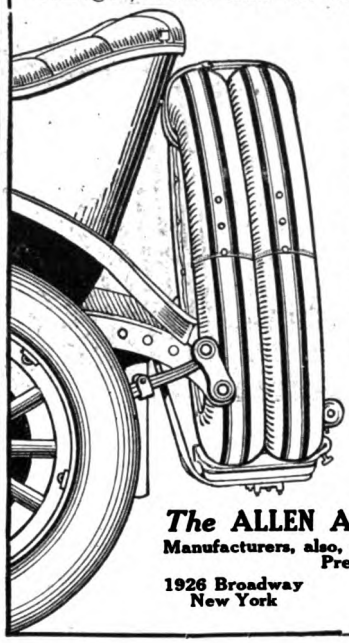
Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.
Ask for Bulletin 33-A

North East Electric Company
ROCHESTER, N. Y.

The ALLEN TIRE CASE

has long demonstrated its superiority as a protection for spare shoes. The deteriorating effects of sunlight, water and oil are completely avoided when the Allen Tire Case covers the spare shoe. Perfect in fit, yet easily buttons on, and is made of finest quality enamel duck; colors to suit the individual owner. Made in all sizes and for all style demountable rims and wire wheels.



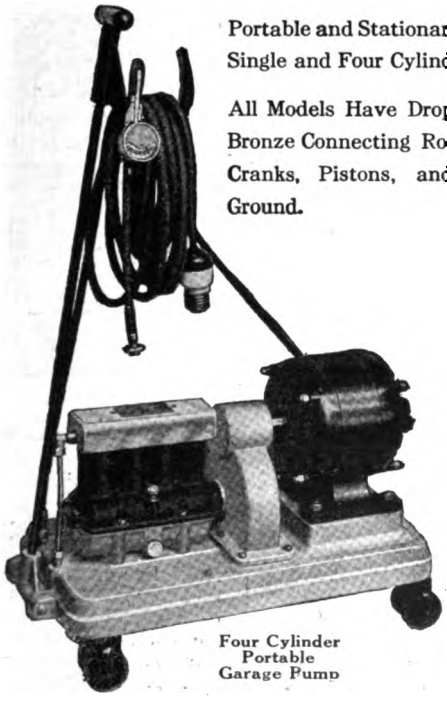
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At All Dealers!

The **ALLEN AUTO SPECIALTY CO.**
Manufacturers, also, of the Allen Tyrometer, Tire Pressure Gauge
1926 Broadway New York — 1627 Michigan Avenue Chicago

LIPMAN ALL METAL AIR PUMPS



Four Cylinder Portable Garage Pump

Portable and Stationary Garage Pumps.
Single and Four Cylinder Tire Pumps.

All Models Have Drop Forged Cranks, Bronze Connecting Rods and Bearings; Cranks, Pistons, and Cylinders are Ground.

Single Cylinder MODEL 21
With Fittings for Leading 1915 Cars
$15.00

We have 15 Models and Sizes of Garage Pumps

Send for New Catalogs

LIPMAN AIR APPLIANCE CO.
602 Pleasant Street BELOIT, WIS.

SAVE YOUR TIRES



Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

VULCANIZIT For inner tube punctures and blowouts,
KUTFILLER For filling cuts and other injuries,
SANBLIST A cure for sand-blisters, repairs blowouts,
NEWTRED For retreading worn tire sections,
PATCHIT Two colors, white and black, for repairing Hot-Water Bottles, Air-Cushions, Rubber Boots, Overshoes and kindred articles.
¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

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Agents wanted everywhere, liberal terms.

Send immediately for descriptive circular giving full particulars of all our special products.

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PITLESS TURNTABLE



All Steel runways Ball Bearing throughout. Can turn a Ford with your little finger. Will last a lifetime.

Built like our standard Turntables that have stood the test for the past eight years. For any light gas car up to 108" wheel base. On account of low cost of steel and increased output we are able to make this price, yet it may only be temporary. Send us your order now, don't wait. ⅓ cash, balance draft to B/L.

PITLESS AUTO TURNTABLE CO.,
2400 BROADWAY, KANSAS CITY, MO.

"AMERICAN" REPAIR STOCKS ACCESSORIES AND CEMENTS

MATERIAL REDUCTION IN PRICES FOR 1915.

The "AMERICAN" lines are unquestionably the highest grade products of their kind on the market.

Will gladly furnish you with working samples, including our wonder "5 Minute Cure Vulcanizing Cement." Manufacturers of "American Indian" Red Inner Tube and American Gray Tube.

ADDRESS ALL INQUIRIES TO FACTORY.

THE AMERICAN TIRE & RUBBER CO.
AKRON, OHIO

Annular Ball Bearings Reground

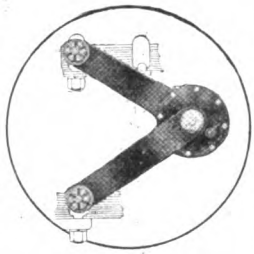
and guaranteed as good as new. We carry a complete stock of Reground Bearings at all our Branches for immediate exchange. Also a Complete Stock of New Annular, Thrust, Radax and Double Row Bearings.

Ahlberg Bearing Co.

1790 Broadway, N. Y. City
93 Massachusetts Ave., Boston
805 Woodward Ave., Detroit
2636 Michigan Ave., Chicago
1841 Euclid Ave., Cleveland
325 West Pico St., Los Angeles

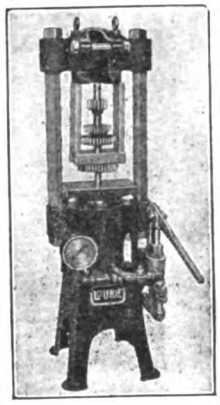
*Hartford
SHOCK ABSORBER

The Hartford Shock Absorber is not a spring, but a spring control. It reduces the sharp oscillation of springs to long waves of motion which are hardly perceptible in the car even on rough country roads.



Send for full explanation.

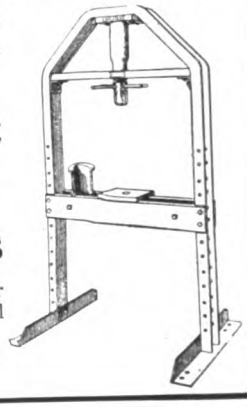
HARTFORD SUSPENSION COMPANY
141 Morgan Street Jersey City, N. J.
Formerly Truffault-Hartford



Lourie Manufacturing Co.
Springfield, Ill.

Make many sizes and styles of

Hydraulic and Screw Presses



Write for circular of our new 4 wheel AUTO JACKS.

Send for Circulars and Prices.

CLARO



MODEL A Hand Horn
$5.00

Best value for the money.

Write for Manufacturer's Catalog of Copper Asbestos Gaskets, Ford Lighting Outfits, Battery Connectors, Terminals, Shims and Shim Brass, and free sample "Spring Lock" Battery Terminal.

THE FITZGERALD MFG. CO.
Railroad Ave., Torrington, Conn.



Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

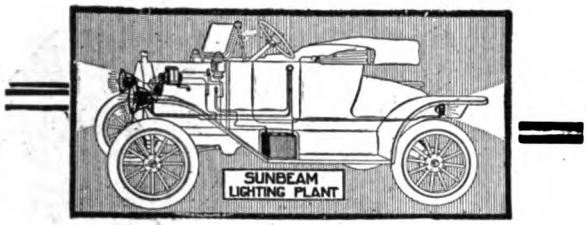
A necessity of high grade car equipment.

Write for catalog showing various models.

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AMESBURY, MASS.

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"SUNBEAM" Complete Lighting Plant For Ford Cars



A BIG MONEY MAKER FOR FORD DEALERS

A complete lighting outfit that is economical and efficient. Not necessary to remove radiator or make any mechanical changes to install. Send for further information.

PRICES

Generator and Cutout	$20.00
Generator, Cutout, Ford Brackets and Pulley	23.00
Generator, Cutout, Ford Brackets, Pulley and Battery	35.00
Generator, Cutout, Ford Brackets, Pulley, Lamp, Switch and Wiring	33.00
Same as above with Battery	45.00

The Milwaukee Specialty Mfg. Co.
730 National Avenue Milwaukee, Wis.



TIRES NEED AIR

Not too much, nor too little—but just enough to keep the tire inflated to the prescribed pressure. There is only one safe, sure way to do this and that is to use a reliable, accurate tire pressure gauge and test the air pressure in your tires frequently. Under-inflation with its rim cutting, loosening of treads, etc., will never bother you if the pressure is tested by the

ALLEN TYROMETER
TIRE PRESSURE GAUGE

This gauge may be used with the valve in any position, and it is guaranteed absolutely accurate. Made of heavily nickeled, specially drawn brass tubing, with sliding band which holds the indication as long as you want it. Only 4½ inches long with clip attached for carrying in the pocket.

Satisfaction Guaranteed or Money Back

Our new booklet is ready. Write for it today!

Price, $1.00

THE ALLEN AUTO SPECIALTY CO.
Manufacturers, also, of the Famous Allen Tire Case
1926 Broadway NEW YORK 1627 Michigan Ave. CHICAGO

The Live Dealers' Opportunity

Gemco MILWAUKEE "THE SIGN OF SATISFACTION"

Popular FORD Specialties

The Most Complete Line on the Market

Starters	Accelerators	Mud Hooks
Shock Absorbers	Cutout Outfits	Chain Grips
Tire Holders	Horn Outfits	Chain Locks
Bumpers	License Brackets	Radiator Caps
Steering Wheels	Jacks	Radius Rods
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Lamps	Spark Plugs	Gasoline Reserve Valves
Wind Shields	Wrenches	Radiator Caps
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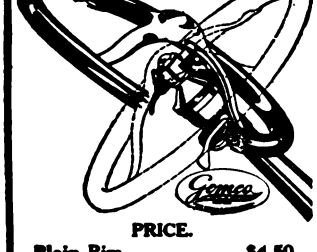
Anti-Rattlers, standard nuts and bolts, etc.

THEY ARE ALL BUSINESS BRINGERS

Here is the line for you to specialize on for 1915. Many new accessories—reduced prices—all live sellers. Leading distributors throughout the country stock and recommend the "Gemco" Line.

GARAGE EQUIPMENT MFG. CO., 756 So. Pierce St., Milwaukee, Wis.
The largest manufacturers of general accessories in the world.

"Tilting Steering Wheel for Ford Cars"

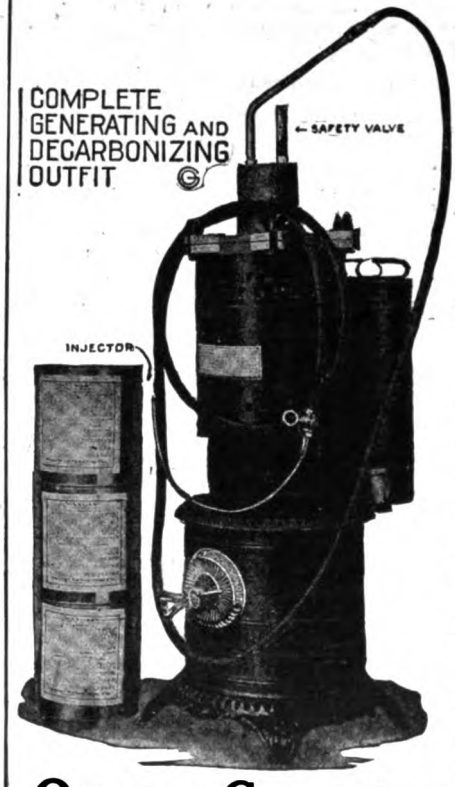


PRICE.
Plain Rim $4.50
Corrugated Rim 5.50

Two of the Big Sellers



Price, complete.....$3.95



An Oxygen Carbon Remover and Generator
$15.00

Tank Nuisance Eliminated.

Complete in every detail. Thoroughly guaranteed.

Removes Carbon from a cylinder in three minutes without dismantling the motor.

A money saver and maker. Write for Particulars.

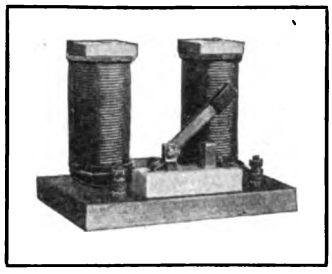
Oxygen Generator Co., Inc.
301 River St., TROY, N. Y.
Manufacturers of Stationary and Portable Generators, Decarbonizers, Reducing Valves, Etc.

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FORD MAGNETO

MAGNETS CHARGED WITHOUT REMOVING from the Car, with the

ST. LOUIS MAGNETIZER



Any magnets used on an automobile can be charged with the St. Louis Magnetizer. This is the Magnetizer that all the garages are buying. It is guaranteed to give satisfaction, and the price is right.

Send for free descriptive circular.

With Ford Attachment - - $8.50
Without " " - - 7.50

ST. LOUIS ELECTRICAL WORKS
EASTON and ARLINGTON AVENUES, ST. LOUIS, MO.

Is your car equipped with a low tension magneto?



If so, write at once for data on the J. & B. Transformer Coil. This coil increases the efficiency of your ignition 100 %. A coil that is guaranteed for life, absolutely fool-proof.

Don't bother with faulty ignition.

Write for particulars.

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Chicago Branch W. A. BARRETT 910 Michigan Ave.
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The unique "Porcupine" drive on the

CARLETON GENERATOR

(7 volts, 49 c. p. direct current) solves the lighting problem.

Gives a steady light with or without storage batteries.



Special attaching brackets for Ford, Saxon and Metz cars, but applicable to any car, cycle, boat or miniature stationary plant.

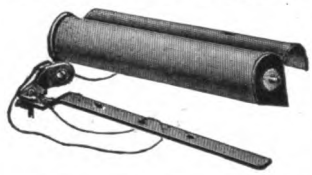
Highest quality and moderate price. Also Automatic Cut-out, Storage Batteries, Governors and Ammeters.

Descriptive Bulletin explains.

Local demonstrating agents wanted where there are no dealers.

The Carleton Company - 180 Summer, Boston

REYNOLDS SAFETY LIGHT SHADE





When using Reynolds Safety Light Shade, you can pass cars with glaring lights—with perfect safety. Price, $2.00. Money refunded, if not satisfied.

Fits on All Windshields. Positive Protection for the Eyes

Special Offer, $1.50 with This Ad. Until May 1st

REYNOLDS SAFETY LIGHT SHADE CO., Oneida, N. Y.

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"The Weld that's Guaranteed"

ALL kinds of Castings—Machine and Auto parts welded—Worn and Weak parts Reinforced by the oxy-acetylene method of welding.

WE MAKE A SPECIALTY OF WELDING "ALUMINUM" PARTS OF ALL KINDS.

No Job Too Small or Too Large For Us to Handle.

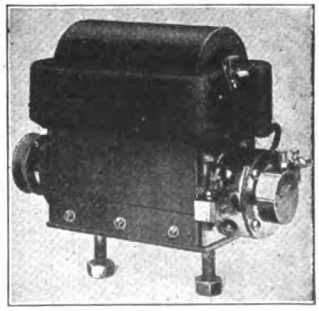
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Complete Oxy-Acetylene Welding and Cutting Plants Installed.

ENGINEERING WELDING WORKS
Welding Department
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"The Cut that's Straight and Narrow."

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VOLTA ELECTRIC LIGHTING SYSTEM

can be put on any make of car

Best and simplest generator on the market

Special Outfits for FORD Cars

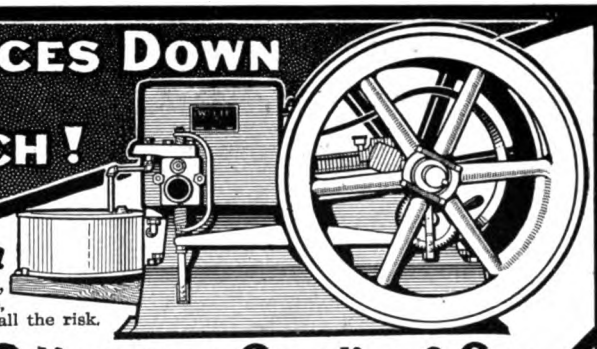
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IRWIN D. GROAK ENGINEERING CO.
Engineers, Designers, Builders
MONADNOCK BLOCK CHICAGO, ILL.

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ENGINE PRICES DOWN ANOTHER NOTCH!



Look at these Prices!

2 H-P, $34.95; 4 H-P, $69.75;
6 H-P, $97.75; 8 H-P, $139.65; 12 H-P, $219.90.
Other sizes up to 22 H-P, proportionally low.

Direct from Factory to User!

Why pay two prices for any good engine, or take chances on a poor, or an unknown engine, when the "WITTE" costs so little, and saves you all the risk.

WITTE ENGINES, Kerosene, Gasoline & Gas

LET ME send you a "WITTE" engine to earn its own cost while you pay for it. It's cheaper than doing without one. I have proved that to thousands who are now WITTE users.
Ed. H. Witte.

Stationary, Portable and Saw-rig Styles.

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CASH OR EASY TERMS.

GET your engine from an engine specialist. All my life I have done nothing but make engines. **The success of my customers and nothing else, makes my success.** I've simply got to sell better engines. I can't lose money on an engine and make back the loss on something else. My factory is the only one, that started in the engine business 27 years ago, which has come through successfully under the same management with which it started. Only WITTE engine-quality has made that possible.

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READ THIS BOOK BEFORE YOU BUY ANY ENGINE
IT IS SENT FREE FOR THE ASKING.

ED. H. WITTE, Main Desk, Witte Iron Works Co.
2493 Oakland Ave., Kansas City, Mo.



PATENTED
PERFECT-LOCK PATCH

"20th CENTURY" PATCHES

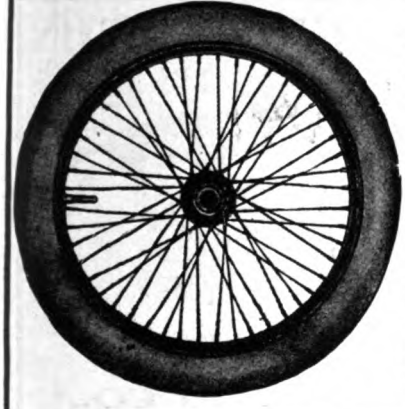
are the ONES that interest the JOBBERS and DEALERS—because of the HIGH QUALITY and LOW PRICE that increase sales. The ONES that interest the MOTORIST—because of the GUARANTEE of Absolute Satisfaction or Money Refunded.

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20th CENTURY TIRE PROTECTOR COMPANY
MIDLOTHIAN, TEXAS
Largest Exclusive Patch Manufacturers in America



RELIABLE CLINCHER PATCH



WIRE WHEELS
FOR
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$20.00 per set, complete, ready to attach. No machine work necessary.

DEALERS:
These wheels are backed by a binding guarantee for satisfactory service. Our selling proposition gladly sent on application.

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MOTT WHEEL WKS.
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Increase Your Repair Business

Equip your shop to handle four times the valve grinding work you can now take care of. Put in the one machine that can do the work in one-quarter the time required by hand—and do it better. The

Fosnacht Valve Reseater

needs no expert operator. No emery—no dirt—no tearing down of motor.

The Fosnacht will build your trade—and give you satisfied customers in every instance. It's to your interest to have it.

You ought to read our free book, anyway. It tells all about this great device. Write for it *to-day—NOW!* Address

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BRAENDER
Tires and Tubes

Are Famous For Their QUALITY

We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

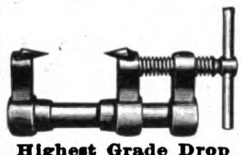
BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2.60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

Braender Rubber & Tire Co.
Factory: Rutherford, N. J.
NEW YORK, 250 West 54th Street
Agents in principal cities

Established Agents Solicited.

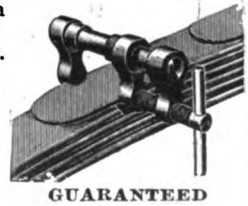
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Highest Grade Drop Forgings. Nickel Plated and Polished.

Gives 100% Easier Riding and STOPS THE SQUEAK

A practical, durable tool for spreading spring leaves for lubricating. Nothing better as a temporary Repair Clamp.



GUARANTEED

One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

Adjustable to any size auto spring.
Sent prepaid anywhere, $1.50.

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(PLANT AT CUDAHY) MILWAUKEE, WIS.

THERE IS MORE POWER IN THAT GOOD GULF GASOLINE AND SUPREME AUTO OIL

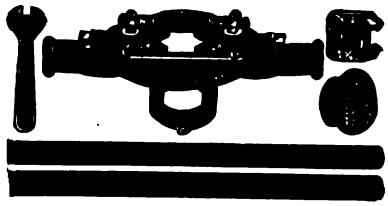
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PITTSBURGH, PA., U. S. A.

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"Send for our free booklet "Progressive Lubrication"



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ARMSTRONG STOCK and DIES

For Cutting

A. L. A. M. THREADS

No. 1 STOCK & DIES, ¼ to ⅝ in.

No. 2 STOCK & DIES, ½ to 1 in.

AND TAPS TO MATCH

Good Tools for Repairmen. These Dies are Adjustable.

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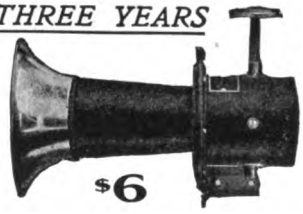
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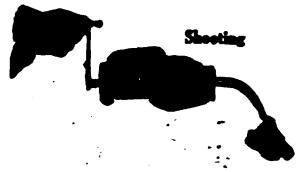
The Handphone

Efficient, Durable, Powerful—Mechanically Perfect and Easy to operate—the slightest touch of the lever gives an instantaneous, loud, penetrating warning.

Automobile Supply Mfg. Co., 220 TAAFFE PLACE BROOKLYN, N. Y.

TOWNSEND GREASE GUN

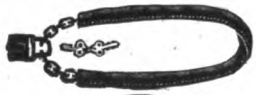


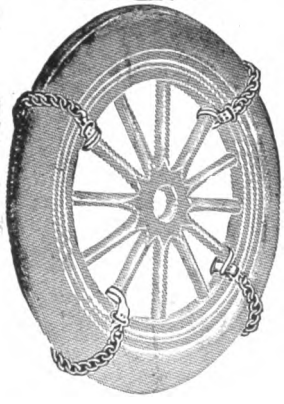


A Good gun should be
Quickly, easily and completely filled.
Quickly, easily and completely emptied.
—A pound a minute.
Not a speck should get on your hands.
The Townsend is such a gun—the only one.

S. P. TOWNSEND & CO.,

15 Central Avenue, ORANGE, N. J.





TAPCO TIRE LOCK

This lock complete with case-hardened chain and covered with muleskin, postpaid **$0.70**

TAPCO MUD CHAINS

3½ inch	Each	**$0.30**
4 "	Each	**.35**
5 "	Each	**.40**

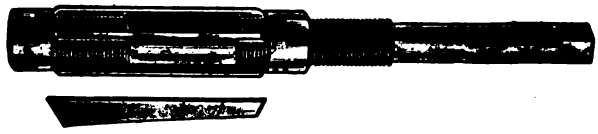
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737-739 Jackson Blvd., CHICAGO

The best made for repair work

The Critchley Expanding Reamer

Try one and you will want more



Reams odd size holes

CHADWICK & TREFETHEN

32 BOW STREET PORTSMOUTH, N. H.

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CARBON REMOVER

CLEANS MOTOR IN ONE HOUR

QUICKEST SELLER ON THE MARKET
NO ACID, GRIT OR CHEMICALS

Quart $1.00, Half Gallon $1.75, Gallon $3.00

Every owner will buy a Carbon Remover that works. KORINE DOES WORK.

EVERY DEALER SHOULD STOCK IT.

KORINE CARBON REMOVER CO.
136 Federal Street Room 316 Boston, Mass.

Important to FORD Owners

The BOSTON STARTER

Is a Time-Tried, Demonstrated Success

The BOSTON STARTER is guaranteed to turn the motor over as certainly as the crank, while the operator is comfortably seated in the car.

The BOSTON STARTER gives the Model "T" FORD CAR the same self-started appearance enjoyed by electrically started cars, at a fraction of the electric starting cost. No batteries, no wiring to require the service of an electrician.

Ford owners—drive right up and ask your dealer or garage man. If he does not happen to know, write our distributor nearest you.

Manufactured by AUTOMATIC APPLIANCE CO., 172 COLUMBUS AVENUE, BOSTON, MASS.
1876 Broadway, New York, N. Y.
304 Hodges Building, Detroit.

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ESSEX ASBESTOS BRAKE LINING



Woven of highest quality long fiber Asbestos Yarn, spun around brass wire.

Scientifically treated and finished to insure great durability and the highest co-efficient of friction.

Not affected by heat, water or acids.

Write for latest Catalog

Made by the ESSEX RUBBER CO., Trenton, N. J.



"STICKALITE" AUTO TROUBLE LAMP $1.00

Has magnet in base—Sticks on iron or steel

—Complete with 10-ft. cord and plug which fits any socket on car—A Fast Seller for Dealers—Get Discounts.
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The CELLO will cut your lighting expense to ½ on your Side and Tail Lights. Send for more information.

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280 Commercial St.
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$6.50 Per Set of Four. 20,000 Sets in Use.

MOORE Jacks save tires by relieving them of heavy weight of car. Easy to apply—simply slip padded loop over hub and press down lever. At dealers, or sent prepaid on receipt of $6.50.

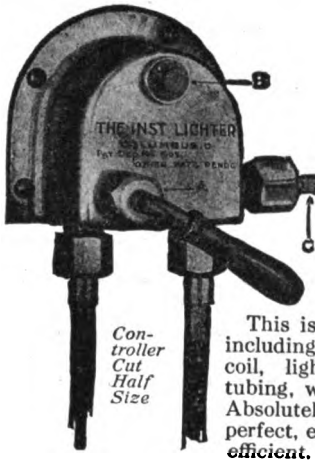
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Light, Dim Or Extinguish Your Gas Lamps Instantly

from the driver's seat without stopping



Controller Cut Half Size

THE INST LIGHTER

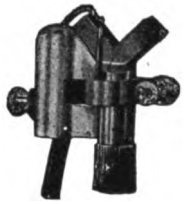
is the most convenient, successful and troubleproof device of iis kind. On the market five years; now used by over fifty thousand motorists.

This is a complete system, including gas controller, spark coil, lighters, heavy brass tubing, wire, cable, etc., etc. Absolutely safe, mechanically perfect, economical and 100% efficient.

Quickly pays for itself in gas saved. Unequalled convenience.

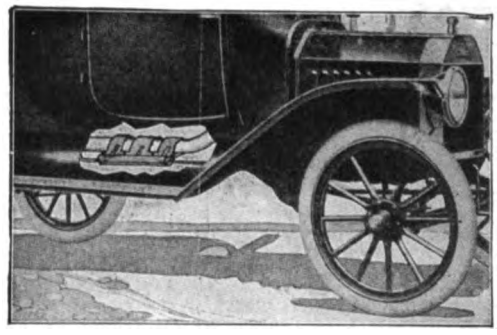
Standard Equipment on America's Foremost Cars

Write today for Profitable Agent's Proposition.



Lighter

1/3 Of Your GASOLINE SAVED BY THE



Economy Gasoline Improver

OR SUPER-CARBURETOR

Cold water will not give off steam, and the best carburetor on earth will not give off real vapor without the assistance of heat, at any time of the year. **Boiling Gasoline** is used at the big races in the middle of the summer.

The Economy Gasoline Improver uses waste heat from the surface of the exhaust pipe to heat the gasoline in the gasoline pipe before it enters the carburetor, greatly increasing the power, improving the running of the engine, decreasing the deposit of carbon and permitting a saving of **One-Third of Your Gasoline. YOU CAN SEE IT SAVE.**

We guarantee that with the **Economy Gasoline Improver** on your car you can turn off the flow of gasoline to the carburetor ⅓ after the engine is warmed up, and still get full efficiency.

PRICE $2.35 **A Special Offer will be made once to each new dealer. Write for it.**

Order through your dealer or direct from us. We ship by insured mail same day order is received. **We pay the postage.**

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AN EASY SELLER

That's what the dealers want. Easy sellers must have merit behind them.

E. Z. RIDER

SHOCK ABSORBERS FOR FORD CARS

Have that merit—Satisfied users testify to the comfort and pleasure E. Z. Riders have brought them.

WRITE FOR OUR DEALERS' PROPOSITION.

THE FOREST CITY ELECTRIC CO.

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It Contains Over 3,000 Money-Saving Automobile Bargains

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Special Dept. for Ford Accessories

Will be mailed Free upon receipt of postal. Write for one today.

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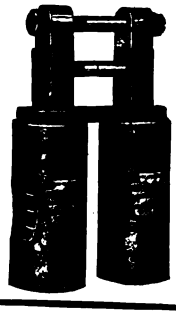
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Easy to Ride On — Easy to Buy — Easy to Sell

KEYSTONE ABSORBERS EMBODY BEST FEATURES

$20.00 PAIR



Two large springs, heavy hanger bolts and steel body insures resiliency and strength

NOTHING BETTER MADE OR MORE EFFECTIVE AT ANY PRICE

Will furnish *one* sample pair in EACH TOWN AT $15.00

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DEALERS GARAGE ACCESSORY JOBBERS OWNERS HOUSES

Increase Your Profits—Sell

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We make them for the leading cars manufactured.

Five High Grade Materials to choose from, including Cravenettes, Mohairs, Serges, and Two-colored Washables.

Our **"Special Dealers Proposition"** will appeal to you.

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WISCONSIN AUTO TOP COMPANY

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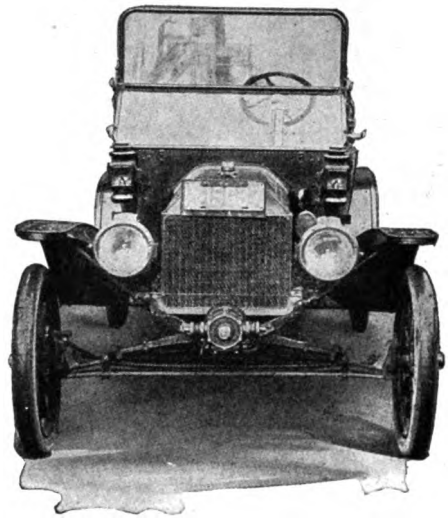
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The Thurber Model F "Ford Special" on a Ford Car

The *Thurber Rotary Air Starter and Tire Inflator* includes a *complete air plant*—pump, tank, starting rotar and tire inflator—spins your motor over 200 R. P. M. Can be readily attached to any car at any time. Simpler than any other type of power starter. Does not need an electrical engineer to look after it. A simple mechanical *power* device operated by compressed air! It starts with a powerful spinning start! It saves tire expense. It will work in any climate—in zero weather or in moist tropical atmosphere.

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Start the Season Right

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TRADE MARK **NON-FLUID OIL** REGISTERED IN UNITED STATES PATENT OFFICE

NON-FLUID OIL lubricates BETTER because of its BETTER lubricating qualities—it lasts longer than LIQUID oils, or greases, because it is more durable, **stays where put,** and lubricates perfectly to the last small particle. Try it on your cars this year and note the improvement.

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DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH **$2.50**

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

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we will sell 500 starters at $10.00 each, f.o.b. Buffalo. Terms: Cash with order. No C. O. D. orders accepted. All orders subject to our approval.

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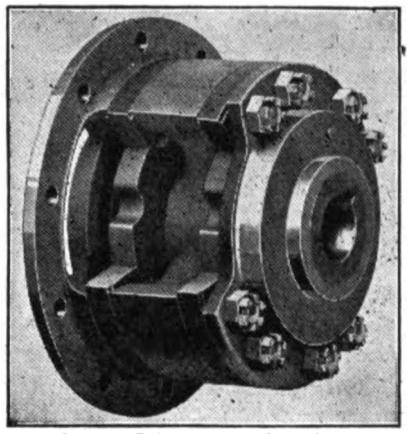
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Most wonderful device ever offered. A real necessity. A dollar will bring one tire tool by mail, prepaid, or ask your dealer.

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Gearless Differential for Ford Cars

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Guaranteed Non-Breakable for Life of Car

Complete, ready to install—anybody can make the change in a few hours' time, cost is nominal. Money refunded, no restrictions, if not satisfied within 30 days.

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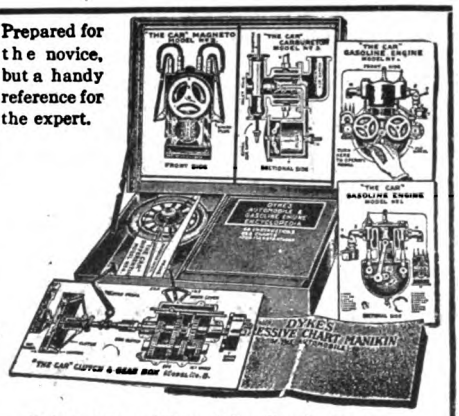
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A New Invention
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Originator of the first Auto Supplies, Publisher of the first practical book on Automobiles in America.

You learn the PRINCIPLE and CONSTRUCTION of ALL parts of ALL automobiles.

Prepared for the novice, but a handy reference for the expert.



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It teaches the principle of Automobile, Motorcycle, Marine, Stationary and Aero Engines.

HOW TO REPAIR, ADJUST AND DIAGNOSE TROUBLES
Also covers Salesmanship

Every subject is treated, such as **ENGINES**, with all the different valve arrangements, etc. **CARBURETION**—beginning at the simplest form, to the adjustment of all leading makes. **IGNITION**—from low tension coils to high tension magneto systems. **Care of a Car**; Operating a Car; Lubrication; Building and Equipping a Garage, for home or pleasure; Self-Starters—in fact, every subject is fully covered.

VALUE OF THIS INSTRUCTOR TO YOU

WE CLAIM that with careful study of this instructor, it will enable you to become 1) **AN ENGINE EXPERT** capable of diagnosing ignition, carburetion, valve timing, cooling troubles, and remedying them. (2) **A DIAGNOSIST** who from knowing the principle and construction of all subjects, can instantly tell the cause of any trouble and apply the remedy. (3) **A RUNNING GEAR EXPERT** capable of diagnosing and remedying such troubles as differential, transmission, axles, brakes, steering wheels and axle troubles (4) **AN AUTO MECHANICIAN** who can adjust and remedy all the troubles after diagnosing. The subject of repairing in this Instructor is complete in every respect.

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FIRST CHANCE! LAST CHANCE!



To Buy the Well-Known "UNIVERSAL" Adjustable Tread, "UNIVERSAL" Ratchet Anchor Repair Boots, Below Mf'r's Cost.

Having purchased the Plant and Property of the UNIVERSAL TIRE PROTECTOR CO., we have a moderate stock of STRICTLY

FIRST QUALITY NEW TREADS AND REPAIR BOOTS

WHICH WE ARE GOING TO SELL, FOR CASH ONLY, WHILE THEY LAST, AT THE FOLLOWING SPECIMEN PRICES: Boots in ½ dozen lots only; Treads in sets of FOUR. We also have the "UNIVERSAL" JUNIOR BOOTS AND CLINCHER FASTENED BOOTS AT VERY LOW PRICE.

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"UNIVERSAL" ADJUSTABLE, Steel Studded Treads

Size	Each
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34 x 4 in	12.73
36 x 4 in	13.09
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3 in	$1.20	$1.35	$1.75
3½ in	1.25	1.40	1.80
4 in	1.30	1.50	1.85
4½ in	1.35	1.55	1.90
5 in	1.40	1.60	1.95

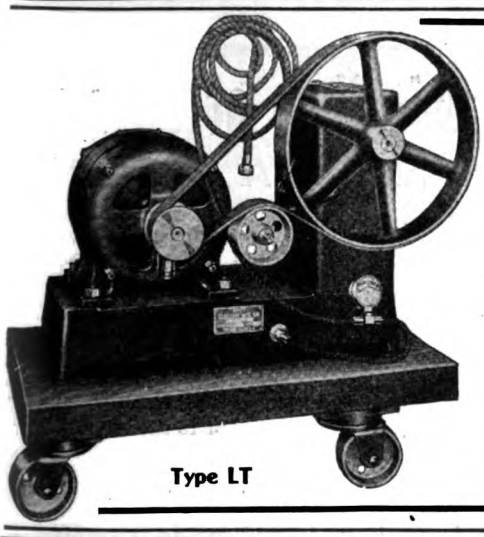
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We will sell the complete manufacturing equipment for these lines, including Dies, Stock, Parts, Materials and Patents, at an extremely low figure. WRITE US TODAY.

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Type LT

THE APEX TWO CYLINDER ELECTRIC AIR COMPRESSOR

For PRIVATE and PUBLIC GARAGES

Pumps air direct into the tire. No storage tank necessary. Attach to any lamp socket.

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SU-DIG SERIES PLUGS

Your car will act like a different machine after you install SU-DIG Series Plugs. It will pull better, "pick up" quicker, climb hills faster, and use less fuel per mile than ever before.

SU-DIG SERIES PLUGS

used with your regular plugs burn the gas almost instantly They enable you to get full power from heavy gasoline.

If your dealer hasn't got them send us his name and we will send you a valuable free folder telling all about Double Ignition.

Superior Motor Specialty Co., 40 N. 4th St., Philadelphia

The SU-DIG Way



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The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS



First Operation

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.



Last Operation

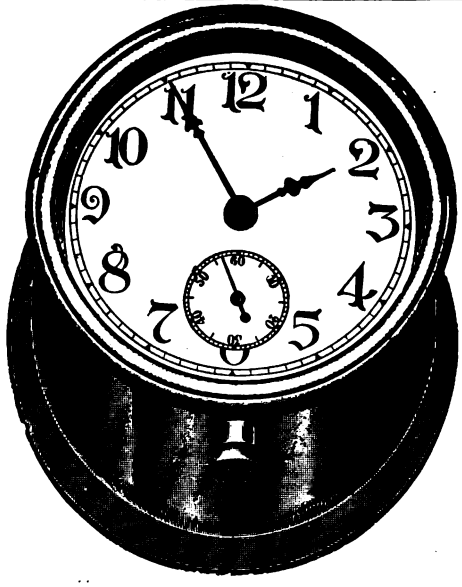
PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

AUTOMOBILE CONSTRUCTION & ENG. COMPANY

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N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South

A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representative North and South: West of Denver



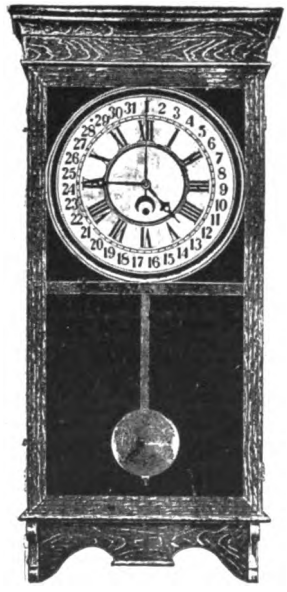
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For your car, and a good one? The clock illustrated in this connection is manufactured by one of the most reliable clock companies in the country and is warranted in every respect. It is not liable to get out of order. It has interchangeable parts. It is the product of skilled labor combined with the most improved Waltham Automatic Machines. This clock is 3¾ inches high, and has a Porcelain dial 2½ inches in diameter. It has a one day movement with second hand. It can be furnished in burnished brass or nickel plated whichever is preferred. The arrangement we have made enables us to furnish **one of these clocks and a subscription to the Automobile Dealer and Repairer for a year** to all residents of the United States and its territories for the precise price the clock retails for, namely, **$2.50.** If an eight day clock is preferred send 50 cents extra or $3.00. Canadian subscribers should add 50 cents extra to cover the extra postage required on the **Automobile Dealer and Repairer.** This clock cannot be sent to foreign countries. The clock can safely be sent by mail and will be forwarded postage prepaid to any part of the country. Remittances can be made in any convenient way. Address

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Every Repair Shop or Garage

SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers in the United States or its territories a **Regulator Eight Day Calendar Clock** 38½ inches high, with a 12 inch dial, finished in **Oak** or **hand-rubbed Mahogany,** with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of **$3.90.** This clock cannot be sent to any foreign country except Canada, and Canadian subscribers must send **50 cents** more to cover extra postage on the paper.

Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

The engraving shown gives the correct appearance of this clock.

This offer is good for either old or new subscribers.

Remittances can be made in any convenient way. Be sure to state whether you want this clock in Oak or Hand-Rubbed Mahogany.

Address all orders to

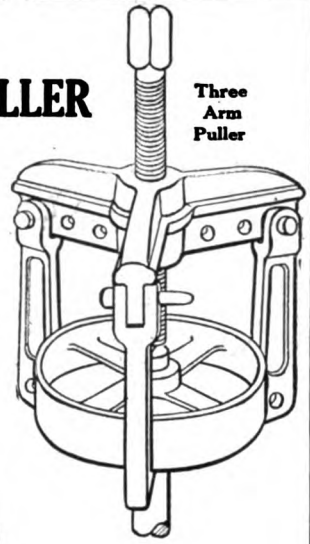
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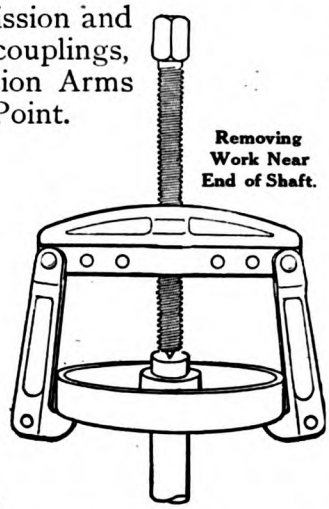
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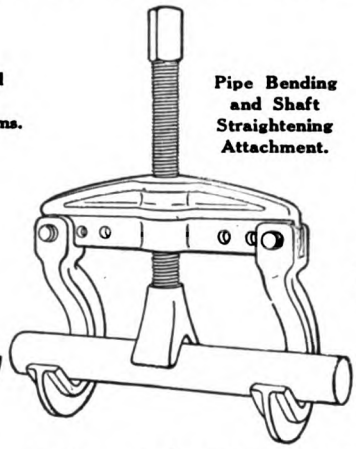
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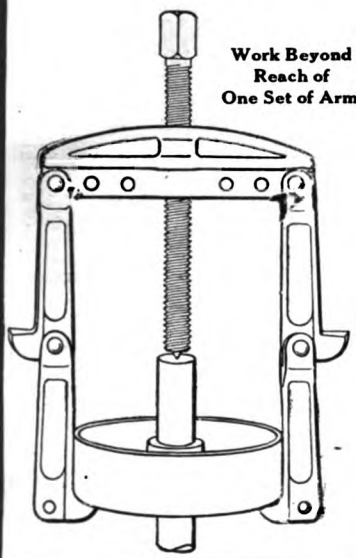
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For removing auto wheels, fly wheels, transmission and cam shaft gears, commutators, sprockets, collars, couplings, etc., with New Combination Hook and Extension Arms and Screw, with inserted Tempered Tool Steel Point.


Three Arm Puller


Removing Work Near End of Shaft.


Pipe Bending and Shaft Straightening Attachment.


Work Beyond Reach of One Set of Arms.

FULLY GUARANTEED

The point of the screw is flat with inserted tempered tool steel point. Will not spread centers. Works equally well on work without centers. The strain is taken on the flat point of screw. **Write for circular "D."**

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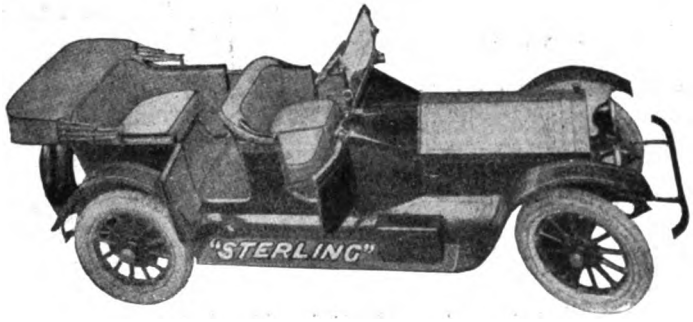
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1915 Prices and Discounts Now Ready

"STERLING" materials *are absolutely* the best obtainable at any price.



Do not be misled by "so-called Lower Priced Seat Covers," made of cheap materials.

The difference between *"Sterling Seat Covers"* and those made by other concerns is the same as comparing a Genuine Diamond with a piece of glass—therefore, choose accordingly.

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Complete Automobile Outfitters

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GARDNER'S "GEE GEE"

THE 1915 GARAGE PUMP

Cannot be equaled for simplicity, capacity, speed or service. Has few parts, no adjustments, and cannot get out of order. Lubrication is by a perfect splash system, which absolutely prevents oil from passing out with the air.

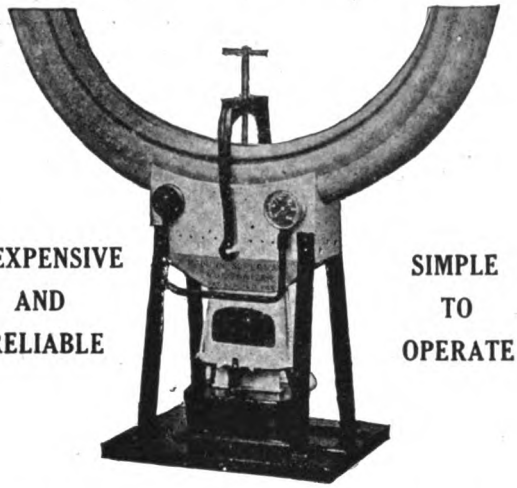
Low in Price, High in Quality and Service.

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If You Want A Good Vulcanizer You Want A Superior Vulcanizer

It will do all your repairs on casings and tubes.



INEXPENSIVE AND RELIABLE

SIMPLE TO OPERATE

BETTER INVESTIGATE AT ONCE.

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RAJAH GIANT



The popularity of the Rajah GIANT Plug has increased wonderfully. The present rate of sales shows an increase of more than 300% in a year.

The construction is the same as the Rajah Standard Plug, but it is much heavier in the Porcelain and metal parts.

The Rajah Giant was originally designed for racing purposes, but the general demand for this Plug for motor-boats, tractors, trucks and pleasure cars necessitated adding it to the regular line of Rajah Plugs. Satisfaction guaranteed under the hardest kind of service.

Specially recommended for Cadillac and Pierce-Arrow.

½" and ⅞-18 only.

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The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

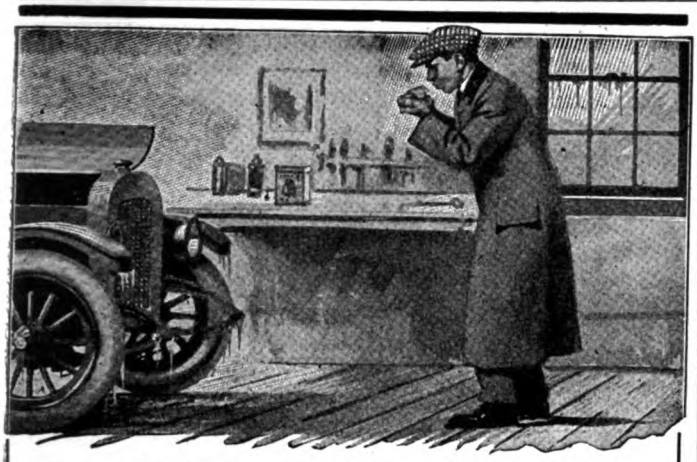
In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

We will send a **sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

Address the

MOTOR VEHICLE PUBLISHING COMPANY, - 71 Murray St., New York City

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Install a Garage Heater This Spring

Take advantage of our special spring prices by buying now. A Stewart Heater gives you warm water for washing all the year round. In winter it prevents freezing of your radiator, saves repair bills, does away with the stiff-fingered inconvenience of making adjustments in a cold garage.

There is a Stewart Heater for every size and type of private garage—from $21 up. Your garage needs one. If you are handy at all, you can install it yourself. We provide special arrangements for water heating where there is no town supply. Our catalog gives complete information. A line brings it.

"STEWART"
TRADE MARK

GARAGE HEATER

FULLER & WARREN COMPANY
Madison Street Troy, New York

THE IMPROVED SIMPLEX STEAM VULCANIZER



A TIME SAVER AND A MONEY MAKER—Vulcanizes eighteen tubes and one casing every hour.

ECONOMICAL—One gallon of gasoline does ten hours' work.

SAFE AND SIMPLE TO OPERATE—The improved SIMPLEX carries a sheet of water between the fire and the tire—making a damp heat which cannot burn your tires. Instructions furnished show how to do the work.

ESPECIALLY ADAPTED for use in small repair shops as well as the largest garages where prompt service is required.

Write for Our Catalogue and Prices.

SIMPLEX TIRE AND REPAIR COMPANY
2042 FARNHAM ST., OMAHA, NEBRASKA

K-C SAFETY LOCK PATCH



COSTS LESS THAN VULCANIZING!

A vulcanized section costs from $3 to $6. The **K-C Safety Lock Patch** is practically a new section—at one-third the first price and **No Second Cost—No Come Back!**

The **K-C Safety Lock Patch** completely encircles the inner tube. The Lock, formed by edges dovetailing and secured with a wire key, makes spreading or bulging through the blowout hole an impossibility.



Holds the Largest Blowout!

Made of highest quality Tire Fabric. All sizes to fit every make and style of tire.

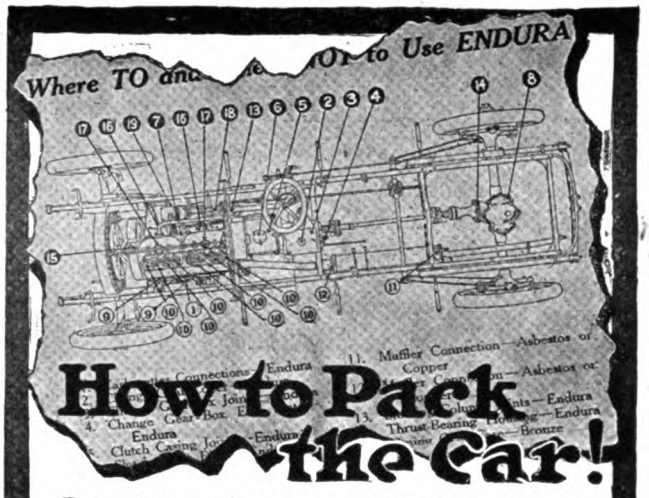
You might cut away a section of casing from bead to bead and this patch, safely locked in, will hold it's own pressure.

Sold by Leading Auto Supply Dealers and Garages Everywhere.

Western Tire & Rubber Co.

"America's Largest Tire Accessory Makers"

KANSAS CITY, MO.



Every dealer and repairman will find this chart of great value. It shows just what kind of packing is best for each part of the car and *where* and where *not* to use oil-tight, grease-tight, gasoline-tight, water-tight

ENDURA
Special-Purpose Sheet Packing

which makes perfect connections of such joints because that is its *special purpose*. In addition to this free booklet let us send you some ENDURA test samples. Mail the coupon today.



ENDURA Mfg. Co.
6305 Eastwick Ave.
Philadelphia

-- Please mail the coupon --
Without obligating me, please send me the free chart, "How to Pack the Car," and free ENDURA samples.
Name.....
Street.....
City.....
State.....

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Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

DINSHAH ENGINE TESTER
Locates Motor Trouble at Once

Shows exactly what is wrong in electrical system, spark plugs or gas plant. Booklet, etc., upon request.

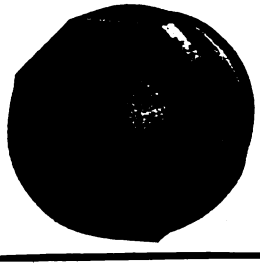


Dealers: Write for our offer.

DINSHAH SALES CO., 735 Seventh Ave., New York

You can earn EXTRA DOLLARS

Accessory and Tire salesmen and dealers can add to their income by selling the TRANSIMETER Hub Odometer; especially easy to sell to truck owners because it fills a need and saves money.



TRANSIMETER

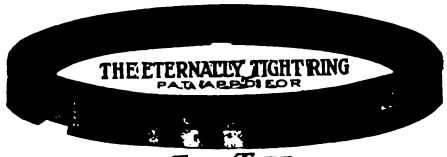
is far ahead of other hub odometers.

Dreadnaught Type—Guaranteed

Indestructible	Price, $20.00
Applied Type (fits any truck)	" 16.50
Ford Type	" 15.00

Write today for our special commission offer.

AMERICAN TAXIMETER CO.
7th Ave. at 49th St. New York City



STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY
Specialists in Piston Rings
MUSKEGON - MICHIGAN

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Price and Quality Must Balance

The quality of the brake lining you sell must be consistent with the price you charge for it, or you will not be able to hold your trade.

This is so—and nobody knows it better than you. That Price and Quality must balance is just as true with respect to net prices as it is with list prices.

What is the Quality of brake linings which list the same as RAYBESTOS—and in some cases higher—but which often are offered you at a lower net price?

What do you suppose is the lowest net price you could get?

How do you know when you get it?

How long before juggled discount prices will affect you?

RAYBESTOS schedule of prices—both net and list—are fixed—uniform to all—and at all times consistent with RAYBESTOS Quality.

Booklet upon request.

TRADE MARK Raybestos REG. U.S. PAT. OFF.

The Royal Equipment Company

1354 Bostwick Avenue **Bridgeport, Conn.**

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From Coast to Coast
FISK SERVICE
All the Way



Panama-Pacific Exposition
San Francisco, Cal.

FISK SERVICE

represents something more than Fisk Tire mileage or "Service Stations" or stock depots.

Fisk Service means direct Fisk Branches, with more than a thousand Fisk representatives trained and willing, courteously, promptly and efficiently, to render any service which ANY TIRE USER may require.

Fisk Service is co-operative and each Fisk dealer profits from our incomparable policy and facilities, to the benefit of all tire purchasers.

Side by side, yet distinctly apart, stand the **Fisk Tire** and **Fisk Service**; each exceptional in its class and each included in the term FISK QUALITY. Write Dept. 26 for Fisk Literature.



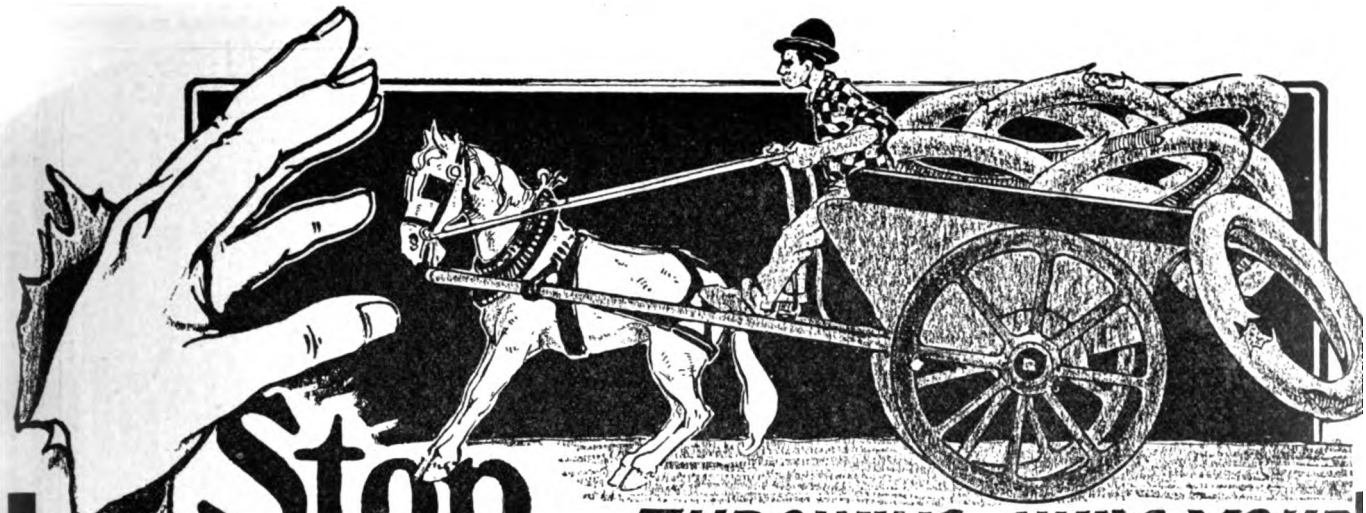
THE FISK RUBBER COMPANY
Factory and Home Office Chicopee Falls, Mass.

You Can Buy Fisk Tires From All Dealers
Fisk Branches in All Principal Cities



Skyline, New York City, From North River

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Stop —THROWING AWAY YOUR WORN TIRES!—

It's just as unnecessary—just as extravagant—to throw away your tires when they have become tread worn or rut worn as it is to throw away your shoes when the first sole gets thin, for you can get 5,000 miles more service out of them by doing what European motorists have done for the past three years. This will result in a saving of from $50 to $200 a year for you—enough to pay for your yearly gasoline and oil combined!

Don't Let the Junkman Profit at Your Expense

That picture of the junk wagon—with its heap of cast-off tires illustrates in a striking manner what becomes of the average rubber tire after 3,000 to 5,000 miles of service—uncertain service with the ever-present nerve-racking dread of tire trouble.

This waste in tires is distinctly an American extravagance.

What European Motorists Are Doing

The foremost European engineers have for years been studying the problem of getting more miles for less dollars. With their usual painstaking, scientific thoroughness they experimented with leather tire protectors and steel studded Treads.

The result—for over three years European motorists have been "half-soling" their tires with steel studded Treads, just as we "half-sole" our shoes when the original sole gets thin.

These European motorists are getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American motorists are getting from 3,000 to 5,000, and—what is just as important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim cuts!

Taking Advantage of That European Experience

When we learned that Foreign engineers had perfected a steel studded Tread that would make a tire run at least 10,000 miles, we set about finding out how they did it.

Then we brought to this country probably the foremost German tire engineer, Herr August Bullerman, who designed *Durable Treads* along the line of that foreign study and experiment, improved them by new basic patents and made them even superior to the Treads universally used by European motorists. Their success was immediate. In eight months 20,000 American motorists took advantage of this opportunity to cut down their tire expense and eliminate their tire trouble. Last year the sale of Durable Treads increased 917% in the United States alone. Over 40% of these sales were unsolicited—made through the recommendation of Durable Tread users.

Where is there an automobile accessory which has received such universal country-wide endorsement?

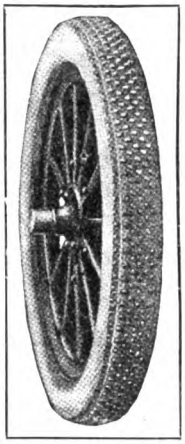
How Does This Affect You?

The almost unbelievable waste in tires by the American motorist is not only national—it is vitally personal. *It affects you—your pocketbook.* Just consider what it would *mean to you* to get 10,000, 12,000, or 15,000 miles out of your rubber casings and at the same time drive your car without the constant dread of tire trouble.

In round numbers it would mean a saving in tire miles sufficient to pay your yearly gas and oil bills—by the elimination of punctures, blow-outs, rim cuts and skidding—a gratification which cannot be estimated in dollars and cents!

Guaranteed 5,000 Miles Without Puncture

Durable Treads are sold under a *signed guarantee for 5,000 miles of wear without a puncture.* This guarantee is an iron-clad agreement—as good as a government bond—and holds good whether your tires are new or old, tread worn, rut worn or rim cut. Think of it—to be able to *FORGET* tires! Not once will you have to get out of that car to fix a puncture, and this *tire vacation* is guaranteed to you!



No More Skidding

Durable Treads are as sure-footed as a burro and they're supremely convenient.

Look at them—they're simply bound to be safe. The sharp-edged steel rivets dig right down through the mud and slush and get to earth every time. They cover the tire completely, extending entirely around from rim to rim. Nothing can work its way in between. They afford a perfect protection—that's why we can guarantee them as we do.

In London and in Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and—what is more important—*you receive perfect non-skid service while your tires are protected instead of injured!*

Ask Yourself This Question

Do you intend to continue allowing the junk man to profit at your expense by carrying away in *tire miles* enough to pay your yearly gas and oil bills, or will you turn to your advantage the experience of European motorists?

It is the same question of economy you decide when you "half-sole" your shoes instead of throwing them away when the first sole gets thin. Rubber tires cost several times as much as shoes and are certainly worthy of the same economy.

Special Discount Offer

To motorists in territories where Durable Treads have not as yet been introduced we offer a special introductory discount *equal to the full dealer's profit.*

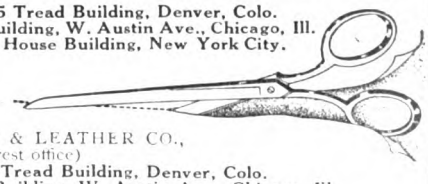
Will you let us give you a demonstration at our own expense and risk? Will you let us make you an offer so fair and square that you do not stand to lose one red cent either before or after you buy?

The time for action is *NOW*, before the tires on your car run another week in a "barefooted" condition—before you get your next puncture or blow-out.

Cut out the coupon below. If you haven't pen or pencil handy you can fill it out afterwards, but *cut it out now* before you turn the page and forget. It will be the means of adding at least 5,000 miles more life to the tires on your car.

Colorado Tire & Leather Co.

165 Tread Building, Denver, Colo.
405 Goetz Building, W. Austin Ave., Chicago, Ill.
655 White House Building, New York City.



COLORADO TIRE & LEATHER CO.,
(Address nearest office)
165 Tread Building, Denver, Colo.
405 Goetz Building, W. Austin Ave., Chicago, Ill.
655 White House Building, New York City.

Gentlemen: Send me samples of Durable Treads, copy of 5000 mile guarantee, special discount terms, and your book, "10,000 Miles On One Set of Tires."

Name .....

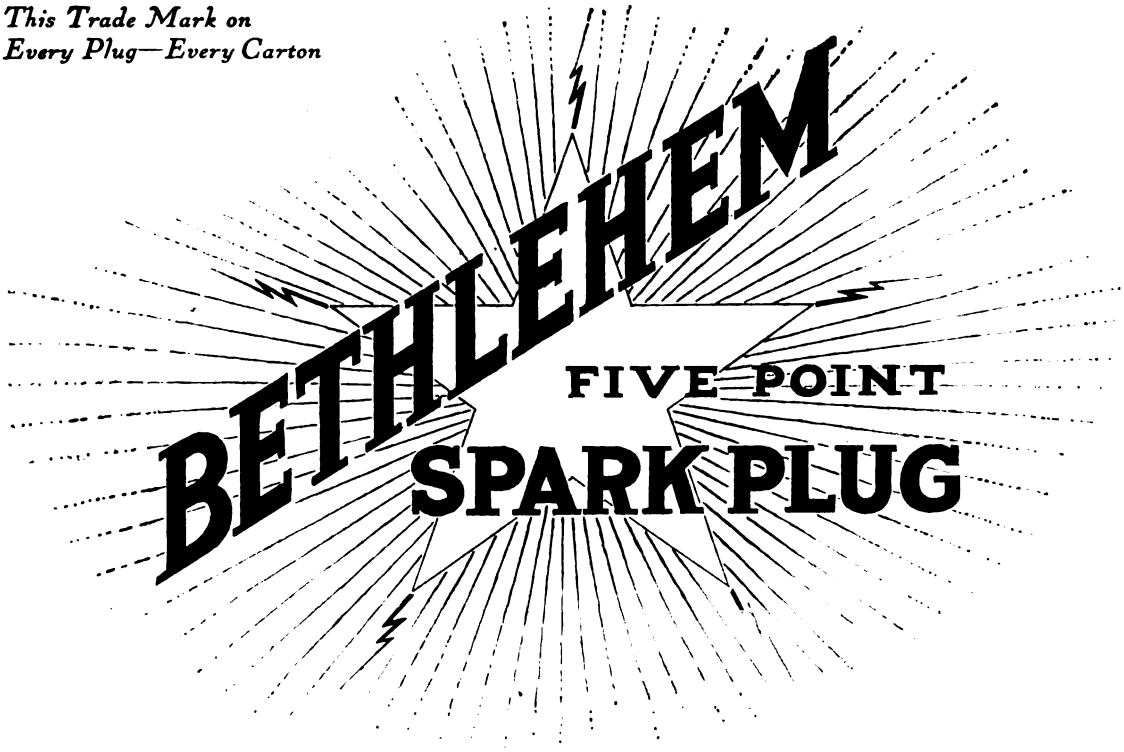
Address .....

City ..... State .....

My tire sizes are .....

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This Trade Mark on
Every Plug—Every Carton



The Wise Car Owner Looks for this Star Trade Mark when he buys Spark Plugs

It Means Quality—and Service

It is the Trade Mark of the Bethlehem Five Point Spark Plug, sold by The Silvex Company, of which Charles M. Schwab is the President.

Think what that name guarantees—as to engineering skill, as to materials!

The Bethlehem is scientifically correct, mechanically perfect, and constructed from the best materials skill can produce and money can obtain.

BETHLEHEM FIVE POINT SPARK PLUGS —*Guaranteed for the Life of the Car*

$1.25 each and worth it—the most economical Plug you can buy.

Saves fuel—increases power—eliminates Plug troubles.

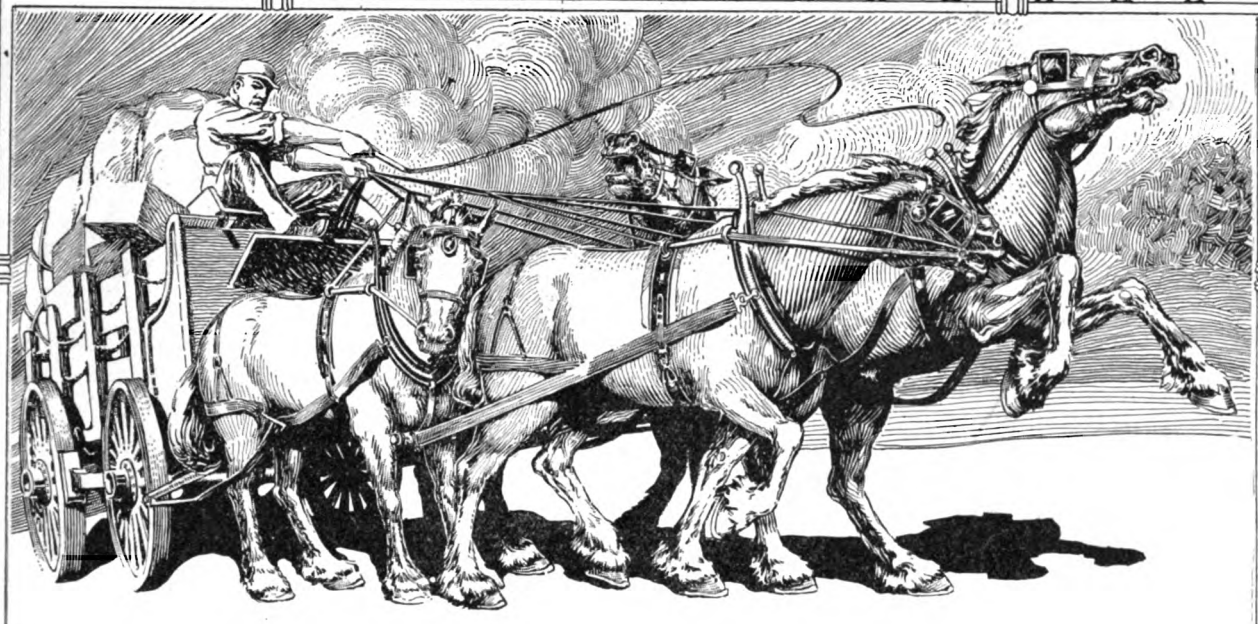
Look for the Bethlehem Display Case at your dealers. It is in Automobile Supply Stores, Garages and Hardware Dealers throughout the land, and contains the right type of Plug for every motor. Illustrated Booklet Free.—

THE SILVEX COMPANY, 171 Madison Avenue, New York

Factory: South Bethlehem, Pa.

Pacific Coast Branch: Oakland, California
W. N. Davidson, Manager

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FORD Owners: Have YOU This Kind of Power?

THIS is how your Ford acts with a poor ignition system. Each horse represents a cylinder of your engine, the wagon your car. Instead of pulling equally, as they should, one horse is jerking ahead, another to the side, one backing, and the other plunging in the air. The truck is getting nowhere. It is being wrenched and racked. It is a true example of EXPENSIVE INEFFICIENCY.

Multiunit coil ignition makes your engine pull like these four balky horses; one cylinder pulls powerfully, another barely moves down on its power stroke; each cylinder works against the others. There are vibration, uneven power and overheating. The engine and car soon become racked and ruined.

THE·BOSCH·MAGNETO
The · Modern · Ignition · System

cures all this, for it serves the Ford as well as it serves the scores of high grade cars on which it is standard. It gives power and snap to the engine, because its arc-like sparks ignite ALL the gas in the cylinders and occur in exact relation to each other. It produces even running, the utmost efficiency and a smile of satisfaction. It's like the powerful team pulling together—IT'S A REAL NECESSITY.

You save yourself all ignition worry, you get a better car, you're satisfied when you fit your Ford with a Bosch Magneto. A simple attachment makes it easy. Fill out the coupon and get an inkling how to make your Ford a better car.

Bosch Attachments made also for all Battery Ignited Cars

Bosch Magneto Company
202 West 46th Street, New York

Please send me the "Key to Ford Efficiency" and full information about better ignition for Fords.

Name .....

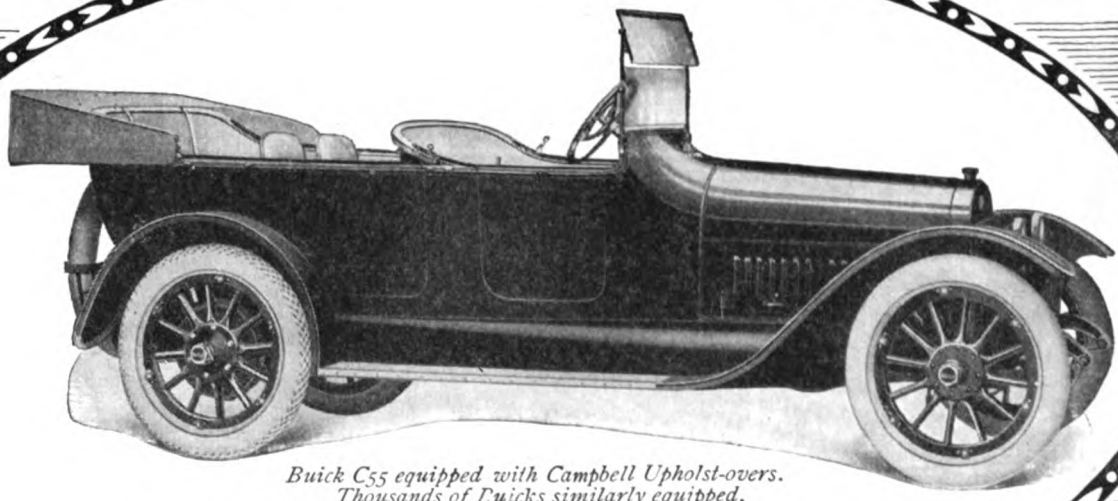
Address .....

Town .....

State .....

I am dealer.....I am Ford owner.....

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Buick C55 equipped with Campbell Upholst-overs.
Thousands of Buicks similarly equipped.

Campbell Upholst-overs

Detachable Upholstery for your Motor Car

Campbell Upholst-overs are a new type of covering for the cushions and interior trim of motor cars. They are detachable and serve the purpose of auxiliary upholstery.
Campbell Upholst-overs are quite different from ordinary seat covers. One minute shows their difference, one month proves it. In fit, in appearance, in wear there is no comparison. Upholst-overs are the last word in luxury and economy.
Various grades and fabrics, hand cut and tailored to fit all popular makes of cars, at decidedly reasonable prices. Write for samples and prices. Liberal discounts to reliable dealers.

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES

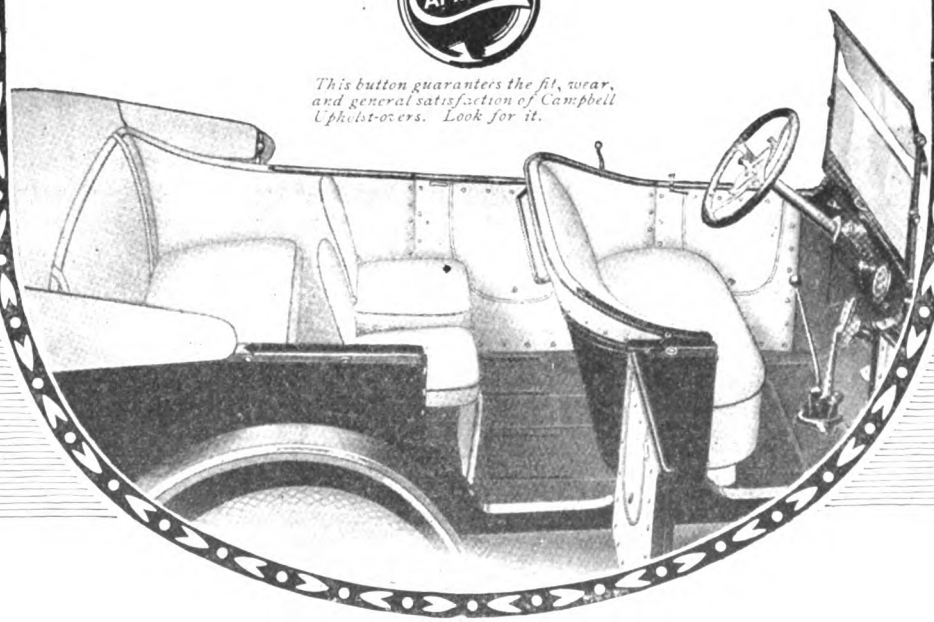
In addition to Upholst-overs, we make a side line of accessories of the highest quality. These include Percama, the cleaner for tops, upholstery, etc.; straps, boots and leather goods of all kinds; an excellent line of Ford specialties, including the famous Campbell Latigo Ford Fan Belt, made also for Overlands and sold in rolls of 10 ft. and up; One-Man-One-Hand Top for light cars; shock eliminators, etc. Back of every article is the Campbell guarantee of satisfaction.

Write for complete catalog.
Interesting proposition to dealers.

THE PERKINS-CAMPBELL CO., 628 Broadway, Cincinnati, O.
NEW YORK OFFICE: 89 Chambers Street

CAMPBELL

This button guaranters the fit, wear, and general satisfaction of Campbell Upholst-overs. Look for it.



Note how beautifully Campbell Upholst-overs fit every line of the car.

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New York Uni-Coil Ignition System for Ford Cars

PRICE $15.00



It gives all the advantages of the best high tension magneto service. The spark is delivered in perfect time to each of the four cylinders. No failure is possible at any speed. Greater power, speed and flexibility is attained by its use.

Operated by the Ford Flywheel Magneto or Battery

It increases the efficiency and perfects the timing of the Ford Magneto to a degree that puts it in a class with the best big-car magnetos. The **vital factors** in **magneto efficiency** are all embodied in its construction—a magneto contact breaker, with but one pair of adjustable contacts—an advanced type of high tension distributor that uses but one of the standard Ford coil units.

The New York Uni-Coil gives the Ford the ignition efficiency of the high-priced cars. It permits unlimited spark advance and assures perfect accuracy in timing at all speeds. It greatly simplifies the Ford ignition apparatus, eliminating the timer and practically all the present wiring. It is readily installed on the car, all necessary fittings and connections being supplied. This equipment includes an **elevating gear bracket which is permanently oil-tight.**

The complete Uni-Coil Ignition System costs $15.00 at retail. Dealers' margin is right—selling terms on request.

NEW YORK COIL COMPANY
338-340 Pearl Street **New York**
WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

DEALERS!

The 500,000 Ford Owners of This Country Form a BUYING PUBLIC That You Can't Afford to Overlook—Here Are Two Ford Necessities That Will Bring Their Patronage Your Way.

The New York Master Vibrator, $10.00

Successful for Six Years on Ford Cars

READILY INSTALLED ON THE NEW 1915 MODELS



The "New York" has always led—six years ago Ford owners were enthusiastic about its performance—to-day it is giving satisfaction on thousands of cars, old and new. It was first in the field and has since been imitated many times, but never equaled.

DOES NOT STICK

Requires the Minimum of Attention

The **"New York"** demands less in the way of adjustment and correction than any other type of master vibrator. It practically manages itself. Under all conditions of service it insures a hot, powerful spark, smooth performance and easy starting. It practically eliminates carbon deposits in the cylinders by producing cleaner combustion. Many engine troubles are avoided when the "New York" is installed on a Ford Car.

It pays for itself in the saving of coil replacement expense and in gasoline economy. At $10.00 it is the best "buy" you can offer a Ford owner. Used with our contact points it is good for the life of the car. These are supplied in **sealed red envelopes bearing our name**—the guarantee of quality and efficiency.

NEW YORK COIL COMPANY
338-340 Pearl Street **New York**
WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

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What's the Answer to the Mileage Question?



But They Can't Answer Your Mileage Question Unless They're On Your Car

SOME men try to answer this question by buying tires at a price. How can they get mileage out of a tire that price prohibits the builder putting into it? Others endeavor to answer it by dickering for adjustments—and that is all they get. Others accept the factory equipment tires on their cars as the solution to the mileage question. But the car builder neither makes nor guarantees tires.

This mileage question is never settled until it is answered right. You can only get as many miles out of a tire as the manufacturer puts into it.

Miller Builds Mileage *In* For You

by first making a shock-resisting backbone of cotton fabric. And do you know that fabric is just as important as rubber in a tire? In fact, while rubber is necessary for resiliency, its greater function is to protect the fabric. The Miller method, which gives you the right rubber compound (and plenty of it) *goes farther.* It produces the right kind of fabric and that's what makes *Miller Tires go farther.*

The Miller Method is an exclusive process of vulcanizing with a low degree of heat—applied for a short time. It retains the natural wax and oil in the cotton fibre, and thus prevents internal friction, because it leaves nature's lubricant in the minute strands and fibre of the cotton.

This wax and oil carbonize at 240 degrees, but the old method requires 287 degrees to vulcanize the tire. A brittle and lifeless fabric cannot stand the terrific punishment that all tires must endure.

The process by which Miller tires are built, thoroughly vulcanizes, makes a perfect unit of rubber and fabric, without burning the life out of either, and with no point of cleavage in the construction.

This method of vulcanization—the retention of the vegetable wax and oil—means life in the fabric and rubber. It results in safety—freedom from blow-outs, and additional miles of wear in Miller tires, as thousands and thousands of motorists have found out.

Settle this mileage question today by going to the Miller dealer. When he puts Miller tires on your car, you can put the mileage question out of your mind for good.

The answer to the skid question is Miller Geared-to-the-road Tires! They gear your car to the road through mud, sand or slush. **With Miller tires on your car you're in control. Its tread is an integral part of the tire and retains its safety features until the entire tire is worn out.** The greater mileage you get from them will make your choice of Miller Tires an economy, as well as a permanent safeguard.

MILLER TUBES answer the tube question.

WAX AND OIL IN THE COTTON MEAN MILES ON THE ROAD

Write for illustrated literature.

The Miller Rubber Company, Akron, U. S. A.

Distributors in Principal Cities

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Something New in Storage Batteries

The frailty and uncertainty of the storage battery has been the great drawback of the industry. No department of electrical science has offered greater difficulties.

The first great battery expert of the country was Pumpelly.

The basic principles of all successful battery construction today are those developed by Pumpelly thirty years ago.

Three decades of tireless work have been put in since then by Pumpelly. A member of a very wealthy family, he has been able to take his time to perfect his ideal battery.

Many able engineers have assisted him in this development. At last he has achieved his purpose.

A tremendous advance in battery construction is marked by the improved Pumpelly Battery.

Its marvellous efficiency and durability have proved a revelation to the engineers of the biggest automobile factories and electrical stations of the country. They have submitted it to the most searching tests they have been able to devise. As a result—

We have their contracts for batteries. That's fair proof that their astonished praises are not mere friendly words.

Big business is the natural, inevitable result of such a remarkable product. We have prepared for it in three ways—and are preparing for it in a fourth.

Low factory costs mean that this wonderful battery competes in price with the old-type batteries.

Large manufacturing capacity means **immediate shipment** of your order, whether it is for one battery or for 1,000 batteries.

Batteries for every size and shape of box are kept in stock in ample quantities. You can replace any known make of battery with a Pumpelly and you can have it shipped at once.

We make a battery for every type of starter—a battery for every make of car.

A country-wide Service System is being rapidly built up. We have over thirty service and sales stations now. We want more. That's where **you** come in. You can control the battery renewal business of your town.

You'll do more business and you'll make more money on the volume than you have ever dreamed of.

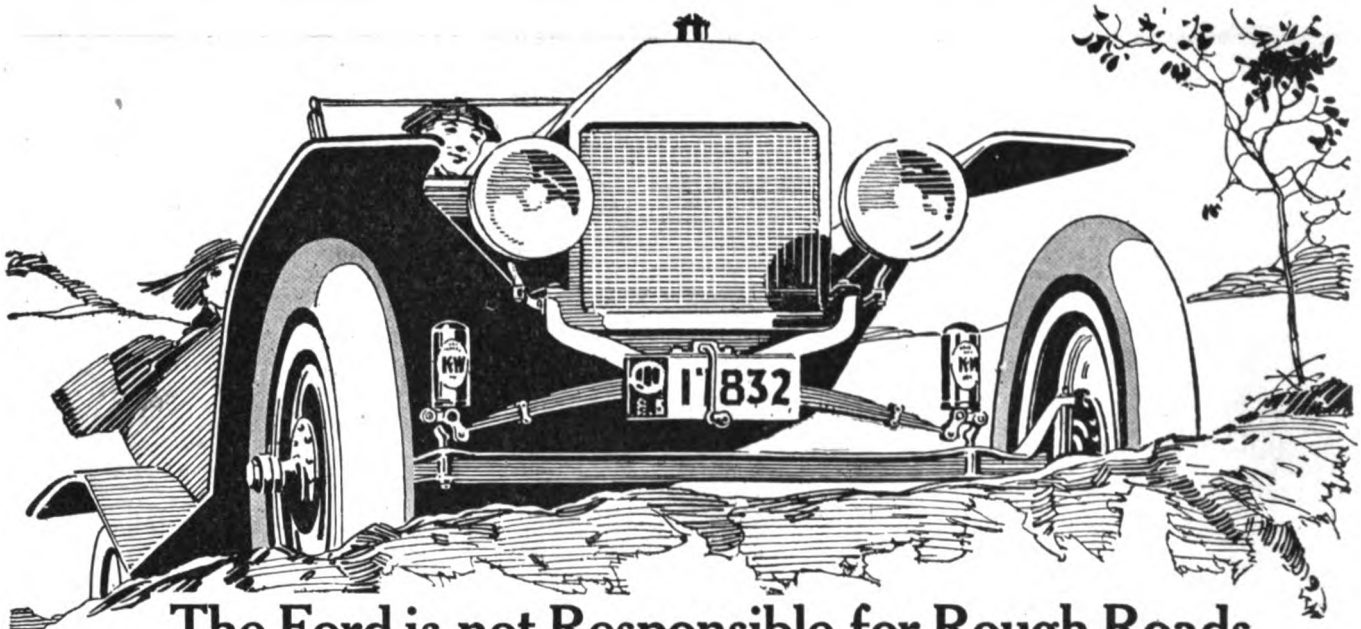
It's the Big Profitable Business of today and tomorrow—this renewal business. Your experience is beginning to tell you that.

Get in Right on It by writing us today for our special service and sales station proposition.

Pumpelly Battery Company

Indianapolis, Indiana

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The Ford is not Responsible for Rough Roads

But no matter how rough the roads or how fast you drive you can ride smoothly over every inch of the roughest roads when you equip your Ford car with

TRADE K-W MARK REG U.S. PAT OFF

Road Smoothers

QUICKLY APPLIED TO YOUR FORD CAR

Give you Ford car advantages, with heavy car comfort

In Buying, Here's What You Must Look For in Order to Combine Comfort, Safety and Economy:

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost *twice the length of spring action* or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.

$15 SET OF FOUR ONE FOR EACH WHEEL



K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all these vital factors *only* in K-W Road Smoothers.

That is why they lengthen the life of your car, by eliminating shock and vibration. Tire economy is assured, because K-W Road Smoothers enable the wheels (not the whole body of the car) to follow the contour of the road. That means no grinding off the rubber of the tires. K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary, except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your cars' usefulness, and bring you home with "that satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet, "That Satisfied Feeling".

TRADE THE K-W IGNITION CO MARK

2817 Chester Ave. CLEVELAND, OHIO. U.S.A.

Makers of 125,000 K-W Master Vibrators

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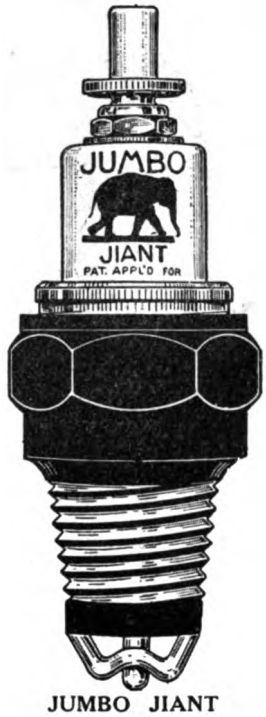
JUMBO FORD

Specially designed for Ford motors. Retails $0.75.



JUMBO JUNIOR

For medium type motors. Retails $0.75. Made in ⅛ A.L.A.M., ½ inch, and Metric sizes.



JUMBO JIANT

A heavy-duty plug for heavy-duty motors. Retails $1. Made in ⅛ A. L. A. M., ½ inch, Metric, and Special Buick sizes.

The name Red Elefant marks the spark plug that's right—

rightly designed—rightly built— rightly priced—right in every way!

Take Another Look

Glance again at the types we've illustrated. Don't they impress you as pretty husky plugs that would take their daily punishment without whimpering? Red Elefant plugs do behave most beautifully under all sorts of conditions. *Guaranteed for a year.*

Get Ready for the Demand

We're stirring up a lively business in Red Elefant plugs. You're bound to hear from our advertising in farm papers and automobile magazines. You'll find that Red Elefant plugs no sooner march in on your shelves than they march right out again.

Answer This—

What's the use of stocking 157 varieties of alleged spark plugs when you know very well there are only two kinds—punky plugs and those that make good? Red Elefant plugs are in the front row of the "make-good" brand—and they're not overcrowded for room in this preferred position.

Your Customers Will Say, "Bully Plugs!"

Send us a trial order. Sell your crankiest customer a set. Tell him to give the Red Elefants the third degree of use and abuse. When he reports—as he surely will—"Bully good plugs; give me a spare set"—then you'll send us a nice fat order.

Do we get this "I'm from Missouri" trial? Here's hoping!

Free to Dealers

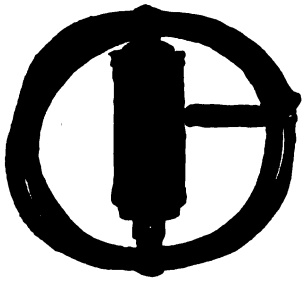
Having trouble with collections? Here's where we can help you. Let's send you three letters that have proved 90% efficient in getting the money and retaining the customer. Write "Dealers' Service Dept."

Gibson-Hollister Company

3389 Washington Street **Boston, Mass.**

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UTILITY



PRICE $10.00
Complete with
Pneu-Meter

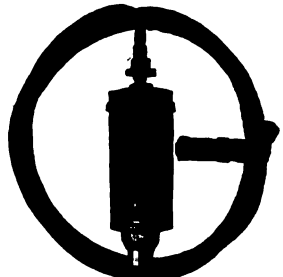
THE ONLY TRULY AUTOMATIC TIRE PUMP ON THE MARKET

The Pneu-Meter installed on the hose line prevents over inflation as well as under inflation. Connect your pump, set your Pneu-Meter at the right pressure, start your engine and forget it.

You don't have to watch your pump—the Pneu-Meter does it for you—when your tire is properly inflated, it becomes a **Safety** blow-off valve, using excess pressure to sound a continuous signal. **So simple a woman can work it.**

PRICE $2.00

UTILITY Jr.



PRICE $6.00
Complete with
Pneu-Meter



WHISTLING PNEU-METER

Sold separately and can be installed on the hose line of any other spark plug or gear driven pumps, garage air tanks, etc.

Absolutely accurate and cannot get out of order. Whistles loudly and can be heard fully a block away, and will continue until the engine stops.

Over and under inflation decreases the life of your tires. This is due to the use of tire pumps which are equipped with ordinary dial gauges and which at the best are inaccurate. This trouble and expense can be absolutely avoided by using **Utility Pumps equipped with Whistling Pneu-Meters.**

Smallest and fastest—simplest and best constructed pumps ever made—**absolutely safe.**

Built of rust-proof bronze, brass and nickeled steel. **LASTS A LIFETIME.**



7", 6" and 5" Long Respectively

The UTILITY Socket Wrench Set

A New Principle With Many Advantages

Has all the advantages of socket wrench sets consisting of fourteen wrenches, with none of their faults. Instant in adjustment. No screws to manipulate, or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench.

SOME NEW FEATURES

Will grasp any nut instantly and requires no further effort to hold wrench in place.

In removing, the jaws hold nut firmly at all times, so it cannot fall or become lost. On the other hand, nut can be placed in jaws and applied to bolt or screw when same is inaccessible to the hands.

Unequalled for use in Garages and Machine Shops, in fact, wherever nuts and bolts are used.

Will take all nuts from ⅛ to ½ inch, inclusive.

Will take all nuts used in auto work.

Will take hexagon nuts, square nuts, wing nuts, cock nuts, and nuts rounded or distorted by use of other wrenches.

Cannot slip and bruise fingers of workmen. as jaws have rigid bearing on four sides—the harder you pull, the harder the jaws grab the nut.

Look at its wonderful advantages and then look at the price.

Utility Wrench Set Complete, $2.50

Packed in neat canvas bag.

Write for Our Dealers' Proposition.

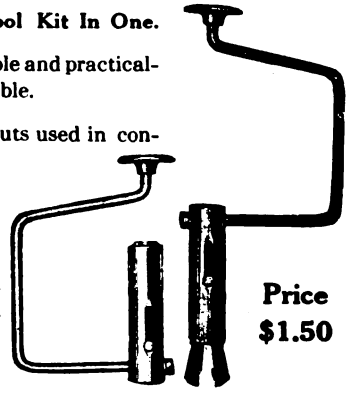
THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

Small, simple and practically indestructible.

Takes all nuts used in connection with demountable rims.

Wrench can be folded when not in use.



Price $1.50

THE HILL PUMP VALVE CO.

18-22 EAST KINZIE STREET CHICAGO, ILLINOIS

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Exclusive territory is now being alloted to jobbers and dealers for the sale of Walsh Tires and Walsh Tubes (Single cure wrapped tread process).

The field is now open for you to step in with us and build up a permanent profitable business on Tires and Tubes that are made to give maximum service for minimum prices.

Dealer discounts are very liberal.

There will be no competition in your territory,—

You will be the exclusive representative.

WALSH TIRES
AND
WALSH TUBES

are made in a daylight factory, with an up-to-the-minute equipment, by an expert manufacturing organization. A very low overhead expense is one reason we can offer such liberal dealer discounts.

Both gray and brown tubes are made with a quality and at prices that make them a splendid "repeat order" proposition.

We will brand under your own name, if desired.

Your application for samples and prices will be given immediate and courteous consideration.

Walsh Tire & Rubber Company

Factory and Sales Office

400-440 Hanover Street Pottstown, Pa.

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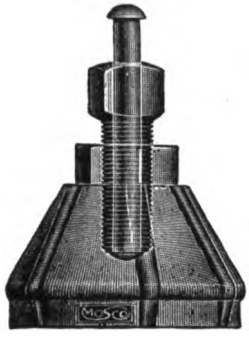
MOSCO SPECIALTIES



FOGG HORN FOR FORD AND METZ Cars

Still going. Still blowing its clear, mellow signal on thousands of cars throughout the land. Some of the skeptics tell us that the electric horn has supplanted exhaust whistles, but we notice that the old reliable FOGG continues to sell. The reason? Because it is the horn located between the engine and the muffler where it gets the full blast of the gas. Also because it has a cut-out in the body so that in buying the FOGG you get two devices in one—a signal and a cut-out.

Price with Cut-Out, $5.00 Without Cut-Out, $4.50



MOSCO (Loose Plunger) Wheel Pullers

Nos. 2, 3, 4, 5 and 6

No. 2 Fits all Fords, Model T having tapered rear axles. **Price $1.00**

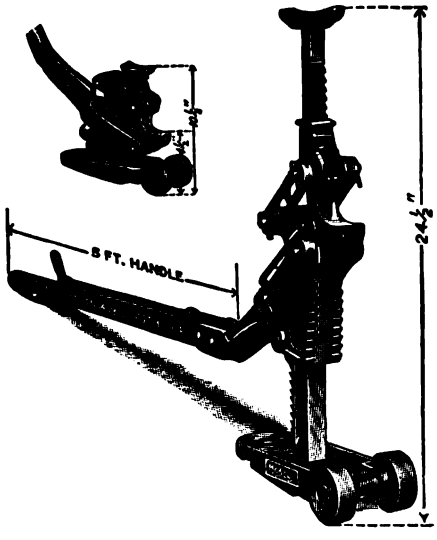
No. 3 Fits all Overland models as follows:
1912 Models 60F and 60T.
1913 " 69R, 69RE, 69F, 69T and 69TE.
1914 " 79R, 79RE, 79T, 79TE.
1915 " 80RE, 80TE, 81RE, 81TE.
Price $1.25

No. 4 Fits all Buick Models 10, 32, 33, 34, 35, 36, 26, 27, 24, 25, B24, B25, C24, C25. **Price $1.25**

No. 5 Fits all Buick Models 16, 17, 19, 21, 28, 29, 30, 31, 41, B36, B37, B38, C36, C37. **Price $1.50**

No. 6 Fits all Maxwell Models, 25 of 1914 and 1915. **Price $1.25**

Patented March 24, 1914. Dec. 15, 1914.



"EXCEL" GARAGE JACK

A Heavy, Powerful Tool for Rapid and Easy Handling of Large or Small Cars

In the Garage, in the Repair Shop, on the Wash Stand, at the Tire Service Station, for Wrecking Crews, for Applying Tire Chains for the thousand and one purposes of business establishments where Power and Time Saving are the main consideration this heavy duty device alone fills the requirement. No other Jack embodies the features of quick action and powerful leverage found in the Excel.

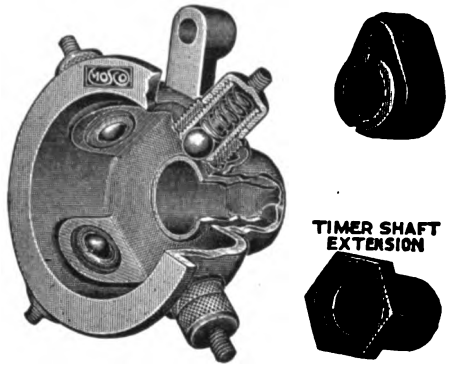
Liberal Discount to Garages and Dealers.

Price, East Mississippi River, - - $16.00
Price, West Mississippi River, - - $18.00

The New BEMUS TIMER

FORD CAR TYPE

Bemus Timer Patents
Sept. 24, 1907
Dec. 17, 1907
Feb. 16, 1915
Others Pending.



BEMUS BALL CONTACT TIMER

Every practical man who knows the Ford car recognizes the fact that this short stroke, high-speed engine requires a Timer capable of rapid, snappy action in the making of contacts and yet having durability sufficient for thousands of miles of running without loss of efficiency.

THE BEMUS IS BEST FOR THE FORD *BECAUSE*

CONTACT is made by a hardened tool-steel brush engaging steel balls with short, glancing impacts, both the brush and the balls turning each time so that fresh contact surfaces are continually engaged.

MOUNTING is direct on the time shaft by means of an extension piece. This brings each of the balls equi-distant from the brush. Result—absolute precision of timing.

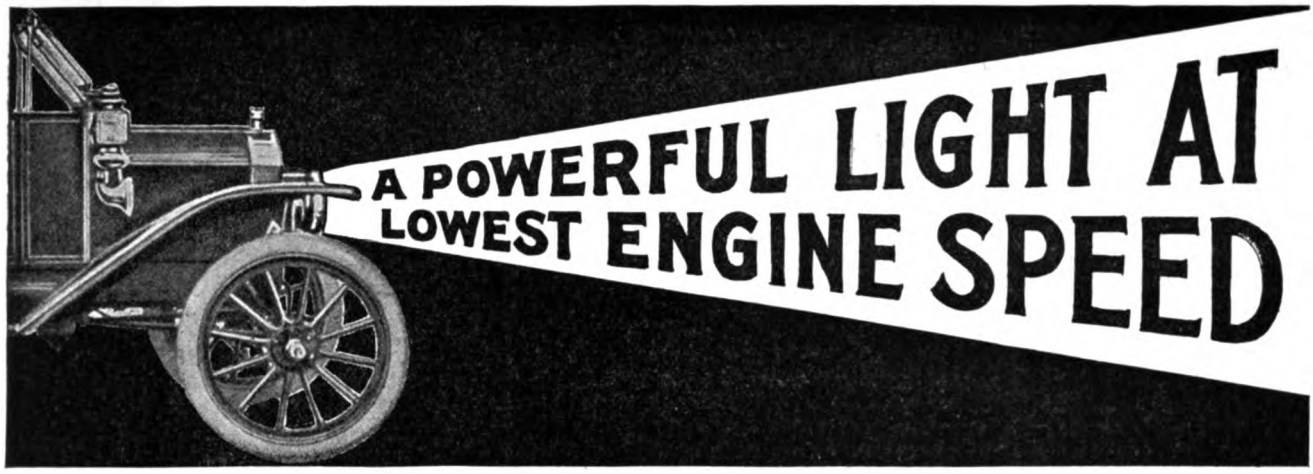
STARTING is facilitated in cold weather because these contacts do not hold a body of oil to prevent passage of current.

DURABILITY of unlimited extent is due to a construction which eliminates all wear of the insulation. The roller brush is reversible, and when worn on both sides may be replaced by the user together with new contact balls at an expense of a few cents.

PRICE $2.25

MOTOR SPECIALTIES COMPANY
MANUFACTURERS, WALTHAM, MASSACHUSETTS

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The New York Automatic Head Light Controller For Ford Cars

PRICE, $5.00

PATENT APPLIED FOR

Uses the regular Ford magneto, no batteries, charging devices, or complications. Every Ford owner will be vitally interested to learn that we have perfected a device that is applied by anyone in ten minutes, which will cause the regular electric light equipment on Ford cars (that have been installed by the owner or by the Ford Company) to deliver a powerful penetrating light at all speeds, *including the lowest speed at which a Ford car can be run.*

The Controller is *entirely automatic* in *operation* and at the same time wonderfully simple in construction. In addition to furnishing a strong light at all times, it prevents the burning out of the lamps at excessive engine speed. All the labor necessary is the removing and replacing of a single bolt together with the simple connecting of three wires.

No belts, gears, or moveable connections to the engine are employed.

It is the first and only solution to the electric head light problem on Ford cars. A trial of ten minutes will demonstrate its value. Orders filled in rotation received.

Our booklet tells a complete story. Gladly sent upon request.

Address Lighting Department.

New York Coil Company

338 Pearl Street
New York, N. Y.

Western Branch
1461 Michigan Avenue
Chicago, Ill.

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Non-Skid Wrapped Tread

Mattson Unguaranteed Tires

Experienced Motorists in ever increasing numbers are turning toward

MATTSON
Unguaranteed Tires

They have discovered that they average better value—service and cost considered—than other kinds.

Nobody knows the life of a tire because nobody can foresee the conditions under which they will be used.

Under favorable conditions a tire will last longer—*guaranteed or unguaranteed*—than under unfavorable conditions.

MATTSON Unguaranteed Tire prices have decided thousands of motorists to try them. The Results MATTSON Tires give invariably decide them to keep on using them.

With increased and improved facilities—made necessary by the growing demand—we are entering upon our ninth year in the manufacture of unguaranteed tires.

While we sell only at wholesale we will be glad to tell you where you can get Unguaranteed Tires.

This information will be valuable, for you can save considerable in your tire expense by using MATTSON Unguaranteed Tires—Plain Wrapped or Non-Skid Treads.

Ask your dealer about the other famous MATTSON Rubber Accessories.

- ¶ High Grade Guaranteed red inner tubes.
- ¶ Reliners, Heavy, Medium, Light, Extra.
- ¶ Service tread boots — Lace-on — Hook-on.
- ¶ Blow-out patches.
- ¶ Repair Stocks for casings and tubes.
- ¶ Cementless patches.
- ¶ Hose connections for radiators, lamps, etc.

MATTSON RUBBER CO.

— Lodi —

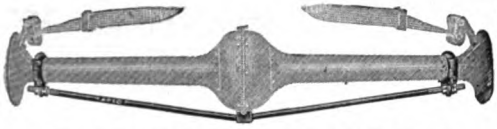
Bergen County New Jersey

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Five New TRADE APCO MARK Specialties

For Sale By All Live Jobbers and Dealers

REAR AXLE TRUSS



The Rear Axle on the 1915 Ford Car has been strengthened about 50% over any previous type, and this is not the first year that improvements have been made on this unit. To strengthen the old cars we offer the APCO Truss which is made from steel rods and semi-steel castings finished in black enamel. The rods are one-half inch in diameter and strong enough to give the axle the stiffness lacking in its original construction. The clamps go around the castings at the extreme end of axle housing, and do not put any strain on the pressed steel parts. The cradle that fits under the center of the housing is fitted with square sockets to accommodate the square heads that are made integral with rods. Bolts for clamps are square headed sunk flush in square sockets to prevent turning and to improve appearance. The whole outfit comes packed in a corrugated box 24" long and weighs 5½ pounds. If your axle housing leaks grease or your rear gears are noisy you need an APCO Truss to remedy the trouble. If not you need the Truss to prevent it. Installation is a matter of ten minutes with no tools but a wrench.

PRICE Complete $1.50

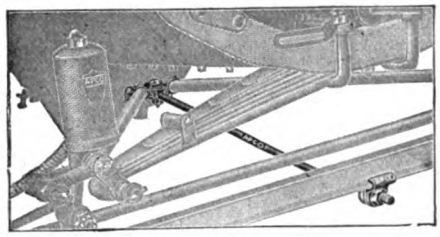
SPRING LEAF LUBRICATORS



One concern selling an oiling or lubricating device for the leaves of automobile springs spent $20,000 advertising their product during last year. Another spring maker makes great claims for his springs because they are self-lubricating. There is no question about the advantages of having the spring well oiled. It's only a question of the means. The APCO Lubricator as shown in the cut consists of a pair of plates with oil reservoirs and felt inserts. These inserts soaked with oil rest against the sides of the spring leaves and give them constant lubrication which increases the riding qualities 100%. They are made from semi-steel, black enameled and are guaranteed to do the work as well as the highest priced article on the market. Set includes four pairs, two pairs for each spring. The only ones on the market that oil both sides of spring.

PRICE Complete $2.00

FRONT AXLE BRACE



The front radius rod on the Ford is made of tubing in which there is more or less spring or give. This give causes the bottom of the front axle to tip or bend back in going over rough roads, causing an unsteadiness in steering. The APCO brace consists of two ingenious clamps and a half-inch steel rod with a square head made integral. One of the clamps is attached to the extreme end of the front axle truss rod with three bolts, all having square heads to prevent turning, and the square head on the rod is held in this clamp. The other clamp is attached to the front axle and is held there by two nuts on the rod which go thru clamp. This device is one of the best accessories we have ever offered and is one that you need. Finished in black enamel. Can be put on the car with a wrench in five minutes. Packed in a corrugated box 23" long, weighs three pounds. There is no need of adding twenty pounds to the weight and five dollars to the cost of your car when ours will do the work. A new radius rod costs $3.00, you will never need a new one if your car is equipped with an APCO brace.

PRICE Complete $1.50

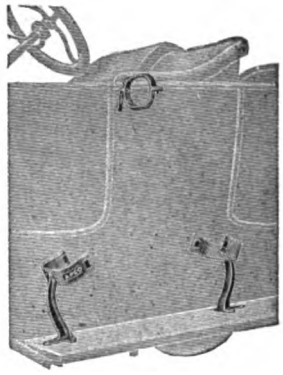
VALVE STEM PACKINGS



When the valve guides on an engine wear it is impossible to get a perfect mixture as air is drawn thru the space between the valve stems and the wall of the guides. This results in a skip that is impossible to find, especially at low engine speeds and full power cannot be obtained from the engine, as part of the suction stroke is wasted by drawing air by the valve stems. The APCO packing consists of a special steel stamping and felt washer which is held in position by valve spring as shown in cut. When in position the felt both prevents air from entering the cylinders and also lubricates the valve stem preventing further wear. They are necessary on the new cars as well as old, and the installation in either case is a matter of a very few minutes without tools of any kind.

Price per set of Eight 50c

SIDE TIRE HOLDERS



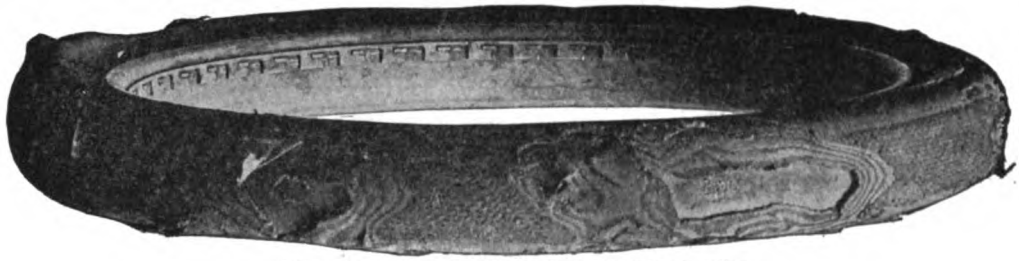
There are so many new rear tire holders on the market that the public is inclined to overlook the good points in favor of a side tire carrier. Absolutely the only advantage of having the tires on the back of the car is that of balance, and as a pair of shoes weighs but 20 lbs. this is purely an imaginary one. There are hundreds of reasons, however, why you should use APCO Side Tire Holders, and the following are a few, any one of which is sufficient for you to decide in their favor. 1. They keep the tires clean. 2. They keep the tires away from the hot exhaust. 3. The tires can be removed in five seconds and replaced in same time. 4. They can not be lost off the car. 5. They are much neater in appearance. 6. They can be installed in ten minutes. 7. With them it is possible to carry a trunk at the rear. 8. They make unnecessary the changing of tail light location. 9. They weigh seven pounds less than the lightest rear holder on the market. 10. There are no straps to lose or break. 11. Price is the lowest of any tire holder on the market, irrespective of advantages. 12. Special catch on top bracket locks automatically when closed and lock need not be used unless wanted. 13. Screws that hold bracket to body cannot be removed with tires in place. 14. Lock is solid brass mail type which opens automatically when key is turned. 15. Lock clasp is rubber covered to prevent rattle. Furnished in black enamel only. Packed in corrugated carton 6"x11"x7½" and weighs seven pounds. Complete with bolts, screws and lock. Will fit two 3½" tires or one 3" and one 3½".

PRICE $2.00

AUTO PARTS CO. - Providence, R. I.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Your tires may often be worn down like this without danger of blowout or tire trouble.

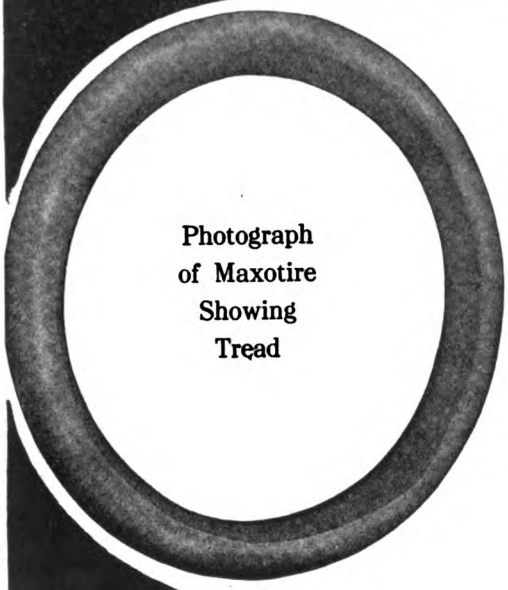
You may now run your tires until there is little left of the outside shoe.

The secret of it all lies in the MAXOTIRE which is in reality a perfect tire having a rubber tread, fabric and bead. The MAXOTIRE is so scientifically constructed that it fits the inside of your tire perfectly. It leaves ample space for your inner tube and protects it from being damaged in any way.

The layer of very tough rubber covering the tread surface of the MAXOTIRE acts as a cushion between the MAXOTIRE and the outside shoe.

When the tire strikes a stone or is put to any great strain, this elastic rubber between the two fabric bodies of the tire and the MAXOTIRE equalizes the strain of both and prevents fabric breaks as well as blowouts.

·MAXOTIRES·



Photograph of Maxotire Showing Tread

Nothing like the MAXOTIRE has ever been sold before

Rubber-treaded MAXOTIRES make your tires practically puncture-proof. Tacks cannot reach the tube, while spikes or nails are invariably turned aside.

When MAXOTIRES are placed in tires this tough rubber tread comes in contact with the inner surface or fabric of the tire. This rubber tread clings to the tire like an overshoe to the sidewalk. There is, consequently, no friction; no heat generated; and no chance for the MAXOTIRE to slip and injure the inner tube.

Smaller inner tubes are not required for use with MAXOTIRES; however, they can be used with success at a saving to you of about 25% of their cost.

USE MAXOTIRES

HAVE TWO TIRES PROTECTING YOUR INNER TUBES

Take No Chances This Spring. Equip your tires with MAXOTIRES before taking your car out. While your car has been standing idle during the **winter,** your tires have deteriorated. They are in much worse condition than the outside appears. Tires blow out in nearly every case before the tread is hardly worn. This is due entirely to internal weakness which no one is able to discover.

MAXOTIRES will make your tires **trouble proof** during the coming season and enable you to get the full wear out of every tire. They are not an experiment but the result of seven years' experimenting by the people who invented the first reinforcements for automobile tires.

AUTO OWNERS: See your dealer, he may have MAXOTIRES in stock (for many have), however, if he hasn't—write for our complete free illustrated catalog and prices, express prepaid.

K & W RUBBER COMPANY

8-20 3rd Street, Ashland, Ohio

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An Expert Opinion On Micro Piston Rings

"The writer personally tried out Micro Piston Rings and found that they are without question the best piston rings obtainable.

"These rings were put in cylinders that have been run from one to four years, without being reground or re-machined, which, in about 36 hours test, gave perfect compression. This I believe to be all you could ask of any ring."

C. A. HERVEY, General Superintendent,
SEAGER ENGINE WORKS, Lansing, Mich.

Coming from such an authority as Mr. Hervey, this should be convincing. If you too would "personally try out Micro Rings" you would become equally enthusiastic.

Users all root for Micro Rings because Micro Rings actually **do** what ordinary piston rings **cannot** do—that is assure **lastingly** perfect compression and the fullest degree of useful work from the explosive mixture.

The sealed openings in a Micro Ring (see picture), remain as tight when the ring gets old as while new, instead of gradually opening up and weakening the force of each explosion as with plain rings.

The compression is further protected with Micro Rings by equalized pressure and by three distinct contact surfaces all around the cylinder wall. Gasoline and lubricant are kept on the respective sides where each does the most good. In other words, every bit of power is made available in going up hills or pulling heavy loads, and absence of excess oil in the combustion chamber reduces carbonization, and the tendency toward overheating, leaking valves, and smoky exhaust.

Micro Rings positively will not break or take a permanent set in fitting. The flexibility which we obtain by individual casting from specially processed fine-grained gray iron permits safe removal and replacement of Micro Rings any number of times.



Micro Piston Rings
The watchdog of a motor's power.

Your judgment in selecting Micro Rings will be more than vindicated on the first installation and you can make the trial at our risk. Business fairness, extensive manufacturing and rigid inspection to micrometer accuracy put backbone into our guarantee.

If your jobber cannot supply Micro Rings don't accept a substitute and be disappointed. Write us direct.

Micro Piston Ring Co.

1960 Broadway - New York

MICRO PISTON RING CO., 1960 Broadway, New York
Please send booklet and prices on Micro Piston Rings.
NAME.....
ADDRESS.....

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Your Old Car Is Worth Ten New Ones

if you only *know how* to cash in its possibilities in Family benefit.

With your permission we propose to *show you* thru the coupon below:

To many Automobile owners it may sound strange when we state so emphatically that Automobile Tours with parties of men, women and children (of any age), over any desired distance, may be made with far greater Safety, Comfort and Pleasure than is possible when traveling in Pullman parlor trains, but we do mean it and will prove it.



Have a Family Picnic Every Touring Day.

The desirable advantage of exclusiveness, independence and unexcelled sight-seeing possibilities while traveling by Automobile, saying nothing of reaching the far out-of-way places so entirely impossible to the railroad traveler, are the points of advantage universally admitted by everyone and need no mention here.

The detail that is not so generally known, however, is: How to equip a car to eliminate excess baggage and useless expense but still maintain every comfort and pleasure of the boulevard spin for each and all the passengers throughout the entire tour. Many car owners who have had reverse experiences, or, say road disappointments, may be a little skeptical because they failed, but we want every reader to be absolutely assured that all past failures have not been without real reasons.

Our experts are past masters in Touring, and after crossing and re-crossing the continent many times, touring and camping with their wives and children, their experience has eliminated many common errors, and like almost everything else in this life, there is a right and wrong way to start. In Automobile touring the right way happens to be much the easiest and far less expensive. We will be only too glad to help all interested Automobile owners for whom a special number of the SERVICE NEWS will be issued June 1, 1915, and copies promptly mailed to all applicants sending in the coupon request.

Kansas City Automobile Supply Co., Kansas City, Missouri.

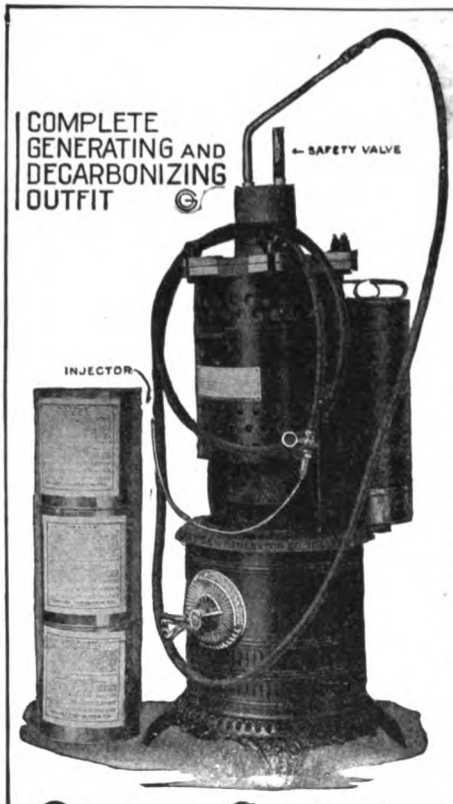
THE LARGEST MOTOR TOURING AND CAMPING EQUIPMENT SPECIALISTS IN THE WORLD.

K. C. AUTO SUPPLY CO.
KANSAS CITY, MO.

Dear Sirs:
I have a_____Automobile
You may send me a free copy of your Touring number. All I agree to do is look it over.

NAME _____

ADDRESS _____



An Oxygen Carbon Remover and Generator $15.00

Tank Nuisance Eliminated.

Complete in every detail. Thoroughly guaranteed.

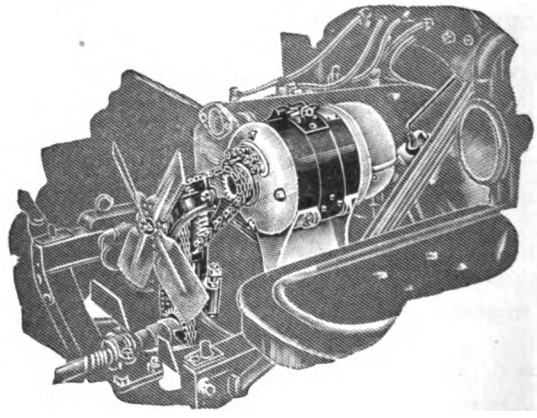
Removes Carbon from a cylinder in three minutes without dismantling the motor.

A money saver and maker. Write for Particulars.

Oxygen Generator Co., Inc.

301 River St., TROY, N. Y.

Manufacturers of Stationary and Portable Generators. Decarbonizers, Reducing Valves, Etc.



North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

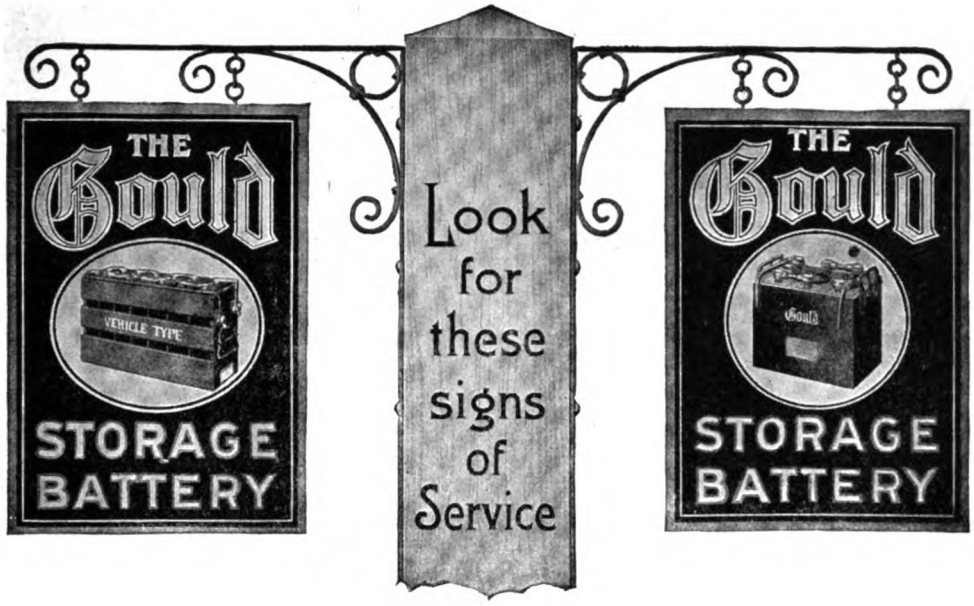
"Universal" System for Any Make of Car.

Ask for Bulletin 33-A

North East Electric Company

ROCHESTER, N. Y.

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Guaranteed Battery Service

A New Protection Inaugurated By The Could Storage Battery Company

Believing that motorists are entitled to the fullest assurance of good starting and lighting service, this company has decided to broadly guarantee satisfaction to every customer.

Any Gould Starting and Lighting Battery sold after this date and not fully justifying our claims will be replaced **with liberal readjustment on the price of a new battery.**

This radical departure from the past policy of battery manufacturers, now offered for **the first time,** and **offered exclusively by us,** enables you to buy your battery service just as you buy tire service from reputable tire makers.

Demand this protection. Insist upon a **Gould Guaranteed Battery** on your new car, or if the battery on your present car is faulty, replace with a **Gould Guaranteed Battery.**

Any of our representatives will install a Gould Guaranteed Battery suitable to meet electrical requirements and fit the battery box on any car. Put yourself **on the safe side.**

DEALERS! **Cut or tear along this line after filling blank and mail**



Please advise me about your agency proposition and quote price on

Starting and Lighting Battery for..... .....car (State make, model and year of car).

Renewal plates for battery driving.....electric car (State make, model and year of car or truck).

Name..... Address.....

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BRUNNER AUTOMATIC AIR SUPPLY

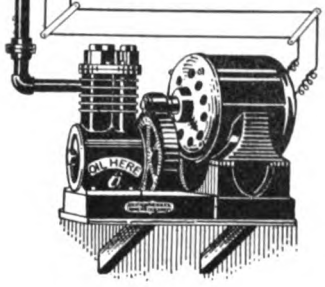
BRUNNER

THIS DOES THE TRICK

115 TO 140 LBS. ALL THE TIME

AUTOMATICALLY CONTROLLED

"Always on the Job"



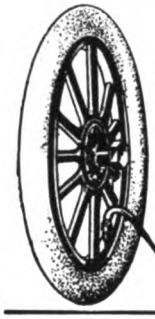
A BRUNNER AUTOMATIC AIR COMPRESSOR OUTFIT WOULD IMPROVE YOUR SERVICE JUST ABOUT 100%

A **Brunner Automatic** would save you time and operating expense—and **eliminate your air compressor troubles**—because it is a practically constructed, mechanically perfect equipment that has proven by many years of satisfying service to be the "best ever." Any garage man who has one, or any jobber who has ever sold one, will tell you this.

The Brunner Automatic Controller Never Lays Down

because it is a large husky, correctly designed and well constructed instrument built to "stand up" and give you **Brunner Service,** and to you **Brunner Service means** the **best possible service**—if you have ever had your troubles with a cheaply constructed unreliable automatic controller you can appreciate what it would mean to you to have a Brunner Automatic in your garage, it would mean—less worry—less expense, and it would mean more trade and better trade.

It Will Pay You To Investigate The Brunner Line



You might not need a Brunner Air Compressor Outfit right now—but you may need one any minute, and a No. 12 Brunner Catalogue with the name of the Brunner Jobber near your town would be a handy thing to have about the place—because we always carry a large complete stock in our warehouse ready for shipment and a telegram from a Brunner Jobber will start one your way instantly.

PLEASE BEAR IN MIND:—Our plant has been devoted to the **exclusive manufacture** of **Garage Air Compressor Equipment** for many years and there are over 17,000 Brunner Air Compressor Outfits in successful operation—it is not a troublesome side line proposition with us—it's a serious business—and we understand it.

Write for Catalog showing our full line and the name of the Brunner Jobber who covers your territory.

BRUNNER MANUFACTURING COMPANY - - UTICA, N. Y.



For the thorough overhauling at the garage, for the sudden emergencies which arise on the road, or for the week-end tinkering by the car owner, there is no one tool that will do as much as the

Starrett Ratchet Wrench

BY INVITATION MEMBER OF

NEW YORK U.S.A.

It will turn any standard nut or bolt in all sorts of difficult places;—places where the ordinary monkey wrench is useless. The ratchet permits rapid action with only a short arc swing. The extension reaches into otherwise inaccessible places. The drilling attachment furnished with the wrench takes any square shank twist drill from ⅛ to ½ inch. A reversible screwdriver makes it handy for turning screws of various sizes.

The L. S. Starrett Co.,
World's Greatest Toolmakers
Athol - Mass.

This complete outfit sells for only $15.00. You'll find it a valuable outfit if you have a garage, and you can make profitable sales on it as a dealer. Write to us now for information, prices and catalog No. 20 D.C.

42-243

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No Danger—If the Brakes Hold!

You who sell brake lining will multiply your sales and at the same time do the right thing by your customers, if you will make the following two suggestions your rules:

1. Test the brakes and brake lining on every car that comes into your hands. Not a slow-stop, but a real test—an emergency test.
2. Sell Thermoid because it is 100%—first to last—because Thermoid can be trusted with LIVES.

Thermoid
HYDRAULIC COMPRESSED
Brake Lining-100%

Thermoid is honest brake lining all through. There's the same gripping friction at the core as on the outside. It is forced by hydraulic compression into a substance of uniform density, and, though worn paper-thin, it still grips and holds instead of being loose and stringy inside with just a thin friction surface, like the ordinary, loosely-woven brake lining.

Watch the brake lining—guard safety with 100% Thermoid



Cannot be burned out nor affected by oil, heat, water, gasoline, dirt.

THERMOID RUBBER COMPANY

TRENTON, N. J.

Our Guarantee: Thermoid will make good, or we will.

Carbon removed

for

5c. to 12c. per cylinder

And as *thoroughly* as the best job you ever saw! Simplicity itself. Takes fifteen minutes. Absolutely harmless to everything except carbon, which it abolishes.

Real Authorities

use and endorse it

Besides this endorsement we have the strongest kind of letters; from the Sales-Managers of well-known Auto Manufacturers—from auto Engineers, Superintendents, Public Officials and hundreds of other enthusiastic users.

Mr. GLENN CURTIS

"A single application will loosen and remove the carbon, clean the plugs and... increase the power and efficiency send me ten cans."

GUARANTEED OPCO OIL PRODUCTS **CARBON REMOVER** GUARANTEED OPCO OIL PRODUCTS

has real MERIT—it is PRICED RIGHT. One of the best repeaters known—a very small number of dealers sold over 15,000 cans in 9 months.

DEALERS OWNERS

Get Offer and Booklet

The demand for a good Carbon Remover is lively; the margin on OPCO is liberal. Get Free Booklet, Prices and Terms—write

American Oil Products Co.

BUFFALO, N. Y., or

248 Boylston Street, Boston
635 Rialto Building, Kansas City, Mo.
13 So. Garfield Avenue, Alhambra, Cal.

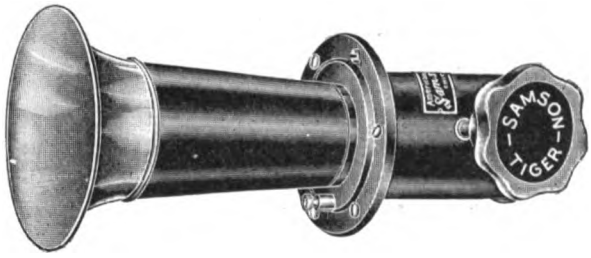
H. Channon & Co., Chicago

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The art of profit making

One criterion only can be used in measuring the success of any business. How much ***net*** profit has been made, is the acid test for the retailer as well as the manufacturer to use. Unless there is something left out of the proceeds of the business after the cost of doing business (which includes the interest on your money and wages of management) has been deducted there is something wrong.

Maybe your margin of profit is too low. Maybe the manufacturer has charged you up with wasteful general advertising. No excessive advertising charges are figured in on the cost of the Samson-Tiger hand horn. It is offered to the dealer at a fair list (**$5.00**) with a profit-making discount. Write today for dealers' discount and sample horn at our expense.



The Samson-Tiger Hand Horn

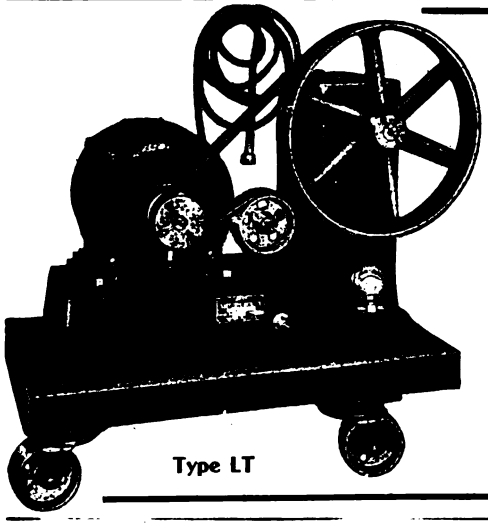
is the only shaft-driven horn on the market. It is not a "push type" horn with a plunger or lever to stick, but is always ready to operate. It has a one-piece brass projector; it is beautifully finished in black with brass or nickel trim, and the tone volume is unequalled in any other hand horn produced.

Note: "Dealer helps" is the kind of advertising you want, and the kind of advertising we believe in. To our dealers we supply effective literature and beautiful counter display signs merely for the asking.

AMERICAN ELECTRIC COMPANY STATE AND 64th STS. CHICAGO

Manufacturers of

Samson Automobile Horns



Type LT

THE APEX TWO CYLINDER ELECTRIC AIR COMPRESSOR

For PRIVATE and PUBLIC GARAGES

Pumps air direct into the tire. No storage tank necessary. Attach to any lamp socket.

MANUFACTURERS OF

The Famous "YANKEE" FOLDING TIRE PUMP

and

APEX MULTIPLE-CARTRIDGE ELECTRIC SOLDERING IRONS

APEX ELECTRIC MFG. COMPANY

1410-12 West 59th Street CHICAGO, ILL.



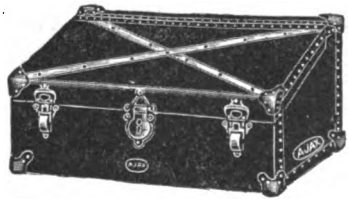
Buick Roadster C-24

Empty $11
With Two Suit Cases 17

AJAX TIRE TRUNKS

—

LUNCH OUTFITS



The First and Largest Mfrs. of AUTO TRUNKS in the World.

Monroe 1915 . . Price, $9

At All First-Class Dealers and Supply Houses

OR AT

AJAX TRUNK & SAMPLE CASE CO.

91-93 MERCER ST., NEW YORK

Write For Complete 1915 Catalogue



Buick Fender

Fits Models C-25-36-37

Complete with Two Suit Cases $25

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Removes Rims Instantly

HERE is an instantaneous tool that does not touch the tire, but opens the rim lock, overlaps the rim ends, and holds them contracted, to permit the immediate removal and replacement of tires in an *upright position.* Nothing to adjust. Weighs 2 pounds, rust-proof, and fits tool box.

Friestedt Rim Contracter $2.00



"IT OPENS THE RIM LOCK"

For all sizes of Kelsey and Stanweld Rims. Guaranteed to make good every claim. Order direct or through your dealer.

Dealers: Write today for attractive proposition. 75 per cent of the cars have these rims.

FRIESTEDT RIM CONTRACTER COMPANY
2931-2939 W. LAKE STREET CHICAGO, U. S. A.

Light, Dim Or Extinguish Your Gas Lamps Instantly

from the driver's seat without stopping



Controller Cut Half Size

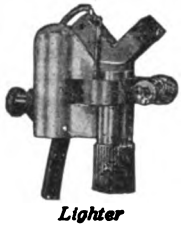
THE INST LIGHTER is the most convenient, successful and troubleproof device of iis kind. On the market five years; now used by over fifty thousand motorists.

This is a complete system, including gas controller, spark coil, lighters, heavy brass tubing, wire, cable, etc., etc. Absolutely safe, mechanically perfect, economical and 100% efficient.

Quickly pays for itself in gas saved. Unequalled convenience.

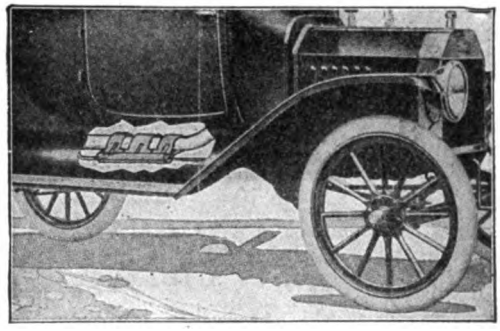
Standard Equipment on America's Foremost Cars

Write today for Profitable Agent's Proposition.



Lighter

1/3 Of Your GASOLINE SAVED BY THE



Economy Gasoline Improver

OR SUPER-CARBURETOR

Cold water will not give off steam, and the best carburetor on earth will not give off real vapor without the assistance of heat, at any time of the year. **Boiling Gasoline** is used at the big races in the middle of the summer.

The Economy Gasoline Improver uses waste heat from the surface of the exhaust pipe to heat the gasoline in the gasoline pipe before it enters the carburetor, greatly increasing the power, improving the running of the engine, decreasing the deposit of carbon and permitting a saving of **One-Third of Your Gasoline. YOU CAN SEE IT SAVE.**

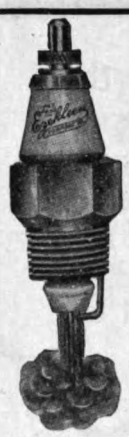
We guarantee that with the **Economy Gasoline Improver** on your car you can turn off the flow of gasoline to the carburetor ⅓ after the engine is warmed up, and still get full efficiency.

PRICE $2.35 **A Special Offer will be made once to each new dealer. Write for it.**

Order through your dealer or direct from us. We ship by insured mail same day order is received. **We pay the postage.**

THE INST LIGHTER CO., 58 East Main Street, Columbus, Ohio

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"EZEKLEEN"

THE ONLY SPARK PLUGS MADE

THAT DO NOT DEPEND UPON THE ELECTRIC SPARK TO IGNITE THE GAS

The EZEKLEEN and Mfrs. SPECIAL SPARK PLUGS have a projecting hollow insulator that is molded in the shell. There is no bushing nut holding the insulator against the shell; therefore, there is no pressure on the insulator to hold the insulator against the metallic compression-tight joint. This projecting hollow insulator is in the flame at each explosion and becomes very hot. Oil or carbon will not stay on this red hot insulator. At each compression stroke of the motor, this hollow insulator is filled with gas. This column of gas becomes very highly superheated and does not need a high voltage spark to explode it. The gas in the cylinder is ignited by the explosion from this superheated mixture that is inside the insulator that is ignited by the electric spark. Therefore, this spark plug does not depend on the electric spark to ignite the gas in the cylinder.

They cannot be short circuited in a Ford car. They are just the thing for a scored cylinder that has poor compression and that rapidly fouls the old time spark plug. They will improve the ignition of any motor that is now equipped with the old time spark plugs.

On sale in all first-class garages. If your dealer does not have them, write for our free trial proposition. You are under no obligations to buy. We have an interesting proposition for a distributing company that can handle a large territory.

THE PERPETUAL SPARK PLUG CO.

DUNMORE, PA.



Manufacturer's Special

WHY REPAIRMEN SHOULD USE Marko



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

"Marko" batteries lead because of their great efficiency and reliability.

STORAGE BATTERIES

Write At Once for Our Proposition to Repairmen and Dealers.

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.

DU PONT FABRIKOID

REG. U. S. PAT. OFF.

OUR HEAVY ADVERTISING Is Making Split Leather A Sales Handicap

WHY try to sell cars upholstered with inferior material when two-thirds of all new cars in 1915 are being upholstered in the improved substitute for splits?

Ask for Free Sample.

Du Pont Fabrikoid Co.
Wilmington, Delaware

Canadian Branch: Toronto, Ontario

SAFETY FIRST

USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D. CHATHAM, N. Y.

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"Build for permanent profits, not for one-time sales"

—Advises Old Man Mileage



Copyright 1914, by the Republic Rubber Co., Youngstown, Ohio.

"There is only one foundation upon which you can safely build your tire business.

"That is QUALITY."

"Mileage, every motorist's supreme criterion of tire value, can come only from quality.

"Republic Tires deliver a greater proportion of uninterrupted mileage per dollar invested than any other tire because they are QUALITY tires, the finest made in the world."

Republic Tires are made in Staggard Tread, the original **effective** non-skid tire, and in Plain and W M Treads, Republic Black-Line Red Inner Tubes and Republic Grey Tubes are Quality Tubes just as Republic Casings are Quality Casings.

Write now for the Republic proposition.

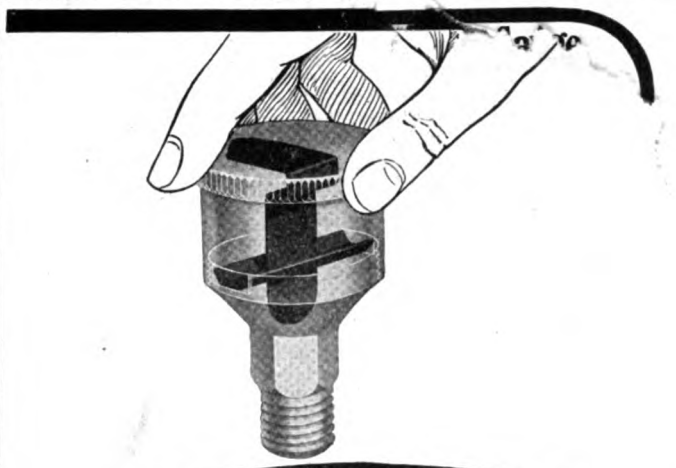
THE REPUBLIC RUBBER CO.

YOUNGSTOWN, OHIO

Branches and Agencies in the Principal Cities



Republic Staggard Tread, Pat. Sept. 15-22, 1908



KLICKET

Ratchet Grease Cup

"HEAR IT KLICK"

You Can't Lose It!

The best and fastest selling ratchet grease cup on the market. Replaced free—if cap is lost or any part breaks. Cap locks as soon as thread engages. Simple, sturdy, interior key prevents cap from working off by itself. Outlasts any car. Made in all sizes and three styles—steel, brass and nickel-plated. Sells at 15c upward.

Makes a loud click as soon as thread engages —and at every ¼ turn. Saves grease and gives perfect lubrication. The "klick" tells how much you have turned it—in dark or daylight.

Handsome Free Counter Display



To every new dealer we give this striking two-color display card—19x39 inches in size. It sits on the counter, in the window, anywhere. Card is punched to carry 3 dozen assorted KLICKETS. They sell at sight. Place it on your counter and get sales you are missing now. Make more grease cup money without any more investment.

Write for Sample

Send 25c for sample KLICKET. Just give inside diameter of cap, size of pipe thread required on bottom of cup, or diameter of bearing hole. Return KLICKET if not O.K. Your 25c credited on first stock order.

Get our attractive dealer proposition and prices. Your jobber will gladly supply you with KLICKETS. Write now.

KLICKET AM. STPG. CO. Battle Creek

American Stamping Co.
600 Burchard St.
Battle Creek, Mich.

Ford Special: Replace both steering knuckle oil cups with brass Klickets for 50c, postpaid.

KLICKET AM. STPG. CO. Battle Creek

(1)

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"NORMA"

Magneto Type

BALL BEARINGS

Get this—more than 75 per cent of the high-speed, ball bearing electrical automobile accessories made in America today carry "NORMA" Bearings as standard construction.

These builders proved the merit of "NORMA" Bearings, before adopting them. Your safest course is to be guided by the judgment of these experienced builders—substitutions are dangerous.

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

"NORMA" *Ball, Roller, Thrust and Combination Bearings*

Cut, Weld and Decarbonize With This One Outfit!

Save time, labor, delay and money with Imperial Oxy-acetylene Combination Equipment No. D-4! Get three complete outfits in one—*for the cost of a single unit!*

Weld broken aluminum cranks, transmission cases, crank shafts, frames, axles, etc., *with remarkable rapidity.* Cut *cleanly* and *narrowly* through iron and steel up to 4 inches thick. Remove every bit of carbon from gas engine cylinders. Install this safe, portable, economical Imperial Outfit No. D-4 in *your* garage!

Let It Pay For Itself!

Learn how Imperial Equipment saves its entire cost in a few operations. Find out all about its wonderful possibilities. *Write today for new catalog and prices.*

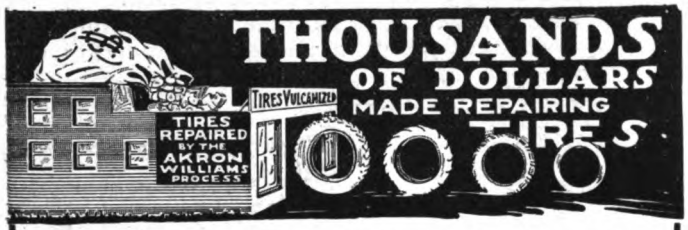
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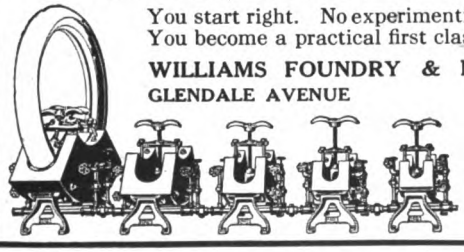
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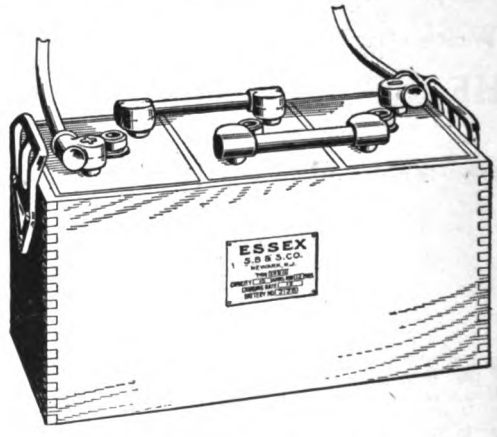
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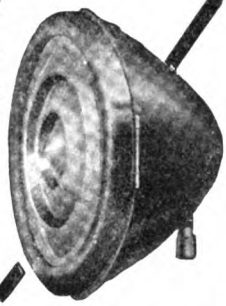
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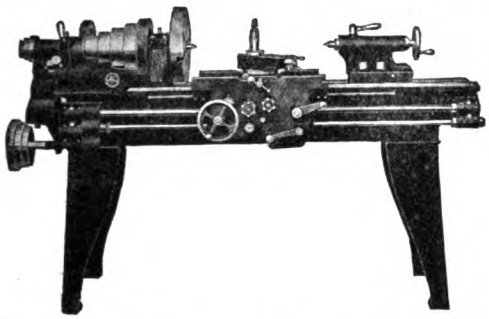
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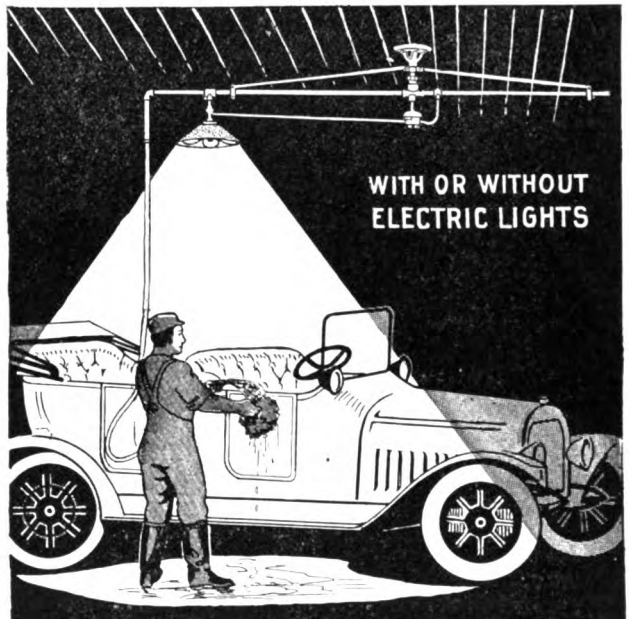
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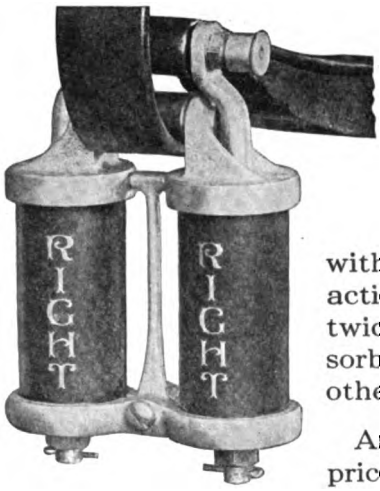
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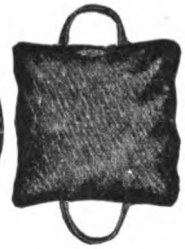
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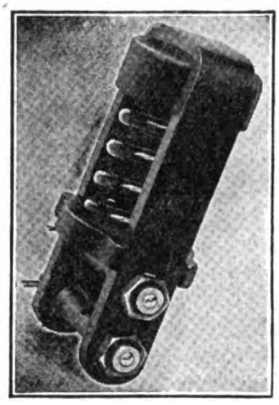
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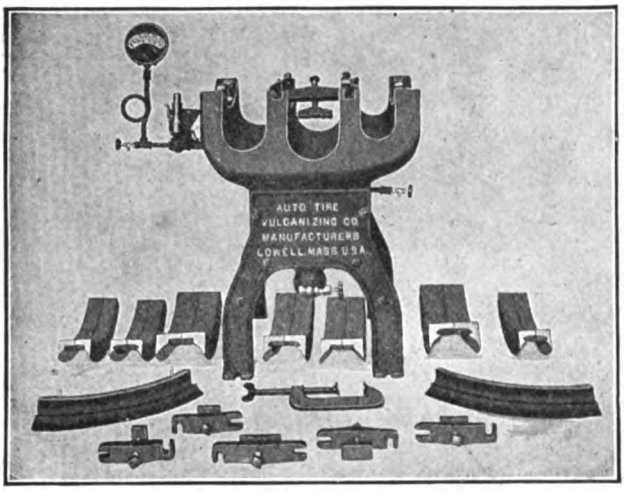
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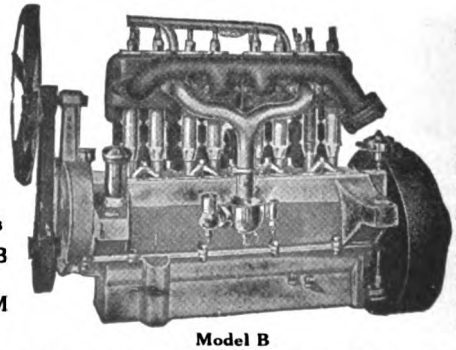
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AUTOMOBILE LUBRICATION.

Conclusion of the Subject with Some Reference to Carbon, Graphite and Acidity.

BY SYDNEY F. WALKER, M. E.

The reason for the tendency to gum has been explained in a previous portion of the article. Mineral oils have no tendency whatever in that direction, and only certain of the vegetable oils. Any tendency to gumminess that would arise, therefore, would be due to an undue proportion of one of the gummy oils in the lubricant. The gumminess referred to has a double effect. It not only causes a deposit of its own, but it also forms a bed for carbon to deposit, so that the evil arising from the deposit of carbon is very much increased.

It is somewhat difficult to give a test that will be satisfactory of the tendency to gumminess. Probably the best test that could be arranged would be to paint a piece of canvas with the oil under examination, and to expose it to a draught of air. The canvas should be suspended in a position where it is exposed to air, plenty of it, but not to the sun's rays; and a measured quantity of the oil to be tested should be employed to paint the square yard of canvas, and it should be left to dry, provision being made of course for the oil to drain off. There should be a certain standard time also for the drying and allowance should be made for the time of the year. In hot, dry weather the drying will take place more quickly than in warm, muggy weather. In cold weather, if there is a sharp breeze blowing, the drying may also be fairly quick. Practical experience will dictate, as in the other cases, how the best arrangements can be made. Probably it will take something like a week to obtain a proper test; though under certain conditions it may take considerably less. In any case, practical experience with different oils will be the best guide. As a preliminary, a number of smaller pieces of the same kind of cloth might be taken, hung in a line where they would all be exposed to the same atmospheric conditions, and all painted with different kinds of oils. One of them should be painted with good linseed oil and careful observation taken upon the time required for it to dry, as a standard for comparison with the others.

The Question of Acidity.

The presence of acid in any lubricating oil is of as great importance as any of the other points that have been mentioned. As will be remembered, the acid can either be present in the original oil, in the case of impure sources; or as is more probable, it can be left in the oil after purification with sulphuric acid. Fortunately there is a very simple test for acidity. Paper soaked in a solution extracted from certain lichens called litmus is made in rolls so that a small piece can be torn off and dipped in any liquid that is suspected of containing acid, and it is also made in sheets, so that a drop of the liquid can be allowed to fall on the sheet. It is sold at a very cheap rate. The litmus paper changes color. If it is blue it changes to red if acid is present. It is also a test for alkalis. For that purpose it is made red and when it is used to test a liquid, if any alkali is present, it changes color to blue.

The Deposit of Carbon.

The matter of the deposit of carbon is also made a great deal of by vendors of lubricants. In the writer's view, however, in the case of automobile engines, it is not of great importance, so far as the lubricant is concerned. The quantity of carbon that is likely to be deposited from the lubricant is very small compared with that which is constantly deposited from the gasoline itself, unless the lubricant supplied to the cylinder is very much in excess of the requirements, and the surplus is burnt. Those who are familiar with the oils and fats used for illuminating purposes will remember that vegetable oils and fats will burn with a wick in the open. On

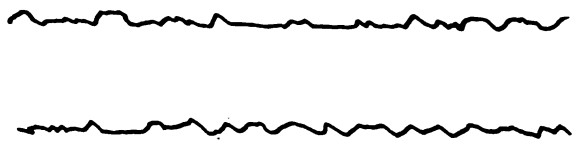


Fig. 26—Diagrammatic sketch showing how machined metal surfaces appear under the microscope.

the other hand, mineral oils, if burnt in the open, smoke so badly that practically no light is given, and the reason is that they require a certain quantity of oxygen for their complete combustion, a larger quantity of oxygen than is apparently necessary with vegetable or animal oils. It is this tendency to smoke, which is the reason for the deposit of carbon from the gasoline charge in the cylinder of the motor car engine. Every user of a motor car knows what a nuisance the deposit of carbon is; and there are numerous apparatus upon the market, and various chemicals designed to clear out the carbon after it has reached a certain thickness. The presence of the carbon in the cylinder is due to imperfect combustion, just as the smokiness of the flame of a mineral oil lamp is. The charge of gasoline is not completely burnt, and consequently a small proportion of carbon is left after each explosion, and the thickness builds up. It builds up very much more quickly if there is some bed for it to deposit on, such as would be produced by a gummy lubricant; but in the writer's view, the quantity of carbon deposited by any lubricant that is likely to be employed in motor car engines, would be very small to that deposited by the gasoline charge itself, except in the case mentioned above, where there is an excess.

The Use Of Graphite.

As readers of the Automobile Dealer and Repairer know, the use of graphite has been advocated

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very largely, and particularly by one firm who have made a specialty in its preparation, for the lubrication of motor car engines. It is sometimes advocated for use alone, but more frequently, as an addition to the ordinary lubricant.

The argument upon which the use of graphite is based is a very important one, and it necessitates the question of lubrication being looked at from an apparently different point of view to that that has been used above. Advocates of graphite say, and with justice, that however carefully two surfaces that are to slide over each other are machined, if they are examined under the microscope, it will be found that there are small holes and small pin points all over both surfaces and that these holes and pin points tend to engage with each other, when the surfaces are sliding over each other. There is no doubt that there is a great deal in this. Fig. 26 is an endeavor to show diagrammatically the appearance of surfaces as they would look under the microscope. Every one who has handled machinery is acquainted with the fact that shafts, for instance, which run in bearings run much more easily and sweetly after they have bedded themselves.

There is a piece of apparatus very much used in fitting shops, for cleaning up, known as file card; it is used very largely in the textile industries for breaking up the fibres, ready to be straightened

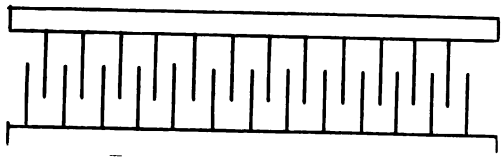


Fig. 27—Diagram showing the arrangement of two pieces of file card, with their teeth interlocked.

out and to be formed into a continuous length. A piece of card consists of a piece of canvas, or any convenient substance as a holder, with a number of small pieces of steel embedded in its surface. It makes an excellent tool for cleaning off hard dirt from any piece of apparatus. If we imagine that two of those pieces of card are placed against each other with their points directed inwards, as shown in an exaggerated form in Fig. 27, and are caused to slide over each other; we have some idea of what is supposed to take place when two machine surfaces slide over it. The points on one card are supposed to fit into the spaces between the points on the other card, so that the cards lock together, and require a considerable expenditure of energy to separate them, and to cause the two cards to slide over each other. Similarly, the two machined metal surfaces which hold these minute pin points and holes, are believed to lock together in the same manner as the cards, and to give rise to friction.

The advocates of graphite claim, and it appears to the writer with considerable justice, that by the use of graphite the pin points are masked, and the holes are filled up. It is as though the two pieces of card referred to above were filled up right to the top of the steel points with some substance that would stand the pressure between the two when they are made to slide over each other; and will present two smooth surfaces, in place of the pin points and spaces between the pin points shown in Fig. 26.

As the writer understands the matter, where an oil of a certain body, a certain viscosity and a certain specific gravity has hitherto been employed for the lubrication say of a motor car engine by the addition of a small percentage of flake graphite, ground up to a very fine powder, a much lighter oil, one of very much lower viscosity, and usually lower specific gravity, may be employed. The graphite will not be dissolved in the oil; but will be carried in suspension, though practically imperceptible, except that the coloring of the oil will naturally be darkened. When the lubricant is in use, when the engine is running, the graphite is carried with the oil to the bearings of the crank shaft and to the piston and gudgeon pin, and the lighter oil evaporating due to the heat to which it is subject, the minute particles of graphite are deposited in the holes, and between the pin points mentioned above, and gradually form a sort of skin of plating over all the surfaces that are sliding over each other. A graphite surface is in itself smooth, it possesses a considerable amount of the "oiliness" that is so necessary for a lubricant. Surfaces upon which a graphite has been deposited, slide over each other with comparative freedom, and it follows that a very much thinner skin of the liquid lubricant, of the oil itself is required between the two plated surfaces. Perhaps a better illustration of the action that takes place between two machined surfaces would be, that of two smooth cut files rubbed against each other, or arranged to slide over each other, as shown in Fig. 28.

To Sum Up.

And now to sum up. The problem involved in the lubrication of a motor car is a very wide one. The most important part is, of course, the lubrication of the main bearings of the engine, of the gudgeon pin and of the piston. For this purpose, the above analysis would appear to show, that a comparatively thin mineral oil will be best, to which has been added a small percentage of one of the non-drying vegetable oils, or a small percentage of one of the animal oils, and also a small percentage of pure finely divided graphite. There is a point, however, that has to be remembered; the lubricant must not be too thin. The viscosity of mineral oils increases almost in the same proportion as the flash point and ignition point. It is of the greatest importance that an oil of too low a flash point shall not be employed in the crank chamber, or in fact anywhere, because it will be subject to somewhat rapid decrease in quantity by reason of evaporation. As explained above, the really important matter in connection with the flash point is the temperature at which vapor comes away from the oil, and it may be taken that all vapor which comes away from it is waste. It may be burnt; but as has very properly been remarked, the office of lubricating oil is not to burn, but to lubricate. It would appear therefore that the flash point of any oil employed in the crank chamber should not be less than 300°F. With regard to its viscosity, the flash point will probably govern the viscosity; but this is one of the things that must be discovered by actual practical experience, and almost every engine will vary in this matter from every other engine. It will be evident that with the type of engine in which the crank chamber reaches a fairly high temperature, the viscosity of the lubricant at

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ordinary temperatures must be higher than with engines in which the design has enabled the crank chamber to be kept at a lower temperature. In all these cases, there is nothing like practical experience. Run an engine under actual working conditions with different kinds of oil, and choose that which answers best under all conditions of service and keep to that oil; but see that you get the same oil by means of the test described above. But though the crank chamber lubrication is the most important, it need hardly be mentioned that it is by no means the whole of the lubrication. Every motor car is, so to speak, full of surfaces sliding over each other all of which require lubrication. There is the half time shaft; there is the clutch rod; there is the cardan shaft where one is employed; there are the axles of the wheels of the vehicle itself; there are the axles of the gear wheels; there are the teeth of the gear wheels; there are the teeth of the sprocket wheel where chains are employed, and so on. Nearly all that has been said above applies, however, to pretty well every pair of surfaces that are sliding over each other, except that they are not subject to the high temperatures to which the lubricant inside the cylinder is. Some of the parts that require lubrication, the valve rods for instance, and some of the moving parts that are in close contact with the engine are subject to a moderately high temperature. With most of them, however, a mineral oil of not too high a viscosity, not too high a flash point, mixed with a small quantity of one of the non-drying vegetable oils or a small quantity of one of the animal oils; and also mixed with a small quantity of pure, finely divided graphite, should answer satisfactorily. Probably one kind of oil will answer for all the bearings that have to be lubricated; so that the oil can be prepared in fairly large quantities at the works, or can be kept ready at any garage.

The question of the delivery of the lubricant to the different bearings is again a most important matter, and there is a great deal to be said for forced lubrication as against gravity, with or without one of the sight feed apparatus. The high speed steam engine that is now so very largely employed in the United Kingdom and in other parts of the world for driving electric generators was not successful as a double acting engine until forced lubrication was introduced. The high speed reciprocating steam engine is being superseded by the steam turbine; but that apparatus also depends very largely for its success upon forced lubrication.

There is one serious objection to the use of forced lubrication in motor car work; viz., the pump and its accessories are something additional to be looked after. Forced lubrication requires not only the pump, but pipes leading from it to every bearing that is to be lubricated, and it also requires pipes leading from the bearings to the reservoir from which the pump takes its supply. It may fairly perhaps be claimed that what has been done with the high speed reciprocating steam engine can be done with the gasoline engine; but it should be remembered, that while the high speed reciprocating engine runs at a maximum of 600 revolutions per minute, the gasoline engine runs now at 2000 revolutions, and will probably be running at 3000 before long. The advantage of high speed in lessening the weight of the engine is so great that in all probability speeds will go on increasing up to the limit. There will be a limit of course to the advantage of increased speeds.

The methed of forced lubrication also has the great advantage, that the oil from the crank chamber can be employed, the crank chamber being a reservoir, and all the drain pipes from the different bearings can be returned to the crank chamber. The crank chamber is the natural reservoir, the natural receiver of the oil from all parts, except such parts as the gear wheels, the differential, etc., which requires special treatment.

With regard to the change gear wheels, the differential, etc., as the writer understands the matter, a thicker, a more viscous lubricant can advantageously be adopted. The conditions in the gear case and in the differential, etc., are quite different from those where shafts are running in bearings. It is of the very highest importance that the gear wheels

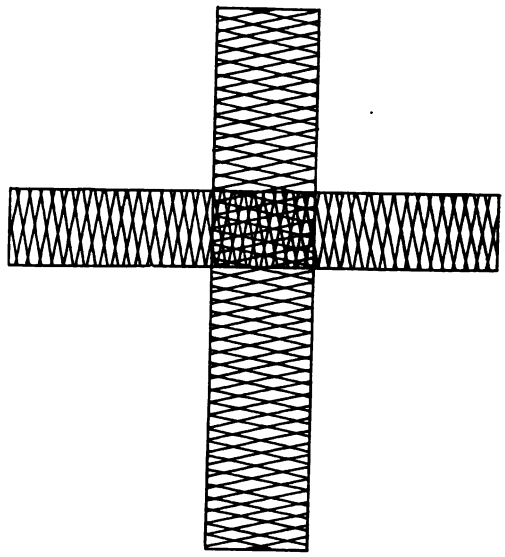


Fig. 28—Diagrammatic sketch showing two smooth cut files rubbing over. each other.

that are sliding over each other should be well lubricated; that there should be a good skin of the lubricant between the teeth that would otherwise be in contact; but under the conditions ruling, a certain amount of heat will almost necessarily be liberated, and that will tend to keep a comparatively viscous lubricant in the fluid state, at any rate, in a sufficiently fluid condition not to set up resistance to the passage of the teeth over each other. Again, however, the substance that could be employed for the purpose would appear to be a comparatively viscous mineral oil, with a comparatively large quantity of one of the animal fats and with a fairly large percentage of pure, finely divided graphite.

There is one point which the writer has not referred to; viz., the possibility of a lubricant setting, becoming more vicid, tending more to the nature of a fat than an oil in cold weather. It does not appear to him that this is a very serious matter except in the case of possibly the gear wheels and the differential. Immediately the engine is running, there is sufficient heat liberated, even in the coldest weather to undo any solidifying that a low temperature may have introduced.

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THE SCIENCE OF STARTING.

The Effect of Starting and Turning—Things the Driver May Do to Save Tires.

BY JAMES F. HOBART, M. E.

The other day I watched a driver start a car at the public market in Indianapolis, Ind., and the manner in which he got under way was good—for the tire manufacturer but for nobody else. The car was standing square against the curb—they park cars here in that manner where curb space is scarce and streets wide—and the driver evidently being in a hurry, he threw the steering wheel clear over as far as it would go—"hard aport," an old sailor would say—then he threw in the clutch so suddenly that the car gave a jerk, the front wheels skidded a short distance, then the car spun around and went off on a tangent so fast that the driver had all he could do to bring the wheel back quickly enough into the straight ahead position.

Evidently this driver had no idea of the severe work placed upon the tires by such a start. Probably he never gave the matter a thought or even knew that it made any difference in tire wear, as to at what angle a sudden turn was made on a start. But it does make a whole lot of difference in tire wear, in the angle at which a quick turn is made as the following diagrams will show.

In fact, were it not for the saving effect of inertia, the driver who makes quick start turns would probably tear tires to pieces faster than he could afford new ones. It requires a certain time for the force of an engine to be transmitted to the wheels and during this time the clutch must slip and that alone, saves many a tire.

When making an ordinary turn, the wheel is thrown over or around until the front wheels of the vehicle stand at about 20 degrees with the rear wheels. Even when the wheel is thrown around very quickly, there is little effect upon the forward tires for the reason that the angle and turn is so slight. But when that driver started his car from

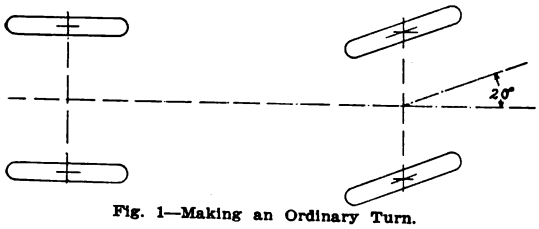


Fig. 1—Making an Ordinary Turn.

the market, the other day, he threw the wheel over about 60 degrees as shown by Fig. 2. It might have not been quite 60 degrees, for I had no way of measuring the exact angle, but anyway he went the limit and threw the wheel over as far as it would go and the wheels stood about as shown by Fig. 2.

The start was so fierce that a basket of provisions upon the seat by the driver, was overturned and its contents sent rolling upon the seat, nearly every article falling to the floor of the car, which indicated that the movement of the car was nearly all sidewise and very little in a forward direction, in which case the articles would have stayed upon the seat.

The driver of that car—and other drivers too—might very profitably do a little figuring as below set forth and then they would go a whole lot easier on making sudden turns. There is a way of finding the power expended, or the stress set up in the tires while making a sudden stop, and this way is without any tedious calculating whatever. Figs. 3 and 4 show this method and how it is worked. In Fig. 3, the line AB indicates the direction in which the automobile was headed when it was started up and the line AC, 20 degrees away, shows the new direction. Now we have to find out how much the engine will push in order to work out this problem and we will assume that its power will push the car ahead at 150 pounds. It may be more or less, but we will assume that it is 150 pounds and use that amount in our calculations.

To make the diagram shown by Fig. 3, which rep-

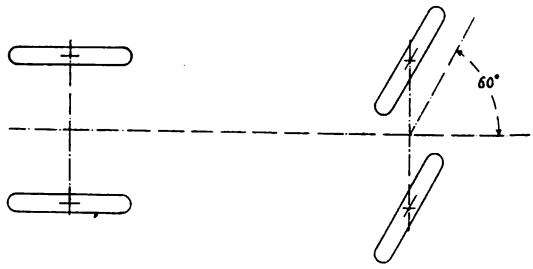


Fig. 2—Making a Short Turn.

resents the stress of making a long or 20 degree curve and as stated, the line AB represents the pull of 150 pounds and to lay down this line, take any convenient scale, say three inches to the 100 pounds, or 6 inches, or 2 inches, as may be convenient. In this case, the line was drawn at a scale of 100 pounds per inch. The engraver probably has changed the scale in making the drawing so you had better make a drawing of your own and not try to work with the small scale used in the illustrations.

Draw the line AB equal to 150 pounds by the scale used. As 100 pounds per inch was used in making the drawing from which Fig. 3 was used, line AB is made 1½ inches long. Then draw line C at the angle of 20 degrees, laying off the angle with a protractor or scale of chords as you may have either at hand. Next, draw the dotted line BC, from B, making this line exactly square (perpendicular to) line AC. Next, measure the length of line BC by the same scale used in laying down line AB. Measurements in this case, show that line BC is (on the original drawing) about 5.1-100 inch in length, hence it will represent a stress of just about 51 pounds. Not pounds per square inch, but 20 pounds without any other qualifying words.

As the line AB equals 150 pounds, and represents the force which drives the car ahead, so 5.1 pounds represents, through line BC, the side force upon the car at the instant of making the turn. Also, the line AC, represents the power applied to the car to send it on its new route. This may be measured, and you can calculate it also, to serve as a check upon your graphic method of determining the length of line BC. Measurement of line AC shows it to be about 1.41 inch in length, therefore the power given to the car on its new course is 141 pounds. Right in Fig. 3, there comes up a good question for you to discuss with your brother drivers. This question is: How, when only 150 pounds was the push applied to the car, can there be 141 pounds applied in the direction? But while you are discussing the

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matter, bear in mind that while 150 pounds push is applied to the car, 141 pounds is used in the useful work of sending the car in its new direction and 51 pounds is expended in trying to skid the car sidewise, a stress which has to be resisted by the grip of the wheels upon the ground, consequently the tires have to stand this side stress in addition to the 150 pounds of straightaway pull in the direction of the wheel rims.

When the short quick turn is being made, the side stress is as shown by Fig. 4. The line which was AB, is now DE. Line AC is replaced by line DF which runs off at 60 degrees. Measuring this line shows that it is about ¾ inch long, which it should be, as in an angle of 60 degrees, the shorter leg is always half the hypothenuse. This means that 75 pounds, or one-half the applied power, is used to push the car in its new direction DF, while the line EF measures about 1.3 inch in length and therefore stands good for 130 pounds of side push upon the tires of the car. Almost as much as the entire push applied by the engine—another very interesting question for discussion, the matter of whence comes this amount of applied stress? Some 205 pounds, according to the diagram, Fig. 4.

If you wish to prove that this amount of stress is really developed, you may do so very readily and all the apparatus needed will be three spring balances such as are used by ragmen, icemen and some other traders. If the spring balances you can get hold of will not weigh as high as 150 pounds, then take some part of that weight, within the capacity of the instruments. You can make the test as well with 15 pounds as with 150 pounds, in which case the other weights would be 5.1 and 14 pounds respectively. A tin can with sand in it will answer for the weight of 15 pounds.

Some cord or stout string will be needed and a couple of nails which are to be driven into a convenient wall or attached to some beam as shown by Fig. 3, and attach the strings as shown from I and J, to H. Two of the spring balances are hooked over the nails as shown at K and L, and the strings are tied to the hooks of the balances and made long enough to reach to H, in such a manner that each

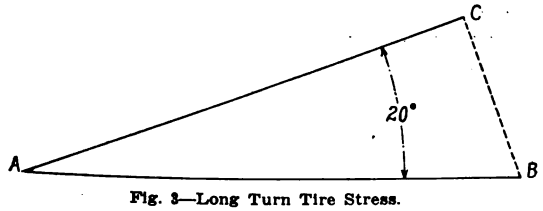


Fig. 3—Long Turn Tire Stress.

cord makes an angle of 30 degrees with a vertical line through GH. We may draw the angles directly upon the wall and then make the strings hang just right to exactly cover the marks. Next, measure off vertically from H, where the strings come together, a distance of 15 inches to represent the 15 in the other diagrams. Then, if we measure off 13 from H, on either cord, to I and J respectively, then we have an exact representation of the conditions shown by Fig. 4, with the exception that the figure is made double in order that it may be self-supporting. If we now draw the dotted lines JG and IG, we have the exact representation of two diagrams like that shown by Fig. 4, and joined along the 150 pound line.

The above being the case, we should, by hanging 150 or 15 pounds upon scale H, find a stress of 130, or 13 pounds upon each of the scales K and L. And this will be found so, provided the cords are made of the right length to bring them exactly over the 30 degree lines drawn upon the wall. Should the cords be lengthened, the load upon the scales—the upper ones—will be lessened and if the cords are shortened, the load upon each of those scales will be increased, until the point is reached where the cords HI and HJ form an angle of 120 degrees with each other, or each is 60 degrees from the central vertical line, then each scale will show 150 or 15 pounds and the little dinky 15-lb. weight below H, Fig. 5, is re-

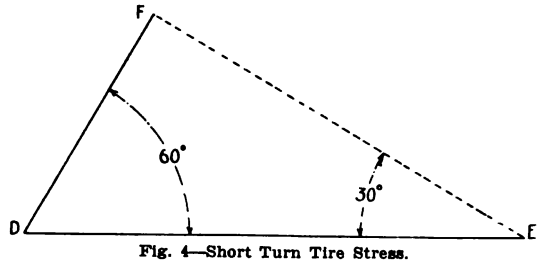


Fig. 4—Short Turn Tire Stress.

sponsible for a showing of 30 pounds upon the scales below K and L. Can you tell from whence comes the extra showing of weight?

From the above, it will be seen that the matter of 150 pounds push ahead in an automobile, is not in error when it is claimed to give 141 pounds push in the new 20-degree direction and 51 pounds more pressure crosswise the wheel and tire. The same shows true in the 60-degree test, both with the automobile wheel diagram and with the scale and string test.

Furthermore: The more the strings are flattened, or moved to a flatter angle, the stress will be increased in the two upper scales and remain the same in the lower one. And this may be carried out indefinitely until the cords have been flattened out almost straight, the strain upon the scales showing more and more, with no limit in sight. And, there is none; for, were it possible to keep the cords perfectly straight, without their sagging in the least, they would pull against each other with an infinite force. There would be no limit to it, and one pound hung upon a perfectly straight line, would pull enough, provided the line stayed straight, to pull the world one side instantly!

But, unluckily—or perhaps luckily—there is no known way of keeping such a line perfectly straight. We have no material in engineering strong enough to stand the stress. Even a 24-inch steel I-beam, placed across a ten foot space, will sag enough to be measured with delicate instruments. And were we to make a frame of stout steel and put a bolt through it and screw up the nut with the bolt in a horizontal position, we could not screw up the nut tight enough but what the bolt would sag a trifle under its own weight. It would be very, very little indeed, but it would settle all the same unless the bolt were strong enough that we could screw it up with infinite force —with all the force in the world and everywhere else.

To come back to our subject: The folly of throwing the steering wheel over very far when making a turn, is well demonstrated by the preceeding paragraphs and it is right up to the good automobile

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driver to keep as clear of this matter as he possibly can. This means, at all times, the turning of corners with the largest radius possible, the avoidance of any sharp turns whenever it is possible to do otherwise.

There is another thing which the driver may do, which will greatly lessen tire strain from turning the course of the car. This way may be called "modifying the turn" and it is founded upon the well known "modified curve" used upon all railroads where high speed trains are operated. To lay down a modified curve, the engineer first lays down the ordinary simple curve with a certain radius, never less than 3,000 feet, and as much more as possible, then he cuts out a portion of each end of the curve and puts in its place a short section of curve with a much greater radius. Next comes another short length

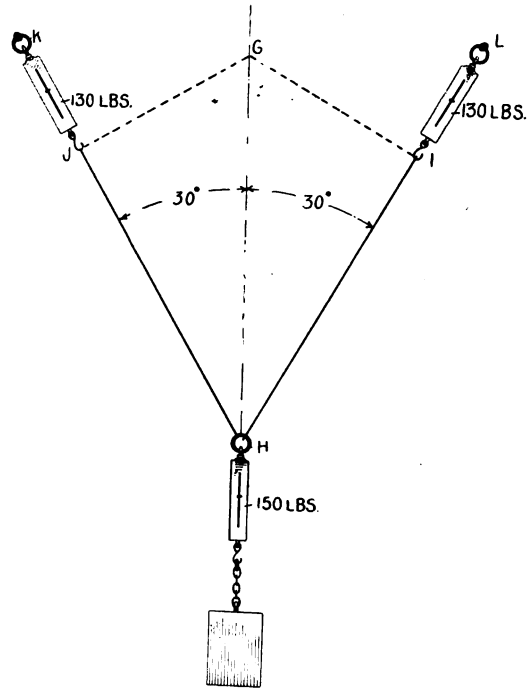


Fig. 5—The Parallelogram of Forces.

of curve with a lesser radius, and so on until it gradually gets down to the radius of the body of the curve.

The same thing is repeated at the ending of the curve, which grows flatter and flatter until the tangent as the straight track is called, has been reached. In this manner, the train is taken gradually from the straight track without the side-jerk which always is felt when a fast train takes a common curve, and which is repeated when the train reached straight track again.

The automobile driver can lessen the side strain by "modifying" the curve in the same manner as is done by the fast train. The driver can turn at a small angle and gradually throw the wheel over until the desired angle has been reached, thereby lessening the strain on the car which is given when a wide angle turn is made quickly and at high speed.

Probably the forward wheels of your car will not turn to form an angle of 60 degrees as shown by Fig. 4. But be this as it may, the wheels will turn to some angle and you can determine this and then make a diagram of it to see what pressure is put sidewise upon your automobile tires when you make a suddent start at that angle. In this way, you may get an idea of the limitations in this direction, of your particular car. And when you drive, and are called upon to make a sudden turn, be sure to keep as far from the limit as possible. The stress comes in two ways, not alone when you jump the car around from a standing position, but the same stress occurs, and to a much greater degree, when you suddenly swerve the car into a new course when it is moving at a high rate of speed. But the force will be much greater in this case, for, instead of having a few pounds stress to contend with—just the torque of the engine, you have the entire weight of the car at the rate of speed it may be traveling when the change of course is made.

This force is enormous as may be judged from the tipping over of cars which try to make short turns to avoid some person or obstacle. The overturning of racing cars illustrates this very point better than anything else and it is the cross-force which does the overturning, that corresponding to the 51 pounds and to the 130 pounds of Figs. 3 and 4. If these stresses come from 150 pounds of push, what must be the cross-stress developed when a car weighing a ton or more is swerved quickly when moving 60 miles an hour?

PROOF OF IMPROVEMENT.

A Test That Will Demonstrate How Much a Car Has Been Helped by Tuning Up.

From N. G. Near, New York.—Loose joints, tight joints, dirt, and insufficient lubrication are all consumers of extra energy in an automobile. Make the loose joints tighter, the tight joints looser, remove the dirt, and use enough of the right kind of lubricant and you may be pretty sure that the engine will deliver about as much power as it can reasonably be expected to deliver, granting, of course, that valve setting, timing, sparking, cooling, and other conditions are at their best.

A friend recently came to me with his car, which wasn't in very bad shape at the time—nor is it now—and asked if I could improve its condition and prove to him beyond a shadow of doubt that I had improved it. It set me a-pondering. I recalled the methods used by drivers in competitions where a gallon of gasoline must do maximum ton-mile work—where they coast at every opportunity. A well lubricated, properly adjusted automobile can certainly coast much farther than can one that is not so well groomed. I, therefore thought I saw my way clear to proving my overhauling ability and advised my friend to that effect, stipulating that he must follow my instructions and submit his car to a few simple friction coasting tests.

He agreed, and I at once climbed into his car and on the way to a suitable spot outside of town I unfolded my plan. We chose a hill that was not very high and that sloped gently to a long level stretch, about as indicated in the figure. The road was in good shape, the air was still, and everything was favorable for the tests. We drove the car up

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the hill, turned around, and then began to descend at a very slow creep. We noted the point at which the descent was begun and thereafter began all descents from the same point. Power was cut off but the clutch was left in. The machine coasted down all right, but at a very slow rate. Before we reached the level stretch we had already come to a standstill. The engine had served as a pretty effective brake just as it is often made to serve when coasting down hill on regular pleasure rides. We marked the distance coasted with a small stake driven into the ground.

Then we climbed the hill again and tried it over with the clutch out. The machine coasted considerably farther, as expected. We drove a second stake at this point, and then tried both tests over again. The results were approximately as before. The stakes were not changed.

Then the car was driven back to the repair shop and we began work on it. Nothing out of the ordinary was done, except that I took particular pains to make everything as smooth-fitting and frictionless as possible. Engine, journals and ball bearings were all carefully inspected, cleaned, adjusted and oiled. Every repair man knows the regular course or the course that should be followed.



The Coasting Test.

By the time I had finished I was positive that the car had been bettered and that I could prove it.

After all parts had been assembled and I had given the car an initial try-out myself I drove to my friend's home and took him to the scene of the tests where I allowed him to handle the car as he did in the first test. This time the car not only coasted more rapidly with the engine "in," but it coasted considerably farther—much farther, in fact, in the second test with the clutch out. I didn't need to tell the owner that his car had been improved. He saw it. Road and weather conditions were practically the same as before. And when he noted how well the engine behaved under all speeds, loads and conditions he paid me a fee that was considerably larger than the fee I had intended to charge.

This method is far more satisfactory than watching the gasoline tank and computing the quantity of combustible consumed per mile, because the results here are visible and certain. In driving a car there are always the personal equation, speed, topography, etc., to be considered, whereas by coasting, with gasoline shut off, these factors are virtually eliminated. It is but logical that a good coasting automobile, with clutch in or out as above, should be economical with its gasoline.

Magnetos give a good spark when the engine is running fast, but for a hot spark when the engine is being turned over to start it the battery-delivered spark is usually the better. It gives even better sparks on slow than high speed, owing to better condenser action.

THE ROUND TABLE.

Practical Points for Driver, Garage and the Repair Man.

From G. D. Crain, Jr., Kentucky.—A tire dealer in an Ohio Valley city created considerable of a stir among motorists of that community, not to mention his competitors, when he announced some time ago that he would send out a man at any hour of the day or night within ten miles of his place of business to change a tire, charging at the rate of 40 cents an hour. The charge was so small, and the service loomed up as so attractive, that most of the car-owners in the city promptly took advantage of it. Even those whose cars were equipped with demountable rims did not always handle the change themselves, preferring, if the distance from the tire shop was not too great, to "let George do it." And there are a lot of cars running that have less convenient kinds of rims, and to their owners getting away from the labor and dirt of changing is a big relief.

The dealer found that the plan worked out so well that now he changes tires free of charge, if the tire happens to be the make which he handles. This is a big lever for business for that tire, because, other things being equal, the motorist will naturally prefer to have a tire which will insure free service of this kind. In this case the dealer figures that the amount of repairing which he gets, as well as sales of new cases and tubes, will more than pay the cost of maintaining the service. It seems to have worked out that way, and certainly his is the largest tire business in the town.

Another Tire Wrinkle.

A tire man who has a lot of business in connection with making changes for motorists who prefer to have him attend to this, rather than ruin their clothes and tempers, found that the time taken up in this work was chiefly consumed in inflating the tires after they had been put back on the rims. The tire men were equipped only with hand pumps, and in addition to taking up a lot of time it meant pretty hard labor for them.

He thought at first of equipping each of the autos which he used in this work with a special tire-pump, but inasmuch as he was also using a few specially equipped motorcycles, for which such an attachment could not be provided, he finally decided against this plan. The cost also seemed too large.

He finally met the problem, however, by simply putting a tank on each outfit and filling it with compressed air. The tire man thus carries his air to the job, and when he has made the change he can fill the tire in a few seconds, instead of having to go to the back-breaking task of pumping up by hand. And, of course, each member of the tire crew is capable of making a great many more changes than was formerly the case.

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Will it Come to This?

An automobile man recently said that one of the developments of the business is likely to be the necessity of providing a car to take the place of that which is put in the shop for repairs. That is, he said, the owner who puts up his car will want to have another for use while his machine is being overhauled.

"It would surprise you," he said, "to know how owners delay having work done, because of the inconvenience to which they are subjected when they are without a motor car. Instead of being a pleasure proposition, the automobile has become an absolute necessity, and a great many business and professional men simply can't get along without them. The average man cannot afford to own two machines—though I know of some Ford owners who have adopted this plan—and hence this puts it up to the garage to supply a car for temporary use while the regular one is being put in condition."

In view of the large number of second-hand cars which are available at small cost, it seems as if this plan may be practicable, after all. And think how much business the garage man who advertised, "Leave Your Car With Us For Repairs—We Will Let You Use One of Ours in the Meantime," would get.

Everybody is familiar with the fact that most jewelers have watches, known as "loaners," which they provide while their customers' time-pieces are being put in condition. A closer analogy is found in the fact that electric supply houses must install motors to take the place of those which are out of commission in a manufacturing plant, and have to be withdrawn for repairs. The automobile is often just as necessary as an electric motor in a factory, so why should not some arrangement such as suggested be made?

In most cases, too, the dealer could get a reasonable amount for the use of his car, and thus be killing two birds with one stone.

Rehabilitating the Old Car.

The man who has to keep his old car, instead of being able to trade it in on a new one, sometimes gets dissatisfied with it, not because it is not performing its duty, but simply because he has tired of its appearance, and has become used to its familiar features.

If he can change its characteristics and give it a different appearance, he will get almost as much satisfaction out of it as though he had bought a new car.

A motorist who couldn't quite finance a new car this season spent about $200 on his old one, and now has a car that is the envy of many of his friends, some of whom are planning to emulate his example. In addition to a job of overhauling the motor and transmission, which put it in good running order, he had the car painted. Instead of making the color black, he changed it to yellow and black, a "loud" combination, but one which is far from unattractive. A new cover, of rough brown canvas, was then put on, and seat covers were supplied. All of the metal work was brass-plated, and the car was ready for business.

The owner has been more than pleased with the attention which his car has attracted, for in spite of the fact that it is a popular make, with scores just like it in the town, it takes a second or third look to determine just what it is.

A Bit of Carelessness.

Just because the operation of the speedometer is not necessary to the use of the car, a good many owners whose meters get out of condition fail to have the necessary repairs made. In fact, if one were to take a "work-needed" census of the cars in a community, it would be found that more speedometers required attention than any other feature of the equipment.

This is poor policy. The speedometer is not only necessary in order to insure keeping within the limit set by law, but it performs a very useful service otherwise. The careful owner keeps tab on his tire mileage by reference to the speedometer, and if this is not working all the time his records are of course incomplete and valueless. Then again, it is worth while to keep the meter operating so that in case the car is sold, the prospective user can be informed definitely how far it has been driven. While the total shown by the speedometer may not necessarily be correct, of course, it will carry weight when backed up by the personal assurance of the owner, especially if the latter is personally acquainted with the purchaser.

When a link in the cable breaks, and the speedometer quits registering, the car goes ahead, and the owner, if he is inclined to be careless, will pay no attention to it. But this is too important an item of equipment to do without, and the broken meter should be put in shape at the first opportunity.

Have You Changed Your Oil?

Changing the oil in the crank-case is desirable frequently, without reference to the season, if the car is to run smoothly and quietly all the time. But the change of seasons makes it especially advisable that this be done. If you have been using your oil during the past winter without emptying the case completely, do it now, and load up with clean, fresh lubricating material. It will help your car.

MORE ABOUT CLUTCHES.

Something About Lubrication, Cleaning, Slipping, And The Working Parts.

The multiple-disc clutch possesses some advantages over the leather-to-metal type. For example, where continual slipping would seriously damage the leather of a cone clutch, the increased surface of the multiple-disc clutch gives immunity from trouble in this respect. The fact that disc clutches operate in a dust-proof bath of oil is a feature that naturally tends to counteract tendencies of wear.

Although much might be said concerning the increased flexibility of modern engines and the decrease in the amount of clutch slipping necessary in ordinary driving, it is not intended to discuss the merits or demerits of either type but merely to draw attention to a few practical points connected with the care and upkeep of multiple-disc clutches, and to throw some light upon the various defects that are liable to occur in them.

The action of the type of clutch referred to is quite familiar, but in order to render the following remarks more clear, a section of a typical multiple-disc clutch is reproduced as Fig. 1. The flywheel is provided with a casing, in which longitudinal

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grooves are cut, and an inner core having similar grooves is mounted on the clutch shaft. The clutch plates are provided with serrations, and being arranged in pairs, engage alternately with the grooves of the casing and those of the inner member respectively. A strong spring keeps the plates normally engaged through the medium of a suitably shaped part known as a presser. In order to give a certain amount of adjustment to the spring, a screwed cap is fitted to the cover of the clutch casing, and when set as required can be locked in position. The plates are operated by means of a fork, working on two projections of the actuator which also forms part of the clutch stop. Adjustment of the latter is secured by screwing the cone part shown in the illustration.

Lubrication of the Plates.

Many drivers have experienced how an overdose of even good quality of oil in the clutch casing will cause a considerable amount of slip between the plates, and at the same time prevent them from disengaging properly when the oil has cooled down. The usual practice is to mix kerosene with the oil in certain proportions, the latter depending upon the type of clutch and the material from which the plates are made. Almost every manufacturer has his own specific mixture for clutch lubrication, which can generally be relied upon to give the best all-around results, but it may be found necessary to thin the oil by the addition of small quantities of kerosene during the cold weather, in order to prevent the plates from sticking. To ensure that the lubricant is uniformly distributed over the entire working surfaces of the plates, holes are sometimes drilled through them, as in Fig. 2, and in cases where this refinement has been omitted the action of the clutch has often been considerably improved by taking out the plates and drilling them.

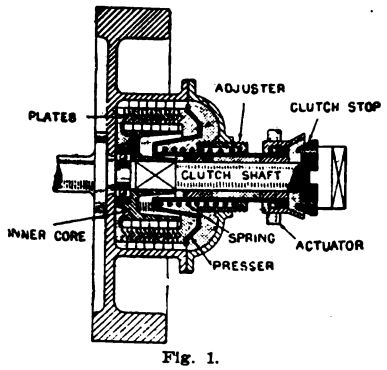


Fig. 1.

Great care, however, must be exercised in removing all traces of "burrs" left by the drill, as their presence would cause the plates to score directly the clutch was allowed to slip.

Cleaning Out The Clutch.

After the clutch has been in use for some time, minute particles of metal become detached from the plates as the result of wear, and on mixing with the lubricating oil these form a pasty substance, which, if allowed to remain in the clutch casing, would act as a very efficient grinding compound, with extremely deleterious results to the plates. Therefore it becomes necessary to wash out the interior of the casing from time to time, and afterwards pour in a fresh supply of oil. In addition to this precaution, it is highly desirable to take the clutch apart every few months, in order to clear out the interior of the casing more thoroughly, and also for the purpose of examining the condition of the plates.

Excessive Slip.

Should experiments with different kinds of lubricating oil fail to cure slipping plates, the adjustment of the spring cap may be altered to increase the compression of the spring, and so increase the friction on the plates. One should notice, too, whether the clutch shaft moves quite freely in a lateral direction, as any tightness caused by want of lubrication of this part has the effect of preventing the plates coming into close contact. If the above expedients do not put matters right, the clutch must be taken down for thorough examination by methods to be described.

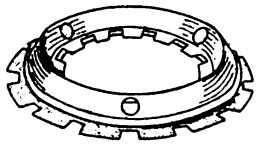


Fig. 2.

Dismantling.

One of the inconveniences in cars fitted with multiple-disc clutches is that the gearbox has to be removed from the chassis in order to give the necessary room for the withdrawal of the inner parts of the clutch. For this reason wear is often allowed to continue until the irregular action of the clutch renders driving extremely unpleasant, whereas a little attention given at the right time makes it easy to keep the clutch in good working order. Even if the amount of work necessary to get at the clutch is a drawback, it is false economy to delay attention to the plates on this account. Assuming that the gearbox has been removed, the clutch stop and actuator are taken off, after which the clutch shaft can be withdrawn. The next step consists of unbolting the cover of the clutch casing in order to expose the plates. Before all the bolts are removed, however, it is advisable to slack out the spring adjusting cap to its full extent, thus partially releasing the spring, for unless this point is observed the interior parts of the clutch may fly out suddenly as soon as the cover is released.

The clutch plates can now be slipped out of their grooves, and should be laid on one side in the order in which they are taken out.

The only part now remaining in the casing is the inner core, which can be drawn from the ball race by means of two hooked levers, the ends of which are inserted between the clutch casing and the back of the inner member.

Working Parts.

Having now taken the clutch to pieces, a careful examination of the working parts can be made, and attention is directed to the following points:—

The continual driving action of the plates causes slight depressions along the grooves of the clutch casing and those of the inner member. These depressions naturally hinder the free lateral movement of the plates, with the result that slipping takes place. The remedy for this defect is to ease the grooves by filing until the depressions disappear

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entirely. The method of carrying out the latter operation is clearly shown in Fig. 3.

Each clutch plate should be examined separately, to ascertain the condition of its working surfaces, as even a slight amount of roughness on one plate will very soon spoil the other plates with which it comes into contact. When the defect is very marked the renewal of the affected plates is essential, and after considerable use it may be found necessary to replace as many as half a dozen or more plates in a single clutch.

Inattention to lubrication sometimes results in buckled plates, which may be largely responsible for the erratic action of the faulty clutch. Buckled plates can very frequently be straightened out by the careful use of a hammer and block of hard wood while the plate is laid flat upon a perfectly level surface.

Should any plates be neither scored nor buckled, one must exercise a certain amount of discretion in determining whether they have not worn so thin

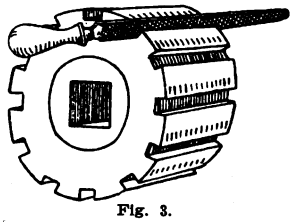


Fig. 3.

as to render them unreliable for further lengthy service, and it should be remembered that the cost of renewing a few plates is small compared with that of the time occupied in taking down the whole clutch to fit them afterwards.

These are sometimes used with the object of allowing the driver and driven plates to slip relatively to one another when the clutch pedal is depressed. One of the two types is generally employed—(a) spring separators and (b) stud separators—and while examining the plates one should take care to notice that none of the separators is missing, as they sometimes become detached from the plates and drop into inaccessible corners of the clutch casing and cause considerable inconvenience when the clutch is being assembled.

The condition of the ball race carrying one end of the inner member should not be overlooked, and if this part shows any signs of wear, the opportunity of effecting a renewal should be taken. One is sometimes apt to imagine that ball races situated in inaccessible positions are endowed with special immunity from the effects of wear and lack of lubrication, which is not the case and is liable to lead to very unlooked-for results.

Although the clutch shaft only revolves in its bearings when the pedal is depressed, the free movement of the former is a matter of no little importance and should receive due attention while the clutch parts are under examination.

There are one or two important points connected with the fitting of new plates that are worth special attention, and readers are warned against the prevalent practice of simply placing the new plates in the casing and assembling the clutch straightaway on the assumption that the new parts fit accurately.

In the first place the new plates should be tried separately in the grooves of the clutch casing as well as those in the inner member, and eased, if necessary, to give perfect freedom of lateral movement.

A further point requiring attention is that the new plates do not occupy more space than the old ones when originally fitted. As this is somewhat difficult to determine after the spring is placed in position the clutch should be temporarily fixed up minus the spring, when the amount of lateral movement on the clutch shaft will show whether sufficient clearance is allowed to permit the plates to slip when the pedal is fully depressed.

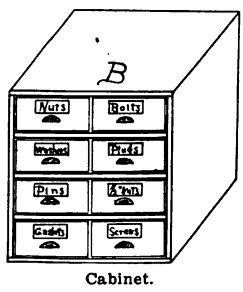
It has been stated on high authority that their ability to run smoothly when out of alignment is one of the great points in favor of multiple-disc clutches, but the writer has never come across a single instance where inaccurate alignment has not adversely affected the proper action of a clutch. On the contrary, in many cases irregularity of action has been completely cured merely by correcting the alignment, without making any other adjustments.

If careful attention has been given to the above-mentioned repairs and adjustments, little difficulty will be experienced in assembling the various parts of the clutch, with perhaps one exception, i. e., the replacement of the spring. Various appliances have been requisitioned for compressing the spring for the purpose of assembling, all more or less unsatisfactory and liable to allow the spring to jump out of position at the critical moment. A long stiff tube is slipped over the projecting end of the clutch shaft, and a plate having a 1 inch clearing hole is placed at the end. Through this hole a long bolt is passed and the head of the latter takes a purchase either against the cross member of the chassis or against a bar attached to the chassis for the purpose. When it is desired to compress the spring, the nut is screwed along the bolt until the two flanges of the clutch cover meet, when the bolts can be inserted and tightened up. This enables one to get over the difficulties usually associated with assembling this type of clutch, and the whole operation can be carried out in an extremely short space of time.

FOR THE SHOP.

A Cheap But Convenient Cabinet for Keeping Tools and Parts.

From C. P. Shattuck, M. E., Rhode Island.—In these days of keen competition among the garages



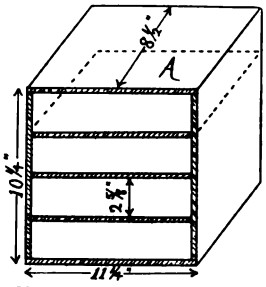
Cabinet.

and repair shops the saving of time is a factor in the bill rendered the customer. Considerable time is wasted in some repair shops in searching for a certain small tool or material, particularly if the parts are not systematically stored. Cabinets can be purchased, and some shops utilize those having drawers for the taps, reamers, drills, etc. The cabinet shown in the accompanying illustration was constructed by the writer for storing small material

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and it proved so useful that a second one was made and fitted with a door and lock for securing small and valuable tools.

The cabinet shown consists of eight empty cigar boxes, but the number may be increased to 12 or 16 as desired, and a housing A which was constructed of whitewood. The boxes employed were 2¼ inches high, 5⅝ wide and 8½ long. As the width of two boxes was 11¼ it was an easy matter to ascertain the width of the cabinet. The ends of the boxes were planed flush with the sides and ¼ inch was allowed for each partition plus a trifle



Showing the Construction.

so that the boxes could be removed and replaced easily.

After the work was completed the cabinet was given a coat of shellac, then sandpapered to obtain a good surface, and varnished with a hard varnish. Ordinary handles or bales were attached to the boxes as shown at B, and each drawer was labeled. The second cabinet built was made slightly deeper and a door swung by using ordinary hinges. The cabinet was fitted with an ordinary hasp, and a padlock prevented tampering with the contents of the drawers.

It is not necessary to buy whitewood as a good packing box can be utilized if of the right dimensions. The cabinet is not only useful in the repair shop, but is a valuable and handy addition to the private garage, especially if two owners share the same garage.

THE GENEMOTOR.

The New Self-Starting And Lighting System Designed For Ford Cars.

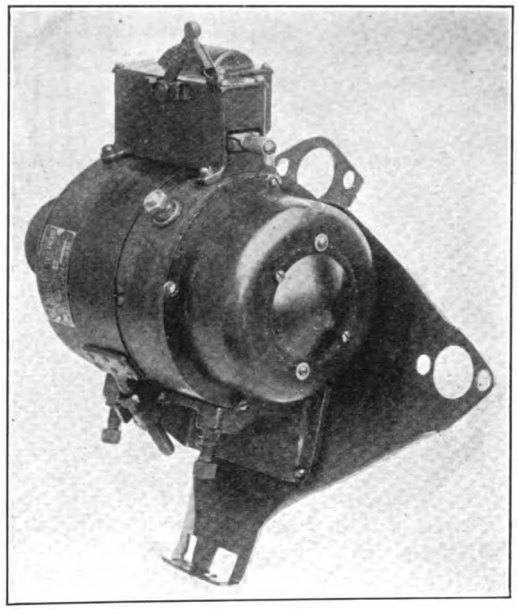
A new self-starting and lighting system known as the Genemotor System has recently been designed and is now being manufactured by the General Electric Company, particularly for installation on Ford cars. The principal mechanism of the system consists of a single electrical unit, wound for twelve volts, which operates as a generator or a motor as the case may be, and the necessary accessories for attaching to and operating on the Ford car. In addition, a six-cell, 42 amp.-hr. battery is included. The outfit thus combines the functions of a generator, which furnishes the primary current required for starting the car and operating the head, side and tail lights, as well as those of a motor for spinning the engine.

The Genemotor is carefully enclosed, about ten inches long over all, seven inches in diameter, and weighs about fifty-two pounds. It is supported rigidly on the right-hand side of a Ford engine, viewed from the front, by a pressed steel bracket secured at three points. The installation is fully covered and protected by the engine hood when the latter is closed.

As a motor, the Genemotor will develop a torque of about 45 ft.-lb.; and the torque developed at the engine shaft by means of the selected gear ratio has been found amply adequate to start a Ford car under severe conditions of tight adjustments in the engine and cold weather. The storage battery is carried on the right-hand running board of the car, and is employed to accumulate current while the car is in motion for supplying the starting and lighting system when the car is at rest.

When the car has attained a speed of about eleven miles per hour, the Genemotor, acting as a generator, develops an electro-motive force sufficiently high to overcome the normal voltage of the battery and permit charging to take place. At this point, the reverse current relay operates, closing the circuit between the generator and battery, and charging begins at a low rate, the current gradually increasing as the speed of the car increases to a maximum of slightly over ten amperes.

A suitable steel procket is mounted on the engine shaft at the point where the crank is ordinarily applied. A steel pinion, mounted on the motor shaft, drives this sprocket and thus the engine through a silent chain of special design. The Genemotor is running either idle, as a motor, or as a generator, at all times while the engine is in motion, and thus all clutches can be eliminated. The fan is driven


The Genemotor.

by a belt from the Genemotor shaft pulley, mounted outside of the sprocket, to a split pulley provided for clamping onto the standard fan pulley.

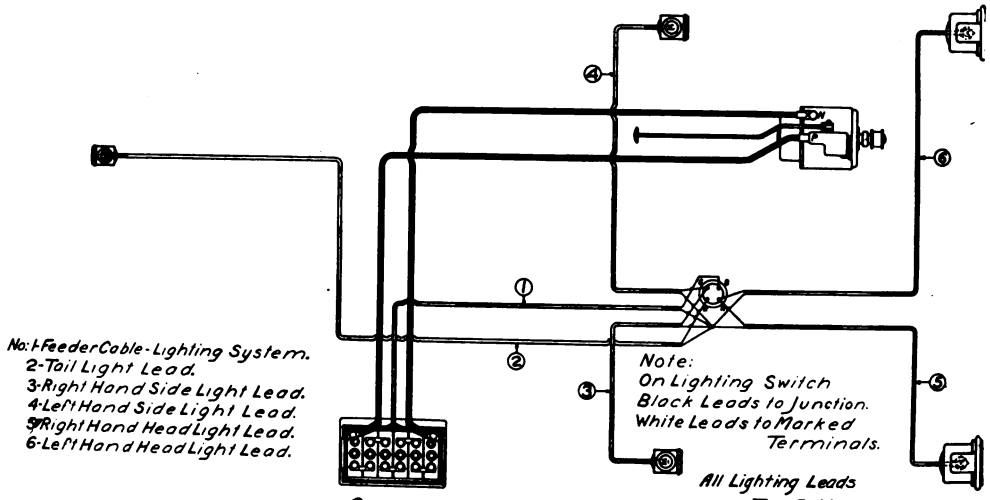
The main switch and reverse current relay are mounted in an enclosed metallic case on top of the Genemotor and are readily accessible. The switch, which controls the motor, is closed through a cam actuated by a push rod extending through the dashboard of the car and terminating in a knob conveniently located near the steering wheel column.

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The contacts are of the multiple leaf pattern and the switch is provided with a mechanism that assures a quick break on opening. The reverse current relay prevents current feeding back to the generator when the latter is operating at low speed or when the engine is not running.

The lighting switch, mounted on the dashboard at the right-hand side of the spark coil as one sits in the car, enables the side lights and tail light, head lights and tail light, or all, to be thrown on or off. It is applicable either to the straight dash or the new cowl hood dash on Ford cars. The wiring system is metallic throughout, no ground return being used. On the Sedan, Coupelet and 1915 models, the lighting switch is placed on the upper left-hand corner of the heel-board under the driver's seat.

The motor starts at once when the switch rod is pushed forward to make the switch contact, and the switch automatically opens when the push rod is released. Having ample power, it spins the Ford engine at high speed. Inasmuch as the Genemotor begins to charge the battery at the low car speed mentioned, the factor of economy is evident. When the engine stops, the reverse current relay automatically opens the battery circuit. The salient feature of the Genemotor is, therefore, its simplicity. It requires no attention from the driver other than a push with the foot to start the car and a twist of the switch to turn on the lights.



Connection Diagram.
G. E.- Starting and Lighting System.
Ford Cars.

BEARING CARE.

Importance Of Correct Lubrication And Frequent Cleaning.

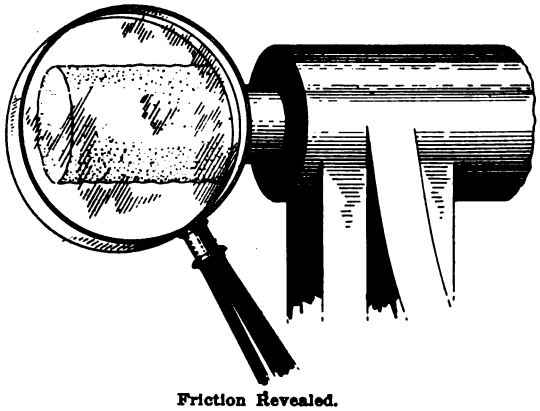
It will not take a long time to ruin a bearing if the conditions are right. And right conditions will be found in either faulty lubrication or neglect. Assuming that a bearing is not overloaded, and is correctly fitted in the first instance, this, of course, being the business of the car makers, the most important factor is the keeping of the bearing rigorously free from any grit or foreign matter, particularly metallic particles. Thus, great care must be taken that only a clean lubricant is used. Gearbox bearings are liable to suffer from metallic particles getting into the lubricant, these particles coming from the gearwheels in the normal conditions of working. This is one reason why a heavy gearbox lubricant is less preferable to a lighter one, which allows any heavy metallic particles to fall to the bottom of the gearbox. Even this does not altogether prevent the possibility of some of the particles being churned up with the lubricant, but it is less likely to happen with a light lubricant than a heavy one. Even so, it will be worth while to clean out the gearbox thoroughly at some period between 1,500 and 2,000 miles, and renew the lubricant. The illustration shows a bearing that to the naked eye seems perfectly smooth and in good condition. But if a magnifying glass be put upon it the defects appear instantly.

Any number of damaged bearings have resulted from the corrosion or pitting of the surfaces due to oil containing free acid. Rust is even more destructive to a ball bearing than acid or alkali in the lubricant, as it is far more rapid in its destructive action, and it is, in fact, the main adverse factor in the maintenance of a bearing that the makers lay most stress on. If the bearing could always remain in the same condition in which it leaves the maker's works it could never lose its frictionless qualities. There must, in a strictly scientific sense, be a little friction created by the lubricant as compared with a new, dry and polished bearing, but the latter, unless protected by the lubricant, would quickly be attacked by rust.

Wheel bearings obviously are from their position liable to the attacks of rust as the result of access of water during the washing-down process. For this reason it is most important to keep these bearings well packed with a heavy grease, and from time to time the hub caps should be removed and new grease forced in. Obviously such a bearing cannot run so freely as it otherwise would do, but the slight extra friction is of small account compared with the protection obtained. At the same time a

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careful car owner will take precautions during the cleaning down of the car to keep water away from the bearings as much as possible. The makers do what is possible in the construction of the bearing to make it wetproof by the use of felt washers, but even this does not suffice against carelessness. The cleaning of bearings when fixed in the normal position is best effected by the injection of kerosene, meanwhile rotating the bearing and repeating the injection till the kero-



Friction Revealed.

sene runs off clean. In cases where the bearing can be detached, a method of cleaning advised by at least one large concern making ball bearings is to immerse them for a few minutes in a hot solution of washing soda, then in plenty of kerosene. The soda will effectively clean away all the solidified deposit and grit which is usually characteristic of much-used bearings.

GEAR RENEWALS.

More Trouble, Care and Work to Get a Fit Than May Be Imagined.

A new gear is seldom found to fit in an old gearbox accurately in every particular, and in many cases, unless a considerable amount of attention is given to the several processes of fitting the new parts, further renewals will become necessary in a remarkably short space of time. For the purpose of explanation, we will imagine that both the sliding gears of an ordinary four-speed selective type of gearbox require renewing and the replacements have been obtained from the manufacturers or their agents.

It must be clearly understood that such parts as gearwheels are turned out by automatic machinery, and after being subjected to the most minute examination, are sent out as interchangeable, that is so far as fitting with new gears is concerned, but, of course, this circumstance provides no guarantee that they will fit in gearboxes that have been subjected to great wear. Therefore it is quite reasonable to anticipate some adjustments, and even alterations, before the new parts will run accurately with the old components of the gearbox.

During the interval in which the car is out of commission pending the arrival of the new gears, the opportunity should be taken to clear out all the grease from the gearbox and remove such portions of the mechanism as may be necessary to facilitate fitting operations.

By passing the old grease through a piece of muslin, particles of metal from the gears will be noticed, thus giving a clue as to whether the damage has resulted from mere abrasion due to changing gear, or whether, on the other hand, the teeth have been subjected to more than the ordinary amount of wear and tear.

As a general rule the wear is not excessive on a sliding shaft, whether it be of the square or of the splined pattern, though it is advisable to see that no play exists in the bearings at each end, as the defect is frequently responsible for noisy gears. Any scoring or roughness on the working surface of the shaft should be eased down with emery cloth before attempting to fit the new gears.

It is quite common to find that a new gear will fit very tightly on the sliding shaft, a condition which, if allowed to pass uncorrected, would render the gears very difficult to operate, and most probably cause permanent distortion of the gear-operating mechanism. To enlarge the hole in the gear by means of filing is, of course, out of the question, owing to the hardness of the wheel, but a simple method of producing the same effect is shown in Fig. 1. The gear A, is clamped by means of straps B and bolts C, to a faceplate D of an ordinary lathe (recommended by reason of its convenience) a stout rubber pad, E, being interposed, as shown in the illustration. The hole F, to be enlarged is then filled with dilute sulphuric acid, made up of one part concentrated acid and two parts water, which is allowed to act upon the metal for about 30 minutes. At the

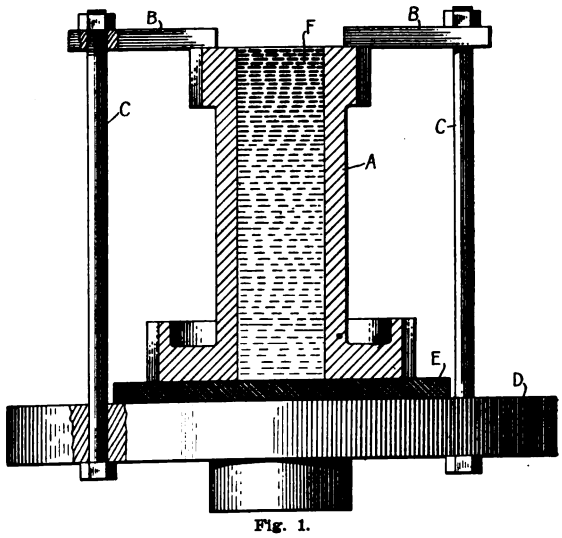


Fig. 1.

end of this time the acid is poured off and further corrosion may then be prevented by immersing the gear in a strong solution of ammonia, finally washing well in water. If the enlargement of the hole under the action of the acid is not sufficient to allow the gear to work freely on its shaft, the treatment may be continued as required. It is important to mention that sulphuric acid requires handling with very great care, by reason of its extremely corrosive nature. It attacks metal, fabric, wood, etc., and contact with same should be avoided. One of the most annoying experiences is to find that after new gears have been fitted, the car runs far more noisily than was previously the case. This often happens

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when the circumferential mesh of the gears is inaccurate.

At first sight it appears somewhat difficult to improve gears in this particular, as in most gearboxes the relative position of the two shafts is unalterable. While the method of procedure recommended in this circumstance is perhaps a little unorthodox, it is preferable to the usual practice of allowing the gears

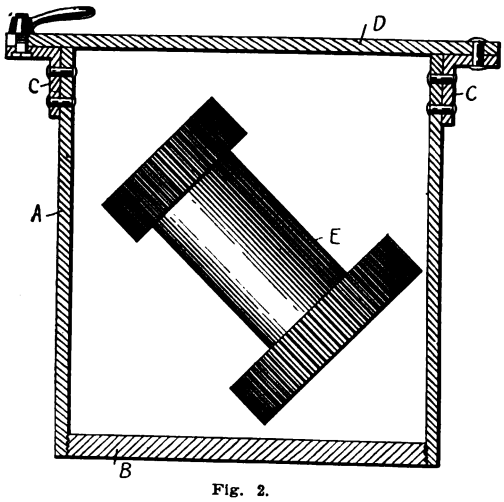


Fig. 2.

to wear in and so make it very easy for the ball races of the shafts and the other parts of the change-speed mechanism to wear out.

If the teeth of the gears engage too deeply with one another or are too thick on the pitch line, the only practical course to adopt is that of softening the gears and securing freedom of action by carefully easing the teeth. Particular attention must be paid to preserving the correct profile of the teeth during the operation, but to a skilful mechanic this presents no difficulty. On the completion of this part of the work, the gears may be run together and tested for silence, after which they must be rehardened.

Case-hardening Gears.

Many people who are fully conversant with case-hardening small parts such as pins and bolts, regard the same treatment for larger components as being shrouded in mystery; and in consequence have serious misgivings concerning attempts to harden gear-wheels. Successful hardening of the latter parts, however, merely entails the construction of some form of "muffle" which can be used in an ordinary forge, and attention to the simple precautions enumerated below.

Fig. 2 shows the construction of a muffle suitable for use in small garages and workshops where the quantity of hardening work does not justify the outlay necessary for the purchase of a gas furnace. A piece of steam pipe, A, of suitable diameter is screwed at one end to receive a bottom plate, B, and two lugs, C, are riveted to the top. The lugs form attachments for the lid, D, of the muffle which pivots horizontally, and by means of slotting the hole for the bolt, access to the interior can quickly be obtained.

The gear E to be hardened is placed inside the muffle and covered with special hardening compound. A forge can be used for raising the muffle and its contents to the required temperature, the effective heat being maintained for about half-an-hour per 1/16 inch of "case" required. After removing the muffle from the fire, the lid is immediately opened, the gear is taken out and cooled off by plunging it into clean, cold water.

Care should be exercised that the whole muffle is raised uniformly to a bright red heat, while it is equally important that no higher temperature should be reached, as otherwise the steel may become burnt and rendered brittle. If for any reason the gear cools down appreciably before being plunged, subsequent heating will be necessary before the cooling out is effected.

There are numerous grades of hardening mediums but in ordering the material one should specify the grade marketed for muffle hardening, as it differs slightly from that employed for the open-hearth process.

A simple test for ascertaining the depth to which the hardening effect has penetrated can be made by placing a piece of scrap mild steel in the muffle with the gear and cooling it out at the same time as the latter. By fracturing the test piece one is enabled to examine the nature of the hardened surface and thereby obtain some idea as to the wearing capabilities of the gears that have been treated.

Unless all the scale is carefully brushed out of the teeth of gears after the completion of the above process, there is a possibility of its working into the bearings of the gearbox. A stiff wire brush will be found very convenient for removing all traces of scale and superfluous hardening compound before commencing assembling operations.

Worn Jaw Clutches.

In many cases the jaw clutches of the direct drive become slightly rounded off at the point of engage-

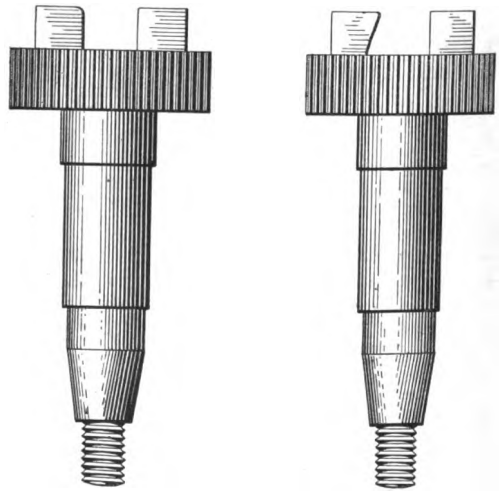


Fig. 3.

ment, and though this wear may not be sufficient to justify the renewal of this part, it is highly desirable that the fault should be rectified. A rounded jaw clutch, as shown at the left of Fig. 3, is very liable to cause the top gear to jump out of engagement at high speeds and damage the gears generally. The other part of the same Fig. shows the gear after having been undercut to prevent any possibility of involuntary disengagement. Each jaw must be cut

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equally by means of a cold chisel, so that all engaging surfaces make proper contact with the jaws of the fellow gear, and the newly-fitted part must be re-hardened as already described.

The slight amount of backlash caused by the removal of the metal from the jaws in the way mentioned does not constitute a serious objection to this method of repair, especially when one considers the subsequent useful service obtained from a part that would otherwise have to be discarded as scrap.

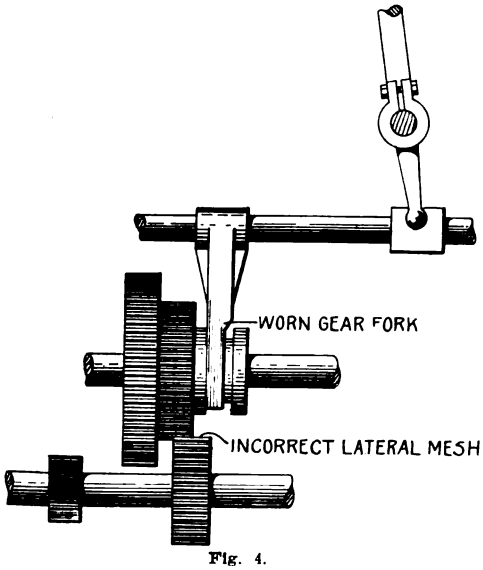


Fig. 4.

Reference to Fig. 4 will show a defect which is very common in gearboxes that have been subjected to considerable wear. It will be noted that, although the change-speed lever is brought to the limit of its movement in the gate, the pair of gears supposed to be in mesh are not fully so. This fault may give rise to several undesirable conditions in the gearbox, among which may be mentioned unequal wear on the gears, a tendency for all gears—the direct drive in particular—to jump out of mesh, and the possibility of the gears being partially engaged when the gear lever is in the neutral position. The latter constitutes a serious danger to the person who starts the engine of a car possessing this defect, as has been demonstrated with painful clearness on numerous occasions. The methods of adjusting the gears in this circumstance are dealt with in the following paragraphs.

Adjustment of Gear Forks.

The forks transmitting the lateral movement of the selector rods to the sliding gears are generally provided with a screw adjustment, by means of which it is easy to make any necessary alteration in the relative positions of the gears. This can be done by first setting the gears so as to give a good neutral, and then if there is a safe margin of movement on either side of the neutral, this margin may be used to any of the other gears that need lateral adjustment.

It sometimes happens that, although one or two sets of gear wheels mesh accurately when the gear lever is in its correct position respectively, the other gears may be considerably out of their true lateral mesh. To correct this fault it is necessary to alter the position of the notches of straight through quadrants, and to make similar provisions in the slots of gate quadrants. This is a matter in which little difficulty is experienced when once a clear idea is obtained as to the exact amount of alteration required.

Although the adjustment provided for altering the positions of the gear forks is extremely useful, it cannot, of course, be considered at all effective in taking up the backlash occasioned by wear on the gear-operating mechanism, as it merely has the effect of transferring the blacklash bodily to the new position. Therefore, it becomes very important to observe at which points backlash is likely to occur, with a view to securing a positive action of the parts affected.

One of the least desirable features connected with backlash in motor parts generally is the way in which it spreads like a disease over every moving part; thus to eliminate all slackness in the gear-operating mechanism, for example, by renewals would entail considerable expense.

Referring again to Fig. 4, the principal point at which backlash is liable to occur will be noticed. Commencing with the ball-ended selector lever, it is quite likely that the key securing this part to the change lever shaft may have become slightly worn, and even if the method of fixing shown in the illustration is adopted, readers are reminded that the mere tightening of the bolt will not effect a permanent cure without first renewing the worn key. The end of the lever engaging with the slot on the selector rod may also be slightly worn, and occasionally such wear, in addition to causing backlash, creates a "sticking" tendency while changing gear. The only practicable way of dealing with this part is to enlarge the worn end by swaging, filing up the ball to fit accurately in its groove, and afterwards draw out the lever to its original length.

Wear on the bushes of the selector rods may allow the latter to "kick" while being moved, which makes it difficult to change speed with ease. The worn bushes should be renewed while the gearbox is down for repairs. When the gear fork is worn, as shown in the illustration, Fig. 4, it is easy to see that quite an amount of waste movement is possible at the lever. In cases where it is not convenient to obtain a new fork and where the design of the latter will permit, the wear can be taken up either by fitting a strip of reinforcing metal or by drilling a number of holes to accommodate steel dowels let into the wearing surface of the fork.

Assembling the Gearbox.

Having given the necessary attention to the above points, the final assembling of the gearbox may be proceeded with. So far as possible, each part should be tested for accuracy and freedom of movement directly it is put in position, as, otherwise, it is difficult to locate any slight mal-adjustment when the whole of the mechanism is put together. Much time may frequently be wasted in taking down a gearbox to discover some trivial want of adjustment that could have been rectified in a minute had it been noticed at the proper time.

In conclusion, the desirability of assembling all parts with a liberal supply of lubricating oil may be emphasized, a factor which materially assists in giving the new and readjusted parts a fair start, and also tends generally towards obtaining satisfactory results.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1603 Magneto Trouble.

From G. S. Herbert, Missouri.—1—I have a low tension Splitdorf magneto, model F, and a coil which is not working right. I start the engine on dry batteries and then switch onto the magneto and it will run very well for a mile or two and stop. I then have to switch onto the batteries and speed up the engine for a short distance, then I can switch onto the magneto again. It will run very well for the rest of the day. It acts this way every day when I start out. Do you think weak magnets are the cause of this trouble? 2—Can magnets be tested without taking them off? 3—If the magnets were taken off of the magneto would that cause them to demagnetize? This magneto is on a 1913 model, 22 H. P., 4 cylinder Maxwell car, made by the Maxwell-Briscoe Co.

Reply.—1—The very fact that your engine runs satisfactorily on your battery of dry cells conclusively proves that your coil is not at fault. It looks very much as if your magnets were partially demagnetized, although your mixture may not be absolutely correct until after the engine is run a little while. 2—The strength of the current generated by the magneto can be tested without removing them. In fact, no one should consider attempting their removal unless fully qualified. 3—Yes, unless a keeper were properly used.

1604 A Good Record.

From James Flett, Iowa.—My Imperial car has run 8,000 miles since August 2, 1911, and during all that time the car has not been in the repair shop, except once a year to have the engine cleaned and spark plugs renewed. The car has been used on all kinds of roads through mud and sand and up and down some steep and very rough hills. I believe I wrote last year that the Goodrich tires which came with the car made a record of 5,000 miles before having to be renewed, and the last tire to wear out made a record of 6,500 miles before being renewed. I would like to hear from other owners of heavy cars in regard to these matters. My car weighs 2,900 pounds, empty. I am now using three Miller tires and one Goodyear and so far the Miller tires are giving the best of satisfaction. It is a comparatively new tire in this part of the country and I believe it is equal to the Goodyear or Goodrich. I see by your magazine there is quite a little discussion in regard to gasoline and cylinder oil. My experience has been that the best is the cheapest. I use gasoline testing 68, and the best cylinder oil I can get. 1—What is a good average distance for a quart of good oil to run the motor? 2—Does the use of low test gasoline and heavy cylinder oil have a tendency to make the motor smoke?

Reply.—1—It depends upon the oil, the motor and the speed of the motor. 2—Yes.

1605 A Question of Contract.

From C. O. Dawson, Kansas.—I used to run a garage and do auto repair work. Three years ago one C. A. Kenney came here and put in a garage and bought my tools and supplies and moved them to his garage. I agreed with C. A. Kenney to stay out of the automobile business for a term of five years. After selling out my automobile business I started up a machine shop.

Now, C. A. Kenney sold out his garage to Edward Gault, about 8 months ago. Can C. A. Kenney sign the above contract over to Edward Gault without my consent, and will it hold good to Gault? I claim it will not, on account that it was not made out to Kenney's heirs or assigns, and when Kenney sold out and quit business, I claim that released me from staying out of the auto business. About 4 months ago I sold my shop and the party I sold it to is doing repair work and handling two cars and I am working for him as a salesman. Gault has filed an injunction against me to stop me from selling automobiles. After I sold out to C. A. Kenney he brought automobile repair work to my shop that he could not do and I did it for him. He also brought automobiles to have them overhauled and tried to hire me to work for him. I claim he waived his contract here in hiring me to do this work for him. Gault has sued me for $1,000 damages, and while he has been here I have neither done repair work nor sold automobiles in Chetopa. If the contract will hold can he secure damages against me?

Reply.—The serious question for you is whether an injunction will issue restraining you from continuing your present employment. I don't believe that the provable damages will be large and quite likely that only nominal damages will be recoverable, especially as you have neither done repair work nor sold automobiles in Chetopa while Gault has been there.

I do believe, however, that an injunction will be granted against you. The contract is undoubtedly assignable, and would pass with the sale of Kenney's business to Gault. Your only hope, to my mind, is for you to show a waiver by Kenney of the condition of the contract. I do not think Kenney waived the negative covenants in the contract by bringing automobiles for you to repair and overhaul, as the covenant was "to stay out of the automobile business and not to work for anyone as repairman or salesman," the latter clause obviously would not apply to work you did as a machinist, working for yourself. "Not to work for anyone as repairman" clearly means that you were not to work as an employe, for any other man who might start an automobile business in Chetopa.

In order to show a waiver you must prove facts directly in conflict with the clear intent of the contract. You would have to prove that you worked as a repairman or salesman, as an employe, in Chetopa,

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with the knowledge and acquiescence of C. A. Kenney after the contract in dispute was made with him.

1606 **Carburetor Trouble.**

From J. L. Pickles, Minnesota.—1—I have a 1913, Model T, Ford touring car, equipped with Holley carburetor, and am having a great deal of difficulty with my engine suddenly stopping on the road with no apparent cause, and I believe it is due to the small triangular intake valve sticking. This carburetor has been cleaned about ten times by various garage men and this valve has been ground in, but does not seem to remedy the matter. Sometimes the engine will pick up and run again before the car has lost its momentum; other times it is necessary to crank the car and it is a very difficult task to get it started. I have had three sets of coils, a master vibrator and a uni-coil outfit, without any results. When using the batteries I obtain very good spark in each plug. My car is very hard to start at all times, and when it is hot it is impossible to start it at all. Can you tell me why this is? The car has run 6,000 miles, was overhauled by maker this spring, and had new piston rings applied. 2—What voltage should I use in batteries in order that the adjustment of the coils would be proper for the magneto when adjusted to a good spark from the batteries?

Reply.—1—We are more inclined to the belief that your float is set too low and that too much rather than too little gasoline is being used, judging from what you say about it being hard to start the motor when warm. 2—Four dry cells should start it, giving you about 6 volts if connected, as they should be, in series, the carbon of one to the zinc of the next, etc.

1607 **Some Strange Questions.**

From W. P. S., Nebraska.—1—Please tell me the cause of a Ford car not wanting to start. I looked for the trouble a long time, but could not find it. Finally I put a little gas in one cylinder and that started it, and in a little while I heard something crack. At the same time I saw a big spark fly from the plug on top of the transmission. After that the engine ran faster. It has a Holley carburetor and a K. W. spark coil. 2—Do you think a master vibrator would make this car run better? 3—How is the best way to time the magneto—that is so the plugs would fire at the right time? 4—What causes the engine to skip 12 to 20 times in a mile run? 5—When the engine is taken apart, what would be the best way to take care of the magneto? 6—If I short-circuit one of the plugs with a screwdriver, or hold one of the vibrators down and the engine runs the same, what would be the trouble? 7—How would a car act if the magnets were discharged enough to bother? 8—What is the best way to repair a punctured condenser? 9—The valve stems and push rods have a clearance of two thicknesses of your magazine. That ought to be enough, it seems to me, but they click all the time. If there isn't hardly any clearance they won't click, but lots of power is lost. 10—What do you think ought to be done? 11—Why is it the engine will not start on half turns? It is even hard to start it turning the crank around, unless the wire that goes to the carburetor is pulled out. After getting it started it will run for a minute and then it will stop with the throttle open to the 3d, 4th and even 5th notch. When open at the 4th or 5th notch gasoline runs freely to the carburetor.

Reply.—1—Pretty hard to tell what is going on in the mind of any motor car. For this reason we are unable to answer your query, except we construe it rather differently, to which different construction we would have to reply that there are no end of reasons why any motor car will not start easily, or every time on the half, or even quarter turn—so many that we could not think of attempting to enumerate them. 2—If properly installed it should help the ordinary car equipped with a vibrating spark ignition system. Yours might be the extraordinary one, hence our care not to say that it will help "this car." 3—You cannot time the Ford magneto. The timer can be timed, and should be timed in strict accordance with the directions given in the Ford instruction book, which you should send to the Ford Magneto Co., Detroit, Mich., or the nearest Ford service station for, if you do not own one. Having secured it, study it and believe everything you read in it, even if some friend or enemy of yours tells you he knows more about Ford cars than Henry Ford and his entire engineering force, and can give him and them "cards and spades" on reliable information concerning Ford cars. 4—In addition to faulty ignition and imperfect carburetion, about forty-eleven primary, secondary and contributory other causes. 5—The best is never to take the magneto apart. 6—You might get a shock through the end of the screwdriver blade that would thoroughly awaken you. This should be trouble enough. It, in addition, would show that no explosions were occurring in that particular cylinder, or that the spark was occurring at the wrong time in the cycle, as would happen if you were to get two plug wires mixed. 7—By "discharged" we presume you intend to say demagnetized. In such condition the engine can rarely be started except on the battery, and it will run much better after it is started on the battery—but such conditions as mentioned are not conclusive proof of the demagnetization of the magnets, for they are but symptoms of other troubles. 8—Drown it, bury it, give it away, or otherwise effectively dispose of it. This is what coil manufacturers do with punctured condensers. 9—The various issues of this publication vary considerably in thickness. The thickness of two issues might be rather more or less than 7/16 inch. This seems slightly excessive when the rule is about two thicknesses of newspaper. We do not see how the push rods and valve stems get near enough together to click. If they do they should "holler," not click. 10—Let them click if you get any more power, unless you want to go to the expense of having the push rod guide holes bushed. 11—We once knew a motor car owner who, if our remembrance is correct, experienced similar trouble to this one you are trying to have explained away. After trying for several weeks he concluded that he would be satisfied if it started every alternate half revolution. This was several years ago. Periodically since he first noticed the motor's starting vagaries he has extended the starting limit—every third half turn, every fourth, fifth, etc., until now he claims he can start it sometimes on the 647th half turn, that once he secured its confidence he found it would eat out of his hand. The experience he gained before he

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had won the motor's confidence he capitalized in connection with a badly run down ice cream business, and the patience he developed he hopes some day to put to commercial use, unless his motor should again bother him about starting when it may be worth even more to him for the pleasure of motoring.

1608 **Wrong Mixture.**

From Burpee L. Bishop, Nova Scotia.—My car is a 1912, Model T Ford, Holley carburetor, Ford coils and master coil. The engine runs beautifully and always has done so. Last summer the engine began to crank up bad in the morning. It would turn over a few times on one or two cylinders, and then stop. After repeating this quite a few times it would keep doing better until finally it would take hold and give no more trouble that day. This spring I have put on a new master coil but trouble is worse. If the car stands any time on the street, say five minutes, the engine may crank fairly easy but runs on one or two cylinders for perhaps ten revolutions, before it takes hold good. I have put in new batteries which I use in starting. My plugs are not new but they seem all right. Compression is fine. A few days ago I found I had a leaky carburetor, in fact enough to lose considerable gasoline, so I thought I had found my trouble at last. I overhauled the carburetor, shellacked the float and put it together. It is perfectly tight now and as far as I can find out does not flood. By removing the large screw over the float valve, no gasoline shows there. The old trouble, however, still continues, although I have not yet tried the engine under all conditions, hot, cold, etc., but as the engine stands cold in the garage I can see no difference. Does my carburetor need adjusting or do you think the trouble may be in the coils or plugs?

Reply.—It is quite evident from the symptoms described that you get either too lean or too rich a mixture when starting the engine. Your carburetor was designed for a much more easily vaporized fuel than is being marketed to-day, when the velocity of the air past the vaporizing nozzle did not have to be so high as at present. Later models of carburetors, Holley as well as others, have reduced area of free air opening. If your float is set too high there will be an excess of gasoline accumulate in a small puddle which the air may draw into the cylinders, making the gas temporarily too rich. The inlet valve stems may be so loose in their guides that air is drawn in to impoverish the mixture. If your cylinders choke with too rich a mixture it should result in a black, smoky exhaust. If the carburetor float valve should leak even slightly it would tend to choke the engine when starting. If on the other hand the mixture is too lean, contains too little gasoline vapor, there will be a tendency to backfires through the carburetor. The needle valve adjustment regulates the amount of gasoline used at intermediate and high speeds, in this carburetor, but it is easily affected by improper float level. From all of which you may be or should be able to divine the cause, too lean or too rich a mixture, and having proven this to your satisfaction you should be able to effect a cure. It is more than probable that very best results would follow the installation of the latest model of carburetor advised by the Ford Motor Co., although you may not find this necessary. We do not think your coils or plugs, or even the timer at fault, but it would not do any harm to clean the timer carefully and observe its condition.

1609 **Magneto Starting.**

From Dr. E. H. V. P., Washington.—I see that in No. 1554, on page 45 of the March number, what appears to me to be a wrong answer. A careful reading of the question leads me to believe that, instead of asking for means to utilize his low tension magneto for charging a storage battery, which in turn was to be used in connection with an electric starter, he really asked if the engine could not be started on the magneto instead of the battery. That is, could not the magneto be used to spark the engine in starting, instead of switching on his dry cells. If my surmise is correct, and it appears to be, your answer ought to have been different. I am using a car which is supplied with a low tension magneto, and a battery of four dry cells for starting purposes. Several times when my batteries had run down so low that they would not give a good spark, I have used the magneto for starting. This can be done if the spark is nearly fully advanced, and the switch on the magneto side, by spinning the engine by hand, after priming the carburetor. Will you please look up this matter again for the gentleman, as he will evidently not be satisfied with your answer if I am correct in my judgment as to what he wished to know.

Reply.—Our understanding of the information desired by our correspondent, whose letter was considerably abbreviated after the reply was written, was whether it were possible to use a low tension Splitdorf magneto for electric starting, but in case he referred to ordinary starting we included in our reply to No. 2 query the following: "There are some engines that are so structurally designed that it is well nigh impossible to start with a magneto," which should have given him the desired information. We are glad to have you call our attention to anything that does not seem fully explanatory or fully understood. Your method of starting on the magneto is the one usually employed. There are motors on the market designed not to be started on the magneto. In such cases the magneto is so timed that on late setting of the ignition the break will occur after the "peak" of the alternation, or when the current is considerably weaker than when advanced as for ordinary running. Such a motor might start easily on a battery and extremely hard on the magneto, in such a case it being practically an impossibility to start on the magneto except one were possessed of extraordinary strength, with the particular knack of doing it. On the other hand there are motors equipped with easy starting magnetos (higher priced usually) on which the motor may start more easily than on battery.

1610 **Rear Cylinders Miss.**

From Reader, Wisconsin.—I have a 40 H. P. Kissel car, 1909 model, equipped with Remy magneto and coil, Stromberg carburetor with water jacket. I purchased this car second-hand three years ago, and have run it about 2,500 miles. It ran fine until one year ago when it began missing on the two rear cylinders. The reason it misses is from spark

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plugs becoming coated with a rather dry, black soot. After cleaning the plugs it runs good for a half a mile or so, when it begins missing again. The valve stems are slightly worn. The cylinders are smooth, and the rings appear to be good. The oiling system consists of a pump forcing oil through tubes to each cylinder. I have carried oil in the crank case very low with no result. 1—When the magneto breaks the primary circuit, a spark occurs at the breaker points. Is this due to a poor coil? 2—I start the engine with four dry cells. The engine works better with the battery than with the magneto when running slowly. The magneto has a stationary coil, no brushes. Can I test the same by connecting an ordinary battery tester in the magneto circuit, while running the engine on the batteries? 3—If leakage past the pistons causes my engine trouble, can it be remedied by replacing the old rings with Leak-Proof rings, advertised in your paper? Any information on why the spark plugs foul in my engine will be much appreciated.

Reply.—1—The sparking at the breaker contact points is not due to the condition of the coil, except the sparking occurs when running on the battery, for the coil is not used in the magneto circuit, and is only used with the battery circuit. 2—You cannot and should not attempt to test the magneto circuit by means of the battery tester. Our advice to you is to send the magneto and coil both to the Remy Magneto Co., Anderson, Ind., for a thorough overhaul. 3—If there are slight leaks, and the cylinders are not scored or badly worn, and the pistons do not fit too loosely, you may be able to secure an improvement by fitting new rings as you suggest, but the chances are that an engine like yours, now six or seven years old, will need much more heroic treatment—reground cylinders, new pistons and newly fitted rings. Machine shops equipped to do this work usually charge about $10 each cylinder. There is no question in our minds of the cause of the sooting of the plugs—the worn condition of cylinders, pistons and rings.

1611 **A Slipping Gear.**

From D. C. Butler, Oregon.—I have a Reo car, model 1912. The intermediate gear slips on my car when I go up hill. The other gear doesn't slip; if I hold the intermediate gear it pulls all right. Do you think it hurt the car to hold the gear in place? I took it to a garage and they said they could fix it but I could see no change so I would not let them experiment with it. I think maybe it is not adjusted right. Could you give me some information as to what the trouble could be?

Reply.—Failure to keep gear in is in all probability due to wear. It will probably necessitate new parts to replace worn ones, bushings most likely. The harm already having been done we do not see how any further injury could result from holding the gear in place by means of the speed lever. We have told you what the trouble might be, but what it could be is too much of a proposition for us to attempt to solve in the limited space allowed for this reply.

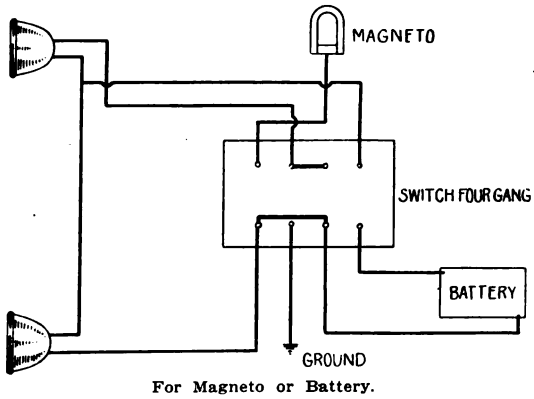
1612 **A Carburetor Problem.**

From Joe Halda, Kansas.—Some time ago I was called out to fix a machine that died on the road, and when I got there I found that the carburetor was flooded, and there was no way to drain the carburetor. Finally I took a spark plug out and primed it and the engine would run as long as the priming would last. Then I took a small plug out of a manifold pipe and put it in the oil can with some gasoline and turned the engine over. It would run as long as the gasoline would last. What would you think would be the trouble with the machine?

Reply.—The trouble was directly caused by a failure to get sufficient gas of the proper proportion of air and gasoline vapor. While this answers your query as you have put it, you probably would like to know what could cause such a condition. There are very many possible causes, such as dirt, water, air-bound tanks, empty gasoline tanks, closed valves, air leaks around the inlet valve stems, waste or old cloths in the air inlet, broken auxiliary air valve springs, stuck air valves, and a few score or so more. This reply of ours we know will not interest our readers nearly as much as would your telling of the cause of failure to get gas, provided the cause were an unusual one.

A Lighting Diagram.

From Earl J. Van Sciver, New Jersey.—Having read with interest article No. 1601 of J. A. Mandel, in the April issue of your magazine, I beg to offer the enclosed wiring diagram which I have found to be entirely efficient. By using a six volt battery and lamps and using a four gang switch, I am able to change the wiring system from parallel to series at will. The top two switches are used for dynamo lighting and the bottom two for battery lighting. While this looks very complicated at first, it is in reality very simple, although I admit that it took me several hours to figure it out.



For Magneto or Battery.

An Elusive Trouble.

From Lyman Fisher, Massachusetts.—I have driven an Overland car, model 52, 1911, which I bought second-hand in the fall of 1911. The car had been driven hard and abused in repairing, but was in pretty good running order. I did some repairing upon it myself and then took it to the Overland Company and they did more work on it when my troubles ceased until this spring when it began to lose power. It would run fine when standing, but when I went to start the power it was not there. Finally it would not pull at all. Experts said it was due to carbon. I had the valves reground and the

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magneto made over, but it only made matters worse. Then the wiseacres laid it to the carburetor and I had that tested and found it was all right. I finally took it to an expert and learned that the cap on the valve spring had become worn and let the pin through. This was fixed and it then ran all right. The cap that caused all the trouble cost 6 cents. It took 19 hours of labor to find out the cause. Before it was fixed one gallon of gasoline would run the car three miles. Afterwards one gallon of gasoline ran it 16 miles with many stops. The car weighs 3,400 pounds. It now runs better and has more power than it has had since I bought it. When the cold weather came last fall I tried to start the engine and took three-quarters of an hour to get it running. The gasoline I used tested only 58 degrees. I then went to Boston and bought a barrel of 73 to 76 degree gasoline and started the engine in five minutes. I had no more trouble with starting until I was out of that high test gasoline. I have concluded that it is no use to use ordinary automobile gasoline in cold weather.

Leaking Grease.

From W. B. C., California.—I would like to say a few words about the leaking of grease from gear boxes and rear ends. If the various parties that are having this trouble would clean out the grease and use a heavy body oil instead (something like 600 W, or lighter) there would be less noise from gear boxes and fewer burned and cut driving pinions. The average person, when the grease begins to leak rushes to get some heavier oil. The reason that the grease runs out and the oil does not is simple. The centrifugal force of the gears throws the grease to the sides and top of the case. It becomes plastered tightly all over the inside and is not on the gears where it should be. As soon as the gears have thrown off the grease there is an abnormal amount of heat generated which expands the air and causes the grease to be forced out. When oil is used, and a pound of flake graphite to the gallon of oil, it is a great help. It is taken up by the gears and thrown all over the case, but not like the grease, it does not stick but drips down again and keeps a steady flow of oil on the gears. There is less heating, the gears are always lubricated and when the air does become warm it can flow out beside the shaft and does not drive the grease ahead of it.

Two-Point Plugs.

From W. B. C., California.—In answer to E. S. Richardson, 1580, who asks about two-point spark plugs, I would say that I have Su-Dig plugs in series with Ezekleens on my Maxwell 30, which is also a T head motor, and would not remove them for any price. There is far more current generated by the present day magneto than can possibly be used in a single plug, and the double ignition is a great saver of gas, as well as less gear shifting and more speed. My observations lead me to believe that there is also less heating.

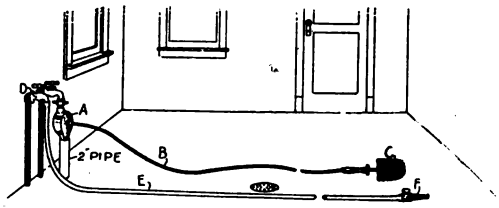
How to Make Tires Last Longer.

The deterioration of a casing should be confined to wear of the tread rubber. Proper inflation will do away with much trouble from rim cuts, and unnecessary bending of the fabric. As long as the fabric, the sinew of the tire, is covered by the waterproof rubber, it remains practically as good as new. But instead of wearing away evenly, the tread is often cut and chipped by sharp stones, glass and ruts. Dirt and water are forced into the cuts, then ground into the fabric with enormous pressure. A sand pocket results; then a blowout that ruins casing and tube. Not one tire in a hundred but fails from just this cause before it has given half its possible mileage. Any good tire should run ten thousand miles or more, if the cuts are sealed before the fabric is injured.

A good vulcanizer will mend casing cuts permanently while the tire is inflated on the car. First the cut is filled with crude Para rubber which can be obtained from any garage. Then heat is applied with the vulcanizer which is simply clamped on the tire, and heated with gasoline, steam or city lighting current. If the temperature is controlled automatically, no watching or regulating is required and there is no danger to the tire so that any motorist or chauffeur can vulcanize as well as an expert. Tubes are permanently mended in about the same way in less time than it takes to stick on a temporary patch. Thus by giving tires only a little attention their mileage can be doubled or trebled, upkeep expense eliminated, and roadside delay due to blowouts can be avoided.

A Car Washer.

The labor of washing an automobile is reduced by a device, shown in the illustration, combining a



Water Motor Car Cleaner.

hose and a revolving brush. At A in the illustration is a four inch water motor connected to a common water faucet. B is a flexible shaft, connected to the shaft of the motor, with a revolving brush at the other end as shown at C. There is also another faucet, D, to which an ordinary garden hose, E, is attached with a nozzle, F. In connection with the motor is a two inch pipe which serves as a drain pipe to connect with the drain of the garage. The mud, etc., is first softened and loosened by the water from the hose, E, without using the brush, C. Then after this is completed the brush is used on the car and assisted by the hose. This car washer can be placed in a garage at a small cost and will save time and thoroughly clean the car.

Good Tire Record.

From George A. Bailey, Michigan.—I have been reading your Trouble Department for five years from which I have received much benefit. So never had any trouble. I go out right and come home right. I bought a Jackson car five years ago last October, fitted with Fisk demountable rims, bolted on tires. I have run this car 9,000 miles without having any trouble, and it is still on the original tires. I got my first puncture at 9,520 miles. Some good luck, I reckon.

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Starting the Studebaker.

From O. E. Kennedy, Pennsylvania.—Regarding trouble question No. 1554, from "Reader, West Virginia," have you answered the question correctly? In reply to "Reader's" question desire to say I own a Studebaker 25, equipped with Splitdorf low tension dual ignition system. With this system you can start on the battery or magneto. In fact I have not carried a battery this winter. When starting on the battery, the spark lever should be well back or retarded from the running position to avoid any possible kicks. To start on the magneto, advance the spark lever to a point slightly above the running position. Spin the engine and you will find it will start easily, or should, providing the contact points on the magneto breaker box are in good shape. A five-cent nail file is a good tool to keep handy for filing platinum points on the breaker contacts. Do this operation gently or the platinum will soon be worn away. After smoothing up the platinum points so they are nice and smooth, they should be adjusted to separate at the furthermost point, not more than the thickness of a smooth dime. If the nail file you have is the thin model kind, the smooth end can be used for a measure to adjust the contact points. The engine should start cold on one-half turn, or when warm on one-quarter turn. There is no easier starting engine made than the Studebaker when mixture, spark plugs, etc., are in good shape.

The Metz Friction Drive.

From C. A. Stone, Iowa.—I have had all kinds of trouble with my 1913 Metz car. I never saw a nicer running engine, but that slipping drive was the trouble. Now that I have located that, it is no trouble for me to go any place, I don't care how steep the hills are. I draw 128 miles on 4 gallons of gasoline. I think you will find the answer to your slipping clutch all wrong, as a heavier clutch spring would not do. Now a friction drive will hold and do good work, but there is one thing that has to be done and that is to have the fiber wheel cover square against the disk. I think if you line up your wheels you will find the right hind one runs ahead and that is a sign that your frame is out of square. This is caused by the fiber running on the left side and pushing back on the frame with nothing to hold it. Then it is impossible to adjust the same so it will not slip. Now I braced the left side of the frame and put a jack screw on the right side and pushed it back until my wheels were lined up. Then I braced the frame by crossing the braces under the frame behind the dust pan. Then I crossed the corners of the frame with some short braces. Put your control lever on reverse, then adjust the disk so it is the same distance from the fiber wheel on reverse as it is on high and you will have no more trouble with a slipping clutch. I often wonder why the Metz Company do not brace their frames better, because a frame out of square on a friction driven car is going to give all kinds of trouble and is hard to locate.

Sticking pedals may cause you to run into some obstacle. A small piece of rubber fastened to the under side of the foot boards where it will act as a bumper for the pedal will remedy the trouble.

A Broken Driving Lever.

For one reason or another the controlling lever occasionally breaks. When this occurs it may be mended as follows:

Take a piece of metal, A, as shown in Fig. 1, and

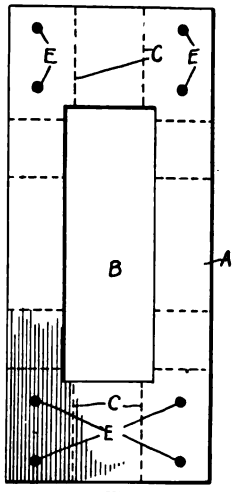


Fig. 1.

cut a slot, B. Then bend on the dotted lines, C. Now place A on the lever, D, as shown in Fig. 2, and hammer it to shape as shown. Drill eight holes, E,

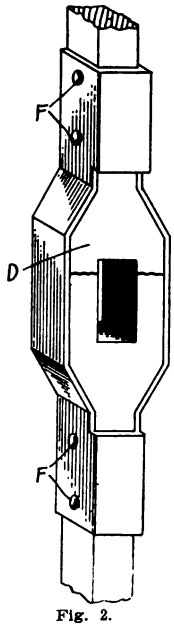


Fig. 2.

to receive the rivets, F. When finished the lever will be found as strong as ever. The lever shown is one that works on a quadrant.

Signal Horn and Magneto.

From Chas. S. Topping, California.—I have an electric horn that operates on the Ford magneto. It gives perfect satisfaction and has been in use two or more years. It is the Dean Ford Horn, Chicago, Ill.

(Note—This horn is now made by the Garford Mfg. Co., Elyria, Ohio.)

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BOSCH SYSTEM FOR FORDS.

Claims of More Power, Greater Speed and a Better Running Engine.

The Bosch Magneto Company now provides special ignition outfits in two forms, gear driven and chain driven, for equipping Ford cars. The gear driven attachment is the one most in favor. This ignition outfit will be attached by any of the representatives of the Bosch Magneto Company at a nominal charge. Practically any garage can fit the attachment and in fact if one be needed, with ordinary tools he will be successful in installing it. The following instructions for installing the gear driven attachment are taken from the Bosch Magneto Company's catalog, although the matter is somewhat condensed.

The first procedure includes removing the hood, draining the water from the radiator, removing the coils from the dashboard and loosening the holding nut of the radiator rod at the radiator end. After detaching the water inlet and outlet connections A, at the engine and disconnecting the priming wire, as well as the gas or electric connections to the headlights, the radiator itself is to be lifted off and the fan assembly and belt removed, leaving the forward end of the engine clear as shown at B, Fig. 1.

Next to be removed are the actuating rod leading from the foot of the steering column to the timer, the bolt and spring holding the timer in place and the timer case with contacts, as well as the wires leading thereto, all of which may be discarded. The hexagon headed nut, washer and cotter pin holding the timer brush assembly are to be removed and the arm and roller pried off with a screwdriver.

The cotter pin at each end of the crank shaft starting pin, on the inside of the lower fan pulley, is to be withdrawn and the pin itself driven out through the opening in the engine support. The starting handle or crank is then to be removed and the lower fan pulley pried loose by means of two screwdrivers placed behind it, one on each side. In order that the fan belt may clear the Bosch gear housing, a new fan drive pulley is to be substituted for the old one and the original crank shaft starting pin, with cotter pin at each end, is to be used to secure it in place. Should the ends of the pin project beyond the rim of the new pulley they are to be filed down flush. The fan belt and starting crank are then to be replaced.

The key for the large Bosch gear is to be set in place on the cam shaft after first enlarging the hole in the protruding end of the shaft by means of the 5/32 inch drill furnished with the attachment. Any burr left by the drill is to be filed down before placing the key in position.

The second and third bolts holding the crank case on the valve side of the engine are to be removed, also the cylinder front cover tap bolt immediately to the right of the cam shaft. The three bolts, two vertical and one horizontal, at the base of the cylinder front cover and to the left of the starting crank, are to be removed and their heads ground down about half way so as not to interfere with the placing of the Bosch gear housing.

In order to provide sufficient clearance for the idler section of the Bosch gear housing, an opening about 2 by 3 inches is to be cut in the engine pan directly beneath the housing, the exact location and size of the opening being determined by applying the housing loosely to the engine, first, however, attaching to the housing the magneto supporting bracket, using for the purpose the two hexagon headed cap screws and washers. The positions of the four bolts securing the magneto to its supporting bracket are to be marked off on the engine pan and a hole about an inch square cut at each point so that the magneto may be removed at any time after completion of the installation merely by disconnecting the coupling and withdrawing the four magneto bolts. The cutting of the openings in the pan may be done with hammer and cold chisel and an ordinary jack used to support the pan during the operation.

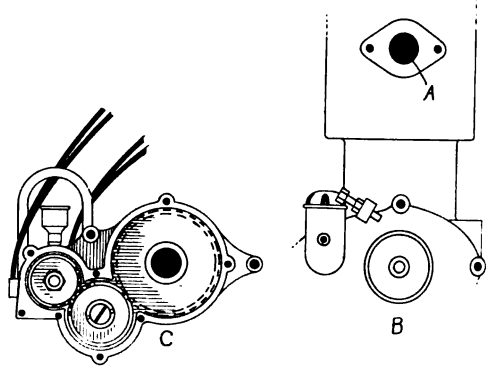


Fig. 1—Gear Driven Attachment.

If these details are properly executed the gear housing and magneto bracket should drop readily into position. This being assured, the magneto end of the coupling is to be secured to the magneto shaft by means of the nut, washer, and crescent shaped Woodruff key accompanying the magneto. The magneto is to be secured to its supporting bracket by the four bolts, which lock washers, and the magneto end of the coupling is to be connected with the bolt end of the coupling, by means of the four slotted hexagon headed bolts and leather center coupling piece.

In assembling the coupling, it should be remembered that the leather center piece is intended to afford a flexible drive from the gears to the magneto, so as to compensate for any slight irregularities in alignment. In order to secure the flexible drive effect, however, the two flanges of each coupling end must be bolted directly to the leather center piece at right angles to each other or, in other words, the flanged ends must be set crosswise one to the other, using all four bolts provided for the purpose. Under no circumstances should the flanges of the two coupling ends be bolted directly together, i. e., in a straight line using only two bolts, as such an arrangement would give a rigid, not a flexible drive.

The Bosch gear housing cover and large gear are then to be removed and the entire attachment mounted on the engine and held loosely by the four supporting belts.

It is possible that slight inequalities in the engine casting may interfere with the proper alignment of the Bosch outfit, so that special care is to be taken that both lugs of the magneto bracket bear on the flange of the crank case and that the two holes in the bracket lugs register with those in the crank

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case flange. Any irregularities which exist may be readily corrected by slightly filing the face of the Ford oil cup casting (or the shoulder of the Bosch gear housing resting thereon), or by placing washers under both lugs of the magneto bracket. C shows the gear driven attachment ready to go on B.

The dust cover over the magneto armature, also the slipring brush holder farthest from the engine, are now to be removed and the piston of No. 1 cylinder (that nearest the radiator) brought on top dead center of the compression stroke and maintained so. The magneto armature is to be turned by hand, by means of its coupling, in the direction in which it is to be driven until, first, the metal slipring segment is visible in the slipring groove corresponding to the figure "1" of the brushholder which has been removed and, second, the trailing end of the armature is about 9/16 inch from the pole shoe on the right side of the magneto, viewed from the shaft end. With the armature held in this position, the large gear is to be slipped into place on the camshaft and meshed with idler gear, care being taken to see that the piston of No. 1 cylinder has not moved from the top dead center position.

It is important that the gears should not mesh too tightly and, after tightening both bolts supporting the housing, it should be seen that there is approximately the same play between the large gear and the idler gear as between the idler and the small magneto gear. In case the large gear meshes too tightly the two bolts supporting the gear housing should again be loosened and the entire housing shifted slightly to the left, which may be done quite readily as the two bolt holes in the gear housing are a trifle oversize. In like manner, the housing should be shifted slightly to the right in case it is found that the gears mesh too loosely.

With the adjustment of the gears correct, the two gear housing supporting bolts, as well as the two bolts securing the magneto bracket to the crank case, are to be permanently tightened, using for the

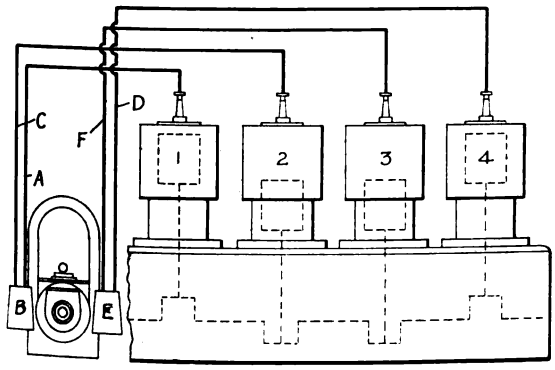


Fig. 2—Wiring Diagram.

two bracket bolts the original Ford nuts and new lock washers. The original nut and washer are also used on the end of the camshaft to retain the large gear.

The gear housing is to be packed with a good quality grease or non-fluid oil and, after carefully fitting the paper gasket, the gear housing cover is to be secured in place. During operation, the grease cup of the Bosch gear housing should be given a turn every day and the cup itself filled with grease whenever oil is supplied to the oil cup on the Ford cylinder front cover. The slipring brushholder and the dust cover over the magneto armature are to be replaced and the four high tension cables connected as follows:

The cable marked A, in the brushholder B, is to be connected to number 1 cylinder, while the cable marked C in the same brushholder is to be connected to number 2 cylinder. The cable marked D, in the brushholder E, is to be connected to number 4 cylinder, while the cable marked F, in the same

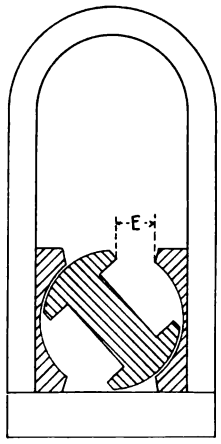


Fig. 3—Timing the Magneto.

brushholder is to be connected to number 3 cylinder. The firing order of the Ford engine is 1, 2, 4, 3.

All cables are to be led under the arch of the magneto magnets and through the cable guide, supported by the bracket, the latter being secured to the engine by means of the middle cylinder head bolt on the magneto side.

After engaging the short connecting rod with the arm of the interrupter housing and securing it in place by means of washer and cotter pin, the advance bracket is to be set across the first two studs holding the inlet and exhaust pipe clamps and is secured to the clamps with the orginal nuts. If necessary, the shoulders of both clamps are to be filed down to permit the nuts to fasten properly on the studs. The long connecting rod passing across the front of the engine, is to be engaged with the ball joint at the foot of the steering column to which the timer rod was originally connected.

The fan, pulley assembly and belt are to be replaced in their former position, after first placing the spacing washer in back of the driven fan pulley to align it with the pulley on the crank shaft. The face of the hole in the dashboard through which the radiator rod passes is to be slightly countersunk to receive the head of the rod and permit the metal plate to set snugly against the dash, covering the holes left by the coil box. The Bosch key switch is also to be fitted and connected. The radiator is to be returned to place and all bolts securing it and its water inlet and outlet connections tightened up, first, however, applying a coat of shellac or white lead to the gasket between the water connections and the engine. After refilling the radiator the engine may be started and tested and, if O. K., the gas connections to the headlights are to be replaced.

During the engine test, the operation of the gears, especially, should be noted. If, during operation, the gears give rise to a high pitched ring, the indications are that they have been meshed too tightly, while a

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rattling noise indicates gears meshed too loosely. Either condition should not be allowed to continue but should be corrected.

In timing the magneto for Ford cars, the magneto armature is to be turned by hand, by means of its coupling, in the direction in which it is to be driven until, first, the metal slipring segment is visible in the slipring groove. Second, the trailing end of the armature is about 9/16 inch from the pole shoe on the right side of magneto, viewed from the shaft end. The 9/16 inch distance should be measured as shown by the letter E in the illustration shown. With the armature held in this position, the larger gear is to be slipped into place on the camshaft and meshed with the idler gear, care being taken to see that the piston of No. 1 cylinder has not moved from the top dead center position.

Danger in Oxygen.

From A. Cressy Morrison, New York.—I notice in your Trouble Department, April, 1915 issue, page 49, No. 1587, entitled "Oxygen for Carbon Cleaning," Newell F. Resseguie asks if anyone has tried cleaning carbon from an engine by running it and feeding it a little oxygen gas at the same time. He adds, "if this oxygen is explosive enough, the engine could be run on it alone and this should clean the whole system without injury, spark plugs, valves and even the muffler, to a certain extent." This inquiry requires a very positive answer which will effectually discourage any attempt to mix oxygen with gasoline vapor in the cylinders of an automobile. In the first place, oxygen is not explosive, cannot be ignited but will support combustion. As the air contains 21 per cent. of oxygen, it must be clear even to your inquirer that it could not be used to run an automobile. If oxygen and the vapor of any hydro-carbon such as gasoline are mixed, however, the rapidity of combustion is increased in direct ratio to the percentage of oxygen added. The more rapid the combustion, the harder the explosive blow which will result. If pure oxygen and gasoline were mixed in an automobile gasoline cylinder in the right proportions, the explosive force at the time of ignition would be increased five times and in all probability, the entire automobile would be wrecked. It should be clear, therefore, that no admixture of pure oxygen with gasoline vapor in automobile cylinders should be attempted under any conditions.

In the burning out of carbon in automobile cylinders, oxygen may be used. The gasoline is shut off, the vapor is allowed to escape and the ignition of the carbon is effected by some suitable means. Once ignited, the pure oxygen blown into the carbon will rapidly burn the carbon out of the cylinder and the heat produced is not sufficient to injure the metal. The burning out of carbon cylinders in this manner is now a very generally accepted and valuable method and may be conducted without danger either to the operator or machine. Mr. Resseguie's suggestion is however, not only impracticable but hazardous.

Buy a tire pressure gauge.

Over inflation is bad for the car and its occupants; under inflation is ruinous to the tire.

Remember that after about 27 m.p.h., tire wear increases as the cube of the speed.

A LONG ROAD

To San Diego With the Smartest Girl These Men Know.

From Felix J. Koch, Ohio.—"Some trip?"

Yes, it was some trip! All the way across the continent, not as the bird flies, (which is, of course, the usual route for the motorist) but on the diagonal, the longest side of the triangle that would be formed by the drawing of a route from the northeast corner of the United States, down to the southwest corner, and then running your lines along the Atlantic seaboard and across the southern frontier. Think of it! All the way from New York to San Diego by automobile—the very first to make the journey.

Caked with dust, but grinning over their success, these first coast-to-coast motorists to arrive at the San Diego Exposition, rushed across the Puenta Cabrille on March 27th, an hour after the passage of the parade escorting Secretary of the Interior, Franklin K. Lane, on his official visit to the Exposition.



Easy Enough to See How They Feel.

Miss Margaret Gale of New York and Raoul LeMat, of Hartford, Conn., occupied the first car and the only one which came through, according to our official report, without serious mishap. Stanley James piloted the second car, but this one came on only from Chicago, where James' first car drove into a ditch and went out of commission. Three other cars had started from New York, but had been abandoned in three successive blizzards.

"It took us from January 9th to make it, and we had trouble a plenty," Miss Gale related. "I don't want the Secretary of the Interior, or any one else, to meet me until I've been to a hotel and got out from under part of this coat of dust."

"But fun? I never had so much fun in my life, and if the others are game, I'll drive back, across

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country. I know we can cut that running time of two months and a half, because the blizzards in the north and the washouts in part of the southwest cost us a good many days. I'll never forget the woebegone expression of the driver we lost in Iowa. His car was buried in a snowdrift and he drove on with us to the next town, to wait for spring."

LeMat led the route from New York to Washington, then on to Pittsburgh, Cleveland, Chicago, across a corner of Iowa, and from Kansas City down along the Santa Fe trail to Phoenix.

From there he came straight to San Diego by way of the Southern National Highway. He reported the roads generally admirable, save for the seasonable difficulties, which are already practically removed in the southwest and will be removed from the northern route when spring is passed.

GASOLINE DANGERS.

The Problem of Handling and Storing to Secure Safety.

From Walter L. Wedger, chemist of the Massachusetts District Police.—As a means of furnishing power for the transportation of both passengers and merchandise, gasoline has come into general use. It is no uncommon sight to see what was only a few years ago a one-horse dump cart, containing gravel or coal, now transformed into a motor truck, with the same load increased to many times its original size, and traveling at many times its original speed.

Motor fire apparatus has become almost indispensable, and the use of gasoline is not confined to getting the apparatus to the fire, but furnishes the power to pump water after its arrival, making gasoline almost as important in the extinguishing of fires as water. I shall expect soon to see Standard Oil motor trucks filled with gasoline responding to all third-alarm fires.

Experience has proven that the underground system renders the storage of gasoline practically safe, the danger being in the handling largely. Underground tanks should be placed not less than two feet below the surface of the ground, and if within ten feet of a cellar or other open area which is below any part of the buried tank, it should be embedded in cement concrete, not less than ten inches in thickness. Such tanks should be constructed of steel plates from 3/16 to ¼ inch in thickness, and should be well covered with asphaltum varnish to resist rust.

Usually there are three pipes leading from the top of the tank—the filler pipe, the draught pipe and the vent pipe. The latter extends from the top of the tank to a point four feet above the roof of the building, and is considered necessary to conduct off the residual vapor in the tank, which is forced out during the process of filling.

In the drawing of gasoline from an underground tank by means of a pump, it is much better to use a pump that holds the gasoline in the draught pipe continuously, rather than one that allows it to run back into the tank, for in the latter case you are pumping vapor for a short time before the gasoline liquid comes.

The act of drawing gasoline from a pump and filling the tanks of cars by means of a hose or a can, through a funnel covered with chamois skin for the purpose of removing water and dirt from the gasoline, has been known to cause a number of fires by the generation of frictional electricity.

For a long time mysterious fires occurring during this process of handling gasoline have been reported to our office.

I was just as skeptical then of the fact that these fires were caused by frictional electricity as the general public is now. During the early part of last April a fire occurred at the Cambridge garage of the Metropolitan Park Commission while they were filling a car with gasoline by pouring it into a funnel through a chamois skin strainer from a five-gallon can. To make the funnel set upright on the car tank they had placed a piece of wood with a hole in it over the filler hole of the tank, thereby insulating the funnel from the metal of the tank. After a few quarts of gasoline had passed through the chamois skin, the man happened to bring the pouring can near to the metal edge of the funnel, when a spark jumped from one to the other and set fire to the gasoline vapor rising therefrom. Quick action with extinguishers saved the car. The man insisted that he saw and heard the spark, and believed he could cause it again in my presence; so, armed with a gold leaf electroscope used to show the presence of static electricity in any substance, I proceeded to make a number of tests. The officials of the Standard Oil Company, both in Boston and New York, as well as several engineers and technical men, were very much inclined to disbelieve what they termed a theory, so I invited them to be present. We imitated the conditions as they were at the time of the fire, except that we took it on the open floor of the garage. We caused the spark by simply pouring gasoline through a chamois skin covered funnel insulated from the floor, and all present saw it.

A chauffeur in a private garage at Brookline hung a five-gallon can by the bail, on the hook of a common self-measuring pump, the bail having a wooden handle, which insulated it from the metal of the pump. He had drawn about a gallon when a spark jumped from the can to the pump and set fire to the gasoline. He threw the can out of the open door and after extinguishing the fire and desiring to fill his car, he repeated the operation with the same can with the wooden handle, and it caught fire the second time.

After that the man refused to go near the pump and went to a public garage to get his car filled.

Not long after that another chauffeur in the same town proceeded to fill his car from a pump by means of a 16-foot rubber hose, to the end of which was fitted a nozzle shut off of metal. While one man was doing the pumping the other held the nozzle near the car tank, but did not bring it in actual contact. A spark, which he describes as half an inch long, jumped to the tank and set fire to the gasoline.

Several fires have occurred recently at one of the Albany oil stations, evidently caused by the generation of frictional electricity in a canvas spout used to convey gasoline to tank cars.

The canvas was covered with a coating of shellac, and the spout hung from an overhead pipe, the lower end being in or near the manhole of a tank car, but not touching the metal of the tank.

Recent tests show that the friction of gasoline passing through this spout and rubbing against the shellac coating caused the generation of between 400 and 500 volts of electricity.

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HOME UNDER POWER.

Hints on How to Make Temporary Repairs Away from Home.

Roadside repairs that have been executed in the past serve to show what can be done with bolts, bars and brains. If your steering column gets bent or the steering box breaks up, must you get towed home? Oh dear, no. At any rate not if a piece of flat iron about 4 ft. long is obtainable.

This actually happened to a car after a very severe strain on the steering gear. Negotiating a hill and approaching what appeared merely an ordinary corner the driver in question was surprised to be faced with a rather severe S bend, the second turn of which was occupied by a truck. The resultant swerve smashed the steering arm coming from the box to the connecting rod and threatened an enforced and somewhat lengthy delay. This motorist happened to be possessed of some experience, however, and got home to his garage in a very creditable manner. Taking out one of the bolts securing the steering box to the chassis he attached thereto a bar of iron 4 ft. 6 ins. long, pivoting on the hole therein which had been drilled about 15 ins. from its lower end, which latter had in turn been secured to the steering connecting rod by means of some cable. The control of the front wheels was not such an easy matter as before, and was possibly reminiscent of prehistoric motoring, but proved sufficiently reliable to reach home.

Many an old car with a bevel drive and a differential stay rod fixed upon the casing has been towed or railed home on account of the latter parting company with its casing, so allowing the whole back axle casing to swivel round and the cardan shaft to drop out. This might at first appear an insuperable difficulty, but closer examination would show the problem to resolve itself into a question as to how to keep the back axle in a rigid position, secure from partially revolving. More than once this has been accomplished, with the assistance of a local blacksmith, by fitting a crossbar to the two sides of the chassis immediately over the front of the back axle and having two drop pieces fitted, one to each side of the casing. These held the latter absolutely immune from any movement, and the car was driven home, carefully, it is true, under its own power.

The same object can be accomplished by securing a stay to both the top and bottom arms of the torque rod and continuing same to the bolt holes of the axle casing. In one instance, which caused a certain amount of amusement at the repair works to which the car ultimately went, it was found that two long tire levers, with holes drilled at one end and securely lashed at the other to the stay rod, had performed this, to them, novel duty!

Whenever executing a temporary repair of this description it must always be borne in mind that the original strength has gone, not only from the affected part, but very often other parts surrounding have been weakened during the onslaught of accident; consequently a high degree of care must be exercised in driving home, especially, in the above instance, in the operation of the clutch and also the brakes, as a sudden taking up of the drive obviously tends to twist the back axle round, as also is the effect when the brakes are used. It is possible, of course, that a steep hill might prove too much for the temporary expedient employed, but, in motoring, any sort of towing assistance is objectionable, and a way out of the difficulty, no matter how bizarre, is worth trying.

Punctures, we know, belong to the category of "things which are sent to try us," and it should be seldom indeed for any experienced motorist to be caught without any spares. Suppose, however, one's stock has been exhausted by a run of bad luck and a big burst is the crowning item of a long day's misfortune! How then? Wait for a passing car, chancing whether it has the same size wheels as yours? This is where the gaiter you should carry comes in useful. Oh, you have already used it! Well, you have either to send one of your party to the nearest town or "run on the flat." But before falling back upon this alternative take the tube out. The cover may be burst, but that is no reason why the tube (almost certain to be repairable) should be ruined.

You can also, if you wish, fill the cover up with old paper, canvas, grass or anything found handy that will make the running a little softer and take some of the heavier shocks!

If, however, you have the ability and material to repair your last tube, the cover may always and easily be patched up in the following manner. Let us assume that the burst has taken the most usual form of a slit, lengthways in the tire, and about 3 ins. long. Now, first cut half a dozen strips of strong canvas about 6 ins. or 7 ins. long, and 2 ins. wide and secure three of these, with solution, diagonally over the burst. The other three must then be placed over these diagonally in the other directions. A piece of cardboard ⅛ in. thick, may then be cut to 7 ins. by 4 ins. and laid lengthwise over the canvas, the whole being bound up, very securely and right around the tire and rim, with copper wire or, better still, some common wire. A repair of this description taking half an hour to execute has carried the writer on a 17.9 h.p. car over 50 miles.

An unoffending tree bough was once pressed into service as a tow-rope! The car in question was suffering from a broken crankshaft caused, presumably, by the seizing of one of the pistons. Not having a spare crankshaft with him (which he would assuredly have put in had he had it) the owner asked a passing motorist if he could assist by towing him in to the nearest railway station, some eight or ten miles further on. Yes, he would tow, certainly, but where was the rope. No rope or chain being available it was decided to experiment with a tree bough, which was accordingly trimmed, shorn of all its beauty, and drilled at each end. Two pieces of mild steel rod of ½ in. diameter were obtained from the spares box and bent into the form of an S, hooking into the bough and respectively on to the front axle of the towed and back spring of the towing car. About 12 ft. long and 2 ins. diameter, increasing to 2½ ins. or so, this extempore "tow-rope" gave good and faithful service. A most interesting museum could be formed out of "things that brought us home."

Careful driving is an enormous factor in successful tire life.

Rusty rims are ruinous. They breed rusty beads, the direct offspring of which is rusty fabric.

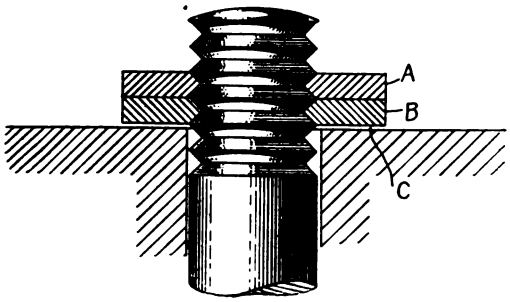
An hour's run in a downpour will not cause rust to deposit. It is the day-after-day drizzle which fosters the germs of rust.

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A Lock-Nut.

From N. G. Near, New York.—Very few automobilists know how to apply a lock nut, despite the simple principle. Most of them instinctively put the large nut on the inside—between the small nut and the piece being held. My sketch herewith shows how the lock nut should be applied and why. For simplicity's sake, I have made both nuts one thread thick. The action is thus better understood. First, put on nut B and screw down until it "almost touches" the piece to be held. Leave a small gap as shown at C, then put on nut A and screw down against nut B so they will both act in contrary directions. That is, the top of thread A will be in contact with the bolt and the bottom of B will be in contact.

Then turn them "both together" until they grip the piece as firmly as you wish. Of course, A and B must be screwed only "snugly" against each other, otherwise tightening will be difficult. Then, when you are sure the piece is firmly held, twist nut A



Applying a Lock Nut.

alone. B will then be forced down but little farther, due to the elasticity of metals, while the clamping action between A and B is materially increased. Where this method is followed there is but little danger of the nuts working loose and coming off. Where B is first screwed down tight and A is afterwards screwed down tigher, B becomes nothing more or less than a washer and might as well not be used at all.

Cleaning the Magneto.

From the Bosch News.—Due to its rapid evaporation, gasoline is frequently selected to wash the magneto free of external dirt or dust. Quite frequently, too, the contact-breaker and the region thereabout are given a good dousing. The need for caution is because gasoline of to-day does not evaporate as readily as it did when the refiners supplied the higher test fuel, and in consequence the surface of the washed magneto retains a film of gasoline longer than at first is suspected. Should the engine be turned over directly after cleaning the magneto, a spark from the contact-breaker would set fire to the film of gasoline which covers the magneto and what would result is hard to say—maybe little, maybe much.

If the wires to the spark-plugs have been removed, there is an additional possibility of a conflagration, for gasoline may have been forced into the chamber of the external spark-gap, and should any action cause the magneto's armature to be rotated, a spark would pass across the spark-gap and light the liquid.

There is no danger of all this occurring, if the magneto is wiped dry, gasoline used sparingly and the magneto or car not put in immediate operation. Just common horse sense saves a lot of trouble in life.

Another point—should the magneto be totally taken apart, it is not entirely wise to wash all parts in gasoline and then assemble. It would be preferable to wash all parts thoroughly in gasoline and then in clean kerosene oil, for when steel parts are washed in gasoline, they become absolutely dry as soon as the gasoline evaporates, which causes these parts to be more susceptible to rust. Ball bearings in particular are sufferers, so that when these are replaced they should be given a thorough covering of light oil—not soaked in it, but covered with a film. It not only lubricates but protects.

The armature can be washed in gasoline, but it is not a good practice to permit it to soak, as the armature covering may be softened and a possibility exists of damaging the condenser also.

One point that cannot be sufficiently emphasized is the warning that only those who are thoroughly conversant with magnetos should attempt to dismantle them. So much depends upon an ignition system that when it requires cleaning or adjusting, it is best to place it in the hands of real experts, rather than take the responsibility yourself. This, of course, applies to complete disassembling and important internal adjustments not covered in the regular instruction books.

Remember, a blacksmith may be able to make an excellent wagon axle, but he hardly could be expected to repair a split second stop watch.

Starting and Stopping.

"In starting or stopping a car, when the power is applied or the brakes used, there is a tendency of the rear axle to turn with the wheels," declares Elwood Haynes, pioneer auto builder. "As was customary with the older designers, instead of using parts already at hand, an additional part was added to the car in the form of a long heavy bar. This bar extended from the axle to the frame and prevented the turning of the axle. In the later designs, the Hotchkiss drive is used. This term is applied to the driving system where the rear springs take both the drive and torque of the rear axle. In other words there is no torque bar extending between the rear axle and the frame of the car. The two rear springs keep the axle from turning. Greater simplicity and flexibility are obtained. The axle is subjected to no sudden shock because the construction is slightly yielding.

"A baseball catcher extends his hands out as far as possible to catch the ball and then allows his hands to come back to stop the ball gradually. It would be too much of a shock to stop the ball without moving the hands. In other words his hands yield to absorb the shock the same as the springs take up the jerks on the axle.

"An attempt is made in the torque bar construction to obtain a yielding action by carrying the forward end between two short coil springs, but the rear axle must bear greater jerks and shocks than can be given it with the Hotchkiss drive system which consists of nothing more than two long flexible arms in place of the one rigid bar."

Never steer suddenly except, of course, in case of necessity.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

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Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

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THE JITNEY SITUATION.

How the present invasion of passenger traffic in cities and towns by the jitney automobile service is to end it is difficult to foresee. Take one single town as an illustration, although quite likely other more forcible instances might be made concerning the havoc this service is creating in the electric street railway business.

Street railway passenger traffic in Winnipeg, Canada, has decreased to such an extent since the advent of the jitneys that the Winnipeg Electric Railway Co. has been forced to adopt new measures to cope with the situation. This will involve a reduction in the number of cars on the various routes, a reorganization of routes, and a probable reduction in staff.

"I may say that the proposed reduction in service is not at all in line with the decrease in traffic," says the company's manager in a letter to the civic board of control. "If we were to merely put in such service as to take care of the present traffic, it would mean a much greater reduction. I also want to inform the board that if traffic continues to decrease, further changes in the service will have to be made to meet the conditions." The company does not mention the jitneys in its letter, but undoubtedly they are a factor. According to city officials, there are 572 jitneys operating on the Winnipeg streets, 428 of which have jitney licenses.

But the end is not yet. The street railway traffic has developed slowly until everything is conducted along strictly economical business lines. Although this business has proven profitable, yet attempts to reduce fares lower than five cents have proved disastrous. With liberal franchises, and tracks and cars constructed specially with a view to the lowest possible cost for the service, it would scarcely seem that an ordinary automobile could do the work for the same price.

It can be readily understood that in the establishing of a jitney service the receipts of a single day or a week may seem encouraging for a profitable business. But how will it be when the year rolls round, with good weather and bad, and possibly in winter a period of deep snow? And how long will an automobile last when put to the severe jitney service? The matter of gasoline and oil are but a small fraction of the cost of up-keep. Tire wear, paint and varnish, and general repair will naturally be heavy from such continuous strenuous use. The jitney service is yet in its infancy. Indeed, in some instances jitney owners have already found that 5 cents is too low and the fare has been raised to 10 cents. In St. Louis a study of up-keep costs has convinced the owners that carrying passengers a distance of 4 miles for 5 cents each is a losing venture. It costs 7¼ cents a mile or 29 cents for the 4 miles according to estimates given by the manager of one of the jitney lines. It would be necessary to carry six passengers on each trip to cover the operating cost but this is seldom possible, because there are hours during the day when trips are made with three and four passengers, and during the rush hours of the morning return trips from downtown are often without a passenger.

The automobile will ultimately be a greater menace to the general railway business than to the street railways. An important essential to profit in the jitney service is speed, and speed is not always possible in congested districts. On the other hand, between cities and towns, where the passenger traffic is heavy and where rapid speed may be made, jitney service will prove decidedly uncomfortable competitors to the railroads.

LAW VIOLATORS.

One of the most pernicious tendencies of everyday life is a noticeable lack of respect for the law. It exists more or less among all classes, but is most apparent where the culprit can "see no harm in it." Or possibly it might be more accurate to say where the culprit pretends to see no harm in it.

Take the case of violations of the speed law, for illustration. We have heard individuals refer in even a boastful way of having done it. The other day a man came into a garage where his motorcycle was stored, took out his watch, and said: "Eighteen miles in 25 minutes; well, that is pretty good time, but I wanted to get in before it began to rain." Then the individual chuckled, as he related how he had avoided arrest on other occasions when he had exceeded the speed limit.

Of course, the person referred to was rebuked as he well deserved, and his qualities of mind and heart are plainly indicated by the remark quoted. But there are a good many individuals of this sort—far more than might be expected—and they are almost wholly responsible for whatever ill-feeling exists for both automobiles and motorcycles among those who do not use them. And the motorcycle is more unpopular to-day than the automobiles, and de-

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servedly so, for it is largely used by those who have an untramelled ambition to "burn up time and space."

It is admitted that this class of law-defiers is not a large one. But like other evil things, they often put a stigma upon the whole. Of course, there is but one thing that can be done to mitigate the evil. Ignorant and unscrupulous human nature can't be made over; it requires generation after generation of example and precept to do that. But even this sort of human nature can be inspired with a wholesome fear. The law against such offenders may be made more severe, and it may be more severely or strictly enforced. There is absolutely no other remedy. Articles of this sort may be written by the press of the country until the crack of doom and they will have very little effect. What is needed is more severe punishment.

Then a duty is incumbent upon lawful users of automobiles and motorcycles. It is plainly their duty to rebuke such instances of lawlessness in the plainest and most forceful terms wherever and whenever it is manifest, just as was done in the case referred to. Such a course is unpleasant, it is true, but if duty were invariably pleasant it would seldom be violated.

A GOOD LAW.

The new automobile law of New Jersey is a good one. It virtually places users of the public highways on an equal footing where they belong. No longer are automobiles to be made the "goat" in the sharing of responsibilities, or the favorites in the sharing of rights. This law defines the rights and duties of every user of the highways, from the pedestrian up to the driver of a high-powered automobile. Moreover, these rights and responsibilities are set forth in minute detail, so that they are easily understood, and if they are properly enforced the number of accidents will be greatly reduced.

Under this new law the word "vehicle" includes not only automobiles, but horseback riders or horses that are led, and everything on wheels or runners, except street railway cars and baby carriages. The word "driver" covers the rider or driver of a horse, of a bicycle, or a motorcycle, an automobile or a street car. Horses, mules and all other domestic animals used as draft animals, or beasts of burden, are likewise placed in the same category.

We have not the space to publish this law in full, but those in other states who are interested in having a sensible automobile law may well send to the Secretary of the State of New Jersey and secure a copy of it. One provision will be especially gratifying, and as far as we know it is somewhat unique, namely: It is unlawful for bicycle riders or roller skaters to attach themselves to vehicles of any kind or trolley cars. Another provision cannot be considered of quite as much merit. It provides that no vehicle shall travel at a greater speed than six miles an hour when passing or approaching a schoolhouse, providing signs are placed on the highway so that those approaching may be aware of the location of the schoolhouse.

The law, however, in its general features is so sensible and just that one can't but wish the same law existed in all the states.

USED CARS "ON TIME."

A Method Which Has Proved Successful for Seller and Purchaser.

From G. D. Crain, Jr., Kentucky.—Although some automobile dealers are taking paper in partial settlement for new cars, it is probable that the bulk of the business on machines fresh from the factory is still on a cash basis. When it comes to second-hand cars, however, an entirely different method has been developed.

Instead of having to plank down the hard cash for his car, the purchaser of a used machine can often get terms which remind one of those offered by the piano and talking-machine dealers. They are not exactly "a dollar down and a dollar a week," but concerns which have specialized in the used car business are making it very convenient for those who want to buy.

One concern in a Middle Western city, which is said to have the largest used car business in that part of the country, advertises a method whereby $50 will get any car on its list. It does not, however, deliver the car on an initial payment of this amount, but simply reserves it for the purchaser, who gets the machine after 25 per cent. of the purchase price has been turned in.

This really amounts merely to a savings bank arrangement, wherein the automobile concern is the banker; and, to carry out the idea still further, the dealer referred to pays 4 per cent. interest on the deposit which is made prior to actual delivery of the car, so that the purchaser can hardly lose.

In addition to attracting the attention and getting the business of people who might assume that purchasing an automobile is an impossibility for them, since the $50 limit undoubtedly brings an immense number into the field who would not be able to consider a larger immediate outlay, the same company makes a special play for "time" business of larger amounts, offering cars up to $700 values on the monthly payment plan.

Showing that it believes that most people are honest, and that the credit risk is not excessive, this company has been advertising aggressively in the territory nearby, and has sold a good many cars on the instalment plan to people living several hundred miles away from its community. Apparently it has experienced little trouble in making collections, and feels that the "time" system is just as logical in the sale of autos as furniture, pianos and other goods which have been sold this way for many years.

Such a business suggests, of course, that the dealer must know what he is selling, and be willing to stand back of it after it gets out of his hands. The concern which is getting spot cash for a second-hand car can be fairly independent about it after delivery. On the other hand, when the customer has merely paid in part of the purchase price, it is evident that he must continue to be satisfied with his car, or there is risk of its being thrown back on the hands of the automobile company.

In fact, this is the point which has always seemed to present an insuperable objection to the system of selling on the instalment plan. So many things can happen to an automobile. It can burn up, get out of condition, have a collision, or what not, and any of them can make the machine rather unde-

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sirable property to the owner. But the instalment concern referred to does not believe that the chances favor anything of the sort. For one thing, it has the car insured, with the policy in its possession, until it is paid for, so that the possibility of its destruction by fire or other casualty is taken care of. And as for the machine giving service, it guarantees it for one year, and its system of payments provide for it being paid for within that time.

A twelve months' period is usually the limit covered by the guarantee on a new car, although many dealers think they are stretching it a point when they guarantee a used car for ninety days. The instalment plan makes the interest of the dealer just as keen ten months after the sale as three, however, and he would probably have to make some sort of adjustment satisfactory to the customer if anything went wrong before the machine was paid for, so that the guarantee is really making a talking-point, for selling purposes. But the dealer makes good by giving every car a thorough overhauling, which amounts to rebuilding, before he puts it out for resale.

This was what was meant by saying that the dealer, under the instalment system, must know what he is selling. He simply can't afford to put out a car which is likely not to give service, because of the certainty of its coming back on him. In such a case the payments already collected would seldom be sufficient compensation, considering the cost of putting the automobile back into presentable shape and selling it again.

Contrast this plan with that which has been in use in some cities, of conducting public auctions for the purpose of relieving the glut of used cars, which develop to a greater degree late in the winter than at any other time. People who have lost their zeal for motoring during the cold weather; those who have simply "needed the money," and those who have been persuaded, by longer allowances than are made during the active season, to trade in their old cars on new ones, have all contributed to the supply, while weather conditions have held down the demand. Hence the first few months of the year usually see an excess of old automobiles that makes one believe, until he actually begins to look around, that he can get anything he likes for any amount he may care to pay.

Under the auction system nothing whatever is done to the car. The buyer looks it over, like a horse at a fair, and forms his own judgment about the value of the car, and the amount of money that would be needed to put it in first-rate condition. No guarantee of quality or satisfaction is made, and it is a case of the buyers pitting their shrewdness against each other, and picking winners from among the cars of all descriptions which may have been offered.

In one city there have been, during the past few months, three regular "auction blocks" where weekly sales of used cars have been held. Some of the wrecks that have been unearthed and put up might have furnished good material for the Smithsonian Institute, but as a matter of fact about the only interested persons were junk dealers. One old car, apparently about ten years old, had to be hauled to the auction. Many of its parts were missing. Its running-boards were in a state of collapse, the steering gear had fallen down upon the front seat, the top had several broken ribs, and the engine was a mass of rust. It was sold for a few dollars and broken up for junk, of course.

On the other hand, some fair-looking cars are often put up for auction, and now and then real bargains have been secured. Many business men who want to buy passenger cars of good make, but obsolete body design, with the idea of mounting a delivery body on the chassis, have found the auctions a good place to locate autos of the type desired, and possibly have secured better values than they might have got otherwise. Yet the man who was deceived by a fresh coat of paint and a pair of new foredoors, into buying a car several years old, under the impression it was a late model had no recourse, and none but himself to blame, when he discovered his error later on.

Rebuilding, guaranteeing and selling on time, as against putting up for sale at public auction without investing anything in work, is the more conservative, but in the end the more satisfactory method. Better prices can be realized, greater satisfaction can be assured the purchaser, and more real automobile enthusiasts created. As a matter of fact, many a man who has feared to buy a car, because of the high cost of maintenance about which he has heard, has been attracted by a low-priced used car into entering the ranks of the motorists. Having found that he could run it and accumulate a fair mileage without bankruptcy, he has gradually improved the character of his automobile until he gets to the top of the heap.

And from the standpoint of the dealer with gasoline, oil, tires and sundries to sell, a used car owner looks just as good as the man who has invested in an eight-cylinder made in 1915.

SOMETHING ABOUT DRILLS.

Useful Information About the Various Kinds of Drills for Lathe Work.

For drilling in a lathe, the drill known as a twist drill is employed for two reasons. First, it has a capacity of drilling straight and true, and second, because the twisted flutes afford excellent and free egress to the cutting and permit of the hole being drilled without removing the drill to get the chips out. There are instances where the straight flute is employed and has advantages over the twist drill but this will be found only in such metals as brass and copper, and in this case they require special grinding, as will be taken up later.

A number of different shanks are employed in different machines but the most common in the small drill is the parallel or the straight shank, sometimes called "jobber's drills." In the larger drill the taper shank, known as the Morse taper, is employed and is held in position by being forced into a taper to fit the drill shank. The small straight shank drills are held by small chucks, as the taper shank would make them more expensive and in many instances quite unsatisfactory.

An ordinary twist drill has three cutting edges, as shown in Fig. 1, at A, B, C. The ordinary drill cannot be made as keen as is desirable for rapid and clean cutting, and therefore, necessitates an increase in speed to overcome this handicap as compared to other tools employed for cutting metals.

The circumference between flutes, known as the

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"land" of the drill, is obtained by grinding from the cutting edge, B, to the back of the flute, C. This is backed off to give clearance, as is shown by the dotted line, D. Consequently the drill has its full diameter at only the two points, as shown in the drawing B to E, Fig. 1. The object of grinding the drill in this fashion is to prevent it seizing from heat or dragging against the walls of the hole and

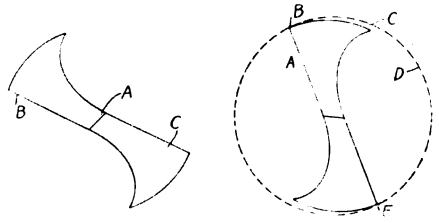


Fig. 1.

cause it to require an unnecessary amount of energy to turn it. In case the "land" of a drill is worn off and the drill be perfect in every other particular, it will be found practically worthless for drilling any depth. Most twist drills have two flutes only. However, three and even more have been made, but owing to the more delicate, complicated operation in grinding, its advantages are counterbalanced to such an extent that it is not considered practical. Therefore, the keenness and durability of the cutting edge of a drill are governed by the amount of clearance given by the grinding of the cutting edge to correspond to the twist of the flute.

The angle of the front face of a twist drill varies at every point in the entire diameter of the drill, being governed by the spirality of the groove or flute. The sooner we acquaint ourselves with these peculiarities found in standard drills the sooner we will get better results with less efforts.

In Fig. 2 we have a drill, B, ground exactly true and the "land" of the drill bears exactly the same

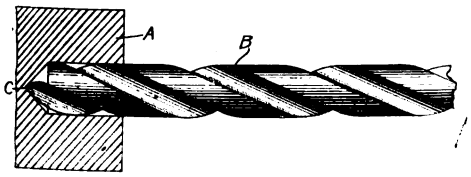


Fig. 2.

all around the walls of the hole. A drill ground in this manner will wear until the flutes are ground entirely away and cut clean, straight holes. On the other hand, if one of the cutting edges is a trifle longer than the other the drill will cut a hole larger than the drill and the result is the drill will be dulled very rapidly on the side doing the cutting. If the hole drilled is of any depth, it will be smaller the deeper it is drilled, leaving it an irregular taper with rough walls. The point, C, will be ground around in something of an eccentric motion in the block, A, and the "land" of the drill on the one side will be destroyed, rendering the drill useless for accurate work.

Then again, we may take a drill ground accurate and increase the feed without, however, increasing the speed accordingly, and get results much resembling the drill ground out of true. If we take a drill with one cutting edge ground longer than the other and the two cutting edges at entirely different angles to the angle of the axis of the drill, we will drill a hole with crooked rough walls, varying in size from top to bottom. Where drills are employed for any amount of drilling and where it should be done accurately, a machine for grinding them should be employed, as the cost will be saved in drills and time in a very short time. It seems to me if some one would invent a simple device which could be attached to the ordinary grinder it would find a ready market.

When drills are ground by hand, a protector, as shown in Fig. 3, should be employed. The length of the cutting edge, C, can be measured by the indicator, D, on the scale of the protector. The flutes of the drill can be kept to the scale of the protector at A, thus giving a very satisfactory grind with a little practice. Care should be taken in grinding drills to not reduce the diameter of the drill by grinding into the "land" of the drill.

At A, in Fig. 4, we have a drill known as a straight flute. It is employed for drilling certain metal where it has quite an advantage over the twist drill. These drills work especially well in brass and will work at a higher speed, without having a tendency to gouge than the twist drill. Then we have again

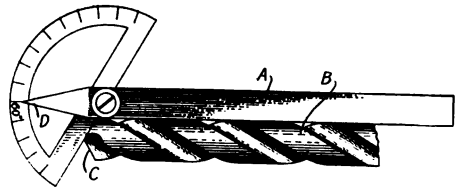


Fig. 3.

at B, in Fig. 5, a drill used for drilling wood and driven by a machine. This drill is made with a conical point, E, which serves to steady it. Then it has two spurs, D, which cut the wood before it is removed by the bit, permitting of a clean wall instead of a rough torn one, as would result in case the ordinary drill were used for this purpose. Flute C, removes cuttings.

For drilling cylinder work a block, as shown at B, in Fig. 5, is employed to rest the work against. The shaft or pipe rests in the lowest part of the block at A, and the forks prevent it turning or moving sidewise while being drilled. C represents a similar block used for the same purpose. Then again we have at D a block of similar construction except the grooves are different widths which come in good play for holding shafts of different sizes

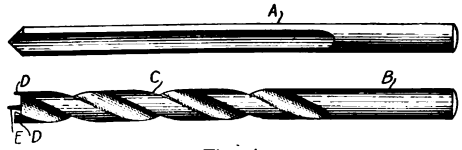


Fig. 4.

from the smallest up to the capacity of the block. A number of these blocks of different sizes should be added to the equipment of every drill press as they will save their price in drills in a very short time. When a shaft drilled part way through turns under the drill, it will invariably break the drill. In case the drilling is done in the lathe the cross should be fitted to a taper spindle which in turn fits the tail stock of the lathe.

We have in Fig. 6 another type of drill or boring

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bar employed for enlarging holes in pulleys and the like. This tool can be used either by hand or in a lathe or drill press. The body of the drill, A, should be the size of the existing hole in the pulley, especially at the end, E. The dotted line, F, represents the hole to be enlarged. A cutter is made and placed in the body of the shaft, A, as shown at C, and held in position by the sunken screw, D. The end of the shaft, B, can be fitted to the drill chuck or squared for a tap wrench and turned by hand. The cutter, C, can be adjusted to make the entire cut at a single operation, unless it is an unusually large one.

A number of these tools should be on hand at all

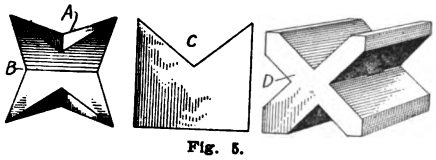


Fig. 5.

times as many pulleys are brought to the shop to be bored that are larger than the swing of the lather or the drill press. Or a simple one can be made with a number of different sized collars to slip over the lower end at E, giving the necessary sizes for a large range of drilling.

In drilling, the lubrication of the drill should be considered as one of much importance, especially in tough stock. In cast iron it is not necessary to lubricate the drill unless in extreme cases. Steel should be lubricated with a good lard oil, and the speed of the drill should be looked to as well as the feed, as each holds relation to the other. Drilling brass and copper differ quite a little from drilling iron and steel, and one should see that the drill will

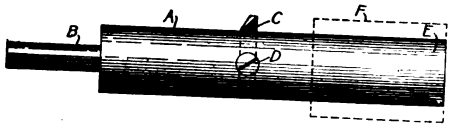


Fig. 6.

vary quite a little. The very small drills will give satisfactory results at a high speed while the large ones should be run quite slow and not feed too fast.

Cross drilling requires skill in judging of speed and feed, as when the drill breaks through if the speed is slow and the feed light, a tendency will be for the drill to catch and break.

Can Anyone Tell Him?

From George G. Keen.—Does anyone of your readers own or know anything about the Winton four-cylinder car of 1905, Model B? Cylinders are horizontal (not upright) and are placed under the driver's feet. Gasoline tank under hood. Transmission gears do not slide but remain always in mesh. There is a clutch for each speed—for low, high and reverse. Also there is a brake on the high speed shaft. Intake valves of engine are automatic, opening and closing without tappets. I am overhauling such a machine and would like to know your opinion or your readers' of such a machine.

Tension rods usually break where the threads have weakened the rod by cutting down the working diameter. The rods should be made larger at the threaded ends to allow for this weakening.

SPRING CLEANING.

A Few Things It Is Well to Do for the Good of the Car.

Although all cars do not require overhauling once a year, all require more or less attention in the spring. This ought to include a thorough cleaning of all the mud, grease and rust from the running gear; the removal of all the oil and grease from the interior of the motor, gearset, universals, axles and wheels, followed by a flushing out with kerosene; refilling all these with grease or oil; and removal of carbon from the cylinders. If the carbon is not caked too hard it can be removed by pouring a half-cupful of kerosene in each cylinder, then turn the engine over a few times and let it stand over night. Run the engine a few minutes in the morning till the black smoke disappears. If the carbon will not yield to the kerosene or some of the patent carbon removers, the services of a repairman with a removing outfit better be engaged, unless you want the tedious job of scrapng.

By the time you have gotten this far in the work you will have located a great many more grease cups and oil holes than you ever suspected the car possessed. These will all need refilling. Some of those that will need attention are the fan, starting crank or electric cranker and generator, pushrods, magneto, control rods from the steering wheel, the clutch and brake operating mechanism, axle bearings, steering gear and connections and the grease cups on the motor, clutch, universal joints and spring shackles and brake connections.

Then look over the electric wiring for ignition, lighting and cranking. Look for signs of wear in the insulation. It often is found that where wire gets a slight constant rubbing the insulation wears through, inviting a short circuit and damage to the battery. The application of a little insulating tape often will save much trouble in this respect.

Take the spark plugs out and clean them. They are likely to be fouled with carbon. Should there have been any gasoline left in a car which has been standing for some time, or should the car have been in service for a season without inspection, it is better to drain out the fuel tank by disconnecting the feed pipe at the bottom of the tank and at the carburetor. If the gasoline is of recent purchase, save it; if the car has been standing many weeks, there will be little left to throw away, and that not much good as gas-engine fuel. Take off the filler cap so the gasoline will drain as fast as possible to carry with it whatever dirt may be collected in the tank. Clean out the strainer, if there is one.

Drain out the carburetor, and then attach one end of the tire pump hose to the gasoline feed pipe you have removed and force air through it for a few seconds. This will remove the sediment that has collected in the line and which later might lodge in the carburetor nozzle with disastrous results. It is a very good plan if the car has a cone clutch to give it a good soaking with neatsfoot oil. This can be done without removing the clutch by wedging a board between the pedal and the front seat so that it holds the clutch out of engagement. Then pour the oil from a fine-nozzled can upon the top of the leather so that it will run all over the face of the clutch. Leave it disengaged for several hours to allow the oil to soak in. With a disk style of clutch

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in which the disks run in oil, it is only necessary to drain out the old oil, flush the case out thoroughly with kerosene and then fill up with fresh oil. If you put in light oil in the fall, go back to the heavier grade in preparation for the warm weather. Gearset and differential should be cleaned out and new grease put in.

Make sure that the bearings are not worn and the adjustments set up properly. When the gearset housing is opened and empty, take hold of the shafts and try to work them up and down, to see if there is lost motion in the bearings. If annular bearings or non-adjustable plain bearings are used, it hardly would be advisable to try to take up any lost motion, except where it is marked enough to cause possible trouble before the next overhauling. In the latter case it is a job for the service station or repairman. The same is true of the axle shafts when the differential housing is open, only this is perhaps the more important. The meshing of the bevel pinion and gear should be looked to, because usually after a season's use this is in need of adjustment. More important still is the inspection for wear and adjustment of the steering gear, because trouble at this point is most likely to be the cause of an accident.

Screw out the grease cup on the steering gear case and squirt a few gunfuls of grease into it. If there is excessive play in the steering wheel, see whether the lost motion is between the wheel and the steering arm or between the arm and the road wheel. There probably is a simple adjustment for wear between the steering wheel and the arm. If there is none, it is another job for the repairman. Likewise, if the play is between the arm and the road wheel, there may be an easy adjustment, if not, let a mechanic do it. If the wheels look at all out of alignment or have a tendency to wabble, the best plan is to get the service station or a repairman at them right away, because they will keep getting worse instead of better and every mile means increased tire wear.

If the tires have been running all winter, they have had the hardest service of any part of the machine. If the tires have not been off in several months, take them off now, take out the tubes—and do it carefully or they will be ripped where they stuck to the casing. Test the tubes for leaks, and go over the casings for cuts and blisters. Cuts can be filled with some of the compounds for the purpose if they are not too bad; bad ones will need vulcanizing; otherwise, some rainy day you will be hung up in the mud with a blowout.

Brakes need a complete going over for worn connections and a liberal application of grease wherever possible.

While too lean a mixture is the usual cause of "popping back," it must not be forgotten that any defect in the intake manifold, either original or acquired, may cause only one cylinder to get too lean mixture, and cause "popping back" when the average mixture is right.

Owing to the fact that the float in the carburetor is violently agitated when the car is traveling over rough roads, the gasoline level is practically raised, and more gasoline is fed to the engine than is needed.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Misjudged Speed of Street Car.—One man and woman are dead, their daughter frightfully injured and another man badly hurt as the result of an accident at Kalamazoo, Mich. It appears that the owner and driver of the car in which these people were riding turned his machine in front of a street car. The automobile was hit squarely and its occupants hurled against a telephone pole. The woman died on her way to the hospital and the man underwent an operation on his skull but did not recover and the girl's condition is very serious but there are hopes of her recovery.

Steering Gear Snapped.—At Richmond, Cal., a young man sustained a crushed chest, internal injuries and possibly a fractured skull as the result of an accident which occurred when his steering gear snapped and he lost control of his machine. The car overturned and pinioned him beneath.

Stood Up in Car.—At Spencer, Ia., a little girl stood up in a car in which she was riding with her father. She suddenly fell back out of the car, breaking one of her legs in two places and the other in one. The child seems to be rather unfortunate as but two weeks previous to the time of this accident she had broken both her arms.

Due to Absolute Carelessness.—An accident in which one man was killed at Kentland, Ind., is due to absolute careless and reckless driving. The driver of the car in which the man was killed attempted to pass a car ahead where there is a deep ditch and very little room. It seems that the drivers had been racing and it was simply the senseless desire to get ahead which caused the accident. The car ran into the ditch into a corn field and overturned, killing one and injuring the other occupants of the car.

Drove Car Through Closed Gates.—One woman was instantly killed and three other persons injured when the driver drove the car through the closed gates at a railroad crossing, directly in front of the switch engine. It is stated that the woman's head was completely severed from her body.

Car Skidded.—A man was killed at Cincinnati, O., when the car which he was driving skidded off the side of the road. The car was overturned, pinning the man beneath and breaking his neck.

Lost Control of Car.—At Ramsey, Ill., a woman was instantly killed when her husband who was driving lost control of the car in going down a hill. The machine plunged over a ledge 15 feet below, landing upside down.

Clutching the Wheel.—At New York City, a car was seen coasting down the roadway and finally hit the tail end of a wagon and stopped. The man at the wheel was found to be unconscious with both hands clutching the wheel. He was taken to the hospital and died shortly after. It is believed he was stricken with apoplexy just after he had shut off his engine to coast down the hill.

Stalled on Railroad Crossing.—In saving the lives of his wife and three other persons, at Gary, Ind., when the automobile in which they were riding became stalled on the tracks, a man was struck by

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a locomotive and badly mutilated, the top of his head being severed. No gates guarded the crossing, although there is a warning bell and an arc light and the tracks can be seen in both directions. It is thought that the party imagined they could clear the tracks when the engine suddenly stalled and the man pushed the car to safety but lost his life.

Plunges Into a River.—Four persons were killed near Seattle, Wash., when the car in which the party were riding ran off a bridge and fell thirty feet below into a river. The car is said to have skidded as it approached the bridge.

Attempted to Save Her Hat.—A woman at Dallas, Tex., may lose her life because of an attempt to save her spring hat. The young woman's hat blew off when she alighted from a street car and when she attempted to save it an automobile knocked her down. Physicians are doubtful of her recovery and the driver of the car is held on a charge of reckless driving.

Falls Asleep at Wheel.—A man was rudely awakened from a nap at Brentwood, Mo., when his car plunged into a hole beside the road. It is said that the machine was badly damaged but the man escaped with slight injuries.

Grade Crossing Accident.—Two men were instantly killed at a railroad crossing in Sherwood, O., when the car in which they were riding was struck by a locomotive and completely demolished. Both men were mangled almost beyond recognition and their bodies carried two or three blocks east of the crossing. It is stated that the car was enclosed and the curtains were on, which probably prevented them from hearing and seeing the train. It was also a dark and stormy night which no doubt made the situation worse.

Dashed Around a Street Car.—A man was probably fatally injured at Lima, Ohio, when in passing a street car which had stopped, another car dashed around in front of the car and crashed into his machine, inflicting injuries from which he will probably die.

Disregarded Signal.—Three young men were killed and another man will probably die as the result of an accident at Lincoln Highway, New Jersey. The young men were returning from an alumni dinner and were speeding along a dark road. As they approached a drawbridge the gateman signaled to the automobile with a red lantern but the car tore through the iron gates and made a fifty foot leap into the river. Witnesses state that the car was going at the rate of fifty miles an hour.

Drove Car Into River.—Near Avoca, Ia., a woman was instantly killed, her neck and back being broken and she was buried in mud and water. The man accompanying the woman, who was also the driver of the car, sustained severe bruises and shock.

Tail Lights Out.—A young woman and her fiance were killed at Chicago, when the engine stalled on the car tracks. The motorman states that the tail lights were out and he was unable to see the machine until too late. The owner and driver of the car was also knocked unconscious and thrown from his car.

Caused by a Copperhead.—In New Jersey one Sunday a man took his family out for a drive. He stopped by the side of the road, at an incline, while the party went over into the field to pick flowers. When they returned they found a copperhead snake had taken possession of one of the seats of the car. Naturally the man was somewhat agitated, but he procured a stick and made a desperate effort to kill the snake. In doing so the car started down the hill and was soon overturned and wrecked. It is hardly necessary to state that the snake escaped. Where there is an incline together with possible copperheads it is well to put the brake on the car.

RULES FOR BEGINNERS.

Suggestions Which Are Usually Known But Are Not Always Borne in Mind.

From J. N. Bagley, Nebraska.—There is hardly a town of any size in this great United States where cars are not sold by some one. Many of these agents know very little about a car, and consequently the person buying it does not receive the instruction necessary to properly drive or care for it. This may result in serious accidents. A car should never be turned over to a new man until he thoroughly understands it. In such a case the buyer should call upon some one having the particular type of car and get his assistance, for almost anyone will be glad to help a new man along and give such information as he needs. Many times the owner of a car is better able to instruct the beginner than the agent.

To Start the Motor.

To start the car, one should make sure that the ignition switch is in the "on" position, and that the gear shifting lever is in neutral position, so that when the motor starts the car will not move until the operator is ready for it. The spark lever should be retarded if cranking on the batteries, to eliminate the danger of a kick back doing injury to the person when cranking. If cranked on the magneto the lever should be advanced to about two-thirds running position, as the spark is a trifle slower when started on the magneto. The throttle lever should be in a retard position, but advanced just enough to allow of a small amount of mixture to be taken from the carburetor, as in nearly every case the motor will start on a light throttle better than a heavy, and besides when it does start if the throttle is wide open, before it can be closed the motor will race with a howl before it can be closed which is injurious. In cranking the motor it is not a good plan to go down on the crank, but to place the crank in position and lift up, keeping the thumb on the same side of the crank as the fingers, for in case of a kick back the crank will be jerked from the hands without doing any injury to the person doing the cranking. At first the new motor will crank a little hard, as all bearings are set up tight to insure long life. The cranking of a motor is not an art, but a simple "knack" and one will realize this better as they do the job a few times. As soon as the motor is started, move the switch from the battery to the magneto and work the throttle before attempting to move the car.

Starting the Car.

We will assume that the car is ready to start and the motor is running along slowly. Press the clutch pedal, slightly releasing the clutch, and place the gear shift lever in position for low gear. Open the throttle a trifle to speed up sufficiently so that the load will not kill it. Now gradually let the clutch in until the car begins to move. Then remove the

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clutch the second time and make the change of gear from low to intermediate and let the clutch back rather quickly before the car slows down too much. As soon as the car is moving well in intermediate we are ready to take the high gear. This is done in a like manner, but quickly allowing the engine to take the load with the car moving with as near the same speed as possible as when it was intermediate. In case the speed is required to be advanced, do it gradually and not abruptly. When the power is applied with a jerk it causes an unnecessary strain on all driving members.

Bear in mind at all times that the ability to bring the car quickly to a stop is occasionally of greater importance than to start or drive it. To stop quickly, release the clutch, throttle the motor and press the service brake down, applying the pressure gradually. All this time the clutch pedal must be held in the released position. As soon as the car comes to a stop the lever can be placed in a neutral position and the clutch released.

In stopping the car, pull the emergency brake lever back. This will lock the rear wheels and prevent the car moving if the ground is sloping. To stop the motor after stopping the car, throw the switch on the dash and at the same time open the throttle about half-way, allowing a rich mixture to be drawn into the combustion chamber of the motor and the next starting will be quite a little easier. An emergency stop may be made with both the service and emergency brake, but this should be done only in severe cases as it is apt to slide the wheels and do injury to the tread of the tires.

Changing Speeds.

Quite often the driver of a car is compelled to accommodate the progress of the car to the movement of the crowded traffic, or to climb hills or force the car through stretches of sand, mud and clay, and it becomes necessary to change from a higher speed to a lower one. The time at which the change should be made must be determined only by experience, and nothing but driving will make an expert in this particular. It is always better to climb a hill slowly and be sure of the completion of the climb, rather than to risk having to pull back through the gears, especially for the beginner. When changing to a lower speed it is necessary to advance the spark. Changing from a lower speed to a higher, requires that after the speed is disengaged the motor be slowed down before engaging the next higher. One should bear in mind continually that it is not necessary to force the gears into position but that when done properly they will drop in with very little effort and almost noiselessly.

Accelerator Lever.

Having gone thus far, we find that besides feeding the motor with fuel by hand we have another device generally for the right foot, and this is known as an "accelerator." Some of them are supposed to move up and down while some of them move sidewise, but the function of either is the same, as the hand lever and the accelerator are inter-locked. The accelerator gives greater freedom to the operator's hands and is an occasional relief and a rest from the throttles. When the car is on a level stretch and is running at a certain speed, the throttle can be placed in position and the foot rested as the foot will tire of a continuous use, especially if the speed requires it to be held in one position for miles.

The Muffler Cut-Out.

Ordinarily the gas passes directly from the engine to the muffler via the exhaust pipe made to secure both, but in some cases a cut-out valve is placed in the line to allow of the gas passing directly through the valve to the open, without going through the muffler. It has been found that muffler designs cannot be made so that a certain amount of back pressure will not occur. Consequently, the opening of the muffler on a hard pull will give a little additional power as well as keep the engine a trifle cooler. It also serves a good purpose in telling when the cylinders are all working perfect as an experienced person can locate many troubles by the sound of the exhaust under different conditions. While the muffler cut-out has its advantages its indiscriminate use, as in traveling through the country at night, etc., is apt to be a nuisance to others.

Some Road Rules.

Before venturing upon the highway, the new beginner should acquaint himself with certain road rules. As a rule the motorists are a law-abiding class, and none but the reckless will refuse or neglect to pay obedience to the rules established by law governing such things. When meeting another vehicle coming from the opposite direction both should keep to the right, each turning to one side of the center of the road. If the coming vehicle be a heavily loaded wagon, it is as a matter of courtesy, proper to give the entire road if possible. In passing slower machines or vehicles going in the same direction, it is proper to go around to the left. When traveling very slow and a machine comes up from behind, give the road, allowing the vehicle to pass. Of course, there are other laws than these, but as almost every person knows the laws governing the public highways, it is almost useless to dwell longer on the subject, but I would suggest using every courtesy possible and gain the good will of all.

Care and Adjustments.

It has been wisely said: "Half of the ability to make an adjustment or repair is the ability to discover the necessity." One should never tinker with the car or make little changes and adjustments without first bringing some amount of intelligence and consideration to bear upon the question of what is most likely to cause the difficulty. Bear in mind that it is of little use to turn the engine over and over in an effort to start it. If it is in readiness and all is right it will start with a very few turns, and if it fails to start something is wrong and one should spend his energy in finding why it does not go rather than cranking and sweating, and many times doing even worse. If it fails to start, note the following. The switch may be on, the gasoline may be shut off from the tank, a wire may be disconnected, the batteries used for starting may be in a run-down condition, or a hundred little things might happen. Therefore, it behooves the novice to be on the watch for the little things that go wrong, for nine times out of ten it is the little things that give the trouble.

By neglecting the little details time will be saved on the road, it is true, but just as sure as fate, the day of reckoning will come. What has been saved in the garage bills and road-side repairs, will sight back to the time that has been taken for the little things. It is attention to the "little things" that count in the long run with automobile driving

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GASOLINE AND THE WAR.

Part it Plays in the Great Conflict Now Devastating Europe.

From the London Petroleum Review.—For the first time in history petroleum products are playing a very important part in the international conflict of arms which is now raging throughout Western Europe. On sea as well as on land petroleum has largely replaced other forms of power. On the sea it is largely taking the place of coal, for to-day a large number of our naval units depend absolutely upon liquid fuel, while on land the internal combustion engine, deriving its power from the lighter products of petroleum is proving a most effective and rapid means of transport.

It is estimated that no less than a quarter of a million motor vehicles are now in actual service in the theatre of the European war. The French army alone has not less than 80,000 motor vehicles—passenger cars and heavy vehicles—on actual service, and this great number is continuously being added to. According to Mr. E. Lascaris, of the De Dion Bouton Company, the French army to-day only use horses in its cavalry, the army officers utilizing high power touring cars, the supply trains carrying provisions and munitions of war to the front being made up entirely of automobile trucks.

The British army in the field is depending upon automobiles entirely for transport and dispatch carrying services, and though at the time of writing England possesses nothing like the number of motor vehicles used by the French armies, it may be taken for granted that it already has on the field over 15,000 such motor driven vehicles.

Russia is somewhat behind England in the number of mechanical propelled vehicles used in connection with its military service, but even here, reliable reports estimate that Russia has now at its command nearly 10,000 motor vehicles of various types. It is over a year ago since the Russian general staff carried out a series of experiments to determine the possibilities of motor transport, and though these experiments were conducted in regions traversed by very bad roads, the motor vehicle proved its great value over all other means of transport, and, as a consequence, large numbers were immediately ordered for army use.

In the case of Germany, that country is particularly well equipped with motor vehicles, and if the figure were placed at nearly 100,000 the actual facts would not be exaggerated.

From the Petroleum Gazette.—To the above uses of the products of petroleum should be added those of the ships and other craft of the air as well as of the land and sea. Despite the reports of their enemies, each of the contending countries appears to have had substantial supplies of these products on hand and to be finding means of obtaining additional supplies as the war progresses. Germany is in the poorest position as to furnishing such supplies from her own resources or replenishing them from other countries, but reports that Germany is facing a famine in these products should be received with a good deal of reserve and consideration of their source of origin. Moreover, it is to be remembered that, although gasoline is most desirable for use in internal combustion engines, there are various emergency substitutes for it, including denatured alcohol, to whose manufacture Germany has been lending the most encouragement, and of which it is the chief producing country.

Samuel G. Blythe says this in The Saturday Evening Post: It has been an axiom of war since wars began that an army travels on its belly. This war, which is the greatest of all wars, has made it necessary to revise that statement. As it now is, an army travels on its gasoline.

Food, next to men, is the oldest factor in war, and gasoline is one of the newest. Of the two, gasoline —or petrol, as they call it over here—is the more important, because, as modern armies are organized and used, as well as from the sheer size of them, there would be little food for the soldiers if there were no gasoline.

The line of battle in the struggle going on in France as this is written extends for more than two hundred miles. Though there is no actual count, it is probable that between three and four million men are engaged in the fight, either directly or indirectly. If these men are not fed they cannot fight. Imagine the difficulties of transporting by wagon food enough for several million men stretched along a broken countryside more than two hundred miles in extent —a battle line extending approximately for example from Washington, through Baltimore, Wilmington, Philadelphia, Trenton and Newark, to the city of New York. Think what it would mean to have nothing but horses and wagons laboriously to take back the wounded and to do all the various sorts of transportation work required by forces so vast as those of the Germans, on one side, and of the allied troops of France and England on the other. No quartermaster's department and no commissariat would be equal to the task. As it is, the supplies of food and ammunition are brought forward expeditiously, and the wounded are taken back comfortably; and this is all due to gasoline.

Some time ago, when I was in Germany, they told me that the taxicabs of Berlin and other German cities were then made on War Department specifications—that is, the General Staff provided the measurements for the taxicabs that were to be used by the civilians, and stipulated the sort of engines to be installed, and all that. I thought my informant was joking, but he was not. He knew what he was talking about; for, as soon as war came the Germans took the taxicabs, and made wonderful use of them. I do not know whether the French War Department went so far into the detail of the matter; but I saw eight hundred taxicabs in one place in France, which had been commandeered from the streets of Paris for use in war. I understood that the French had as adequate realization of the importance of gasoline as the Germans.

Waging War with Gasoline.

One of the first calls issued, after war was declared, was for automobiles. They were taken by thousands. In France almost every private automobile was used. The streets of Paris were absolutely stripped of the automobile omnibuses. I have not been in Berlin as yet, but I am quite sure that the Germans took great numbers of automobiles and busses. Indeed, I have seen some Berlin automobiles in Belgium; plenty of them, in fact. In England the government took over the automobiles and about half the busses, together with a great many of the big, privately owned automobile delivery vans.

A courier from the front no longer dashes up on a foam-flecked steed. Instead, he comes in a high-

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powered automobile. A messenger carrying dispatches from one part of the battle line to another does not lean down on the neck of his horse and gallop madly through a rain of bullets. Instead, he leans over the handles of a motor cycle and goes chugging on his errand at sixty miles an hour. There is no slow process of the wounded in ambulances drawn by horses or on stretchers carried by comrades. The wounded are put in fitted motor busses and delivery vans and hurried to hospitals at thirty miles an hour.

If it is necessary to send a detachment of infantry, say, from one point to another, and speed is demanded, the soldiers are crowded into taxicabs and shifted in an incredibly short time. Automobiles are constantly dashing about in the rear of the battle lines. General Joffre, the commander of the forces of the Allies in France, uses racing machines of the highest power, and can go from one end of the battle line to the other in less than four hours, for he travels at sixty miles an hour. No staff officer goes anywhere on a horse. He uses an automobile.

More than that, the Germans, and presumably the French, have taken auto delivery trucks of the heavier type and mounted field guns on them. These can be moved in any direction almost instantly. They constitute the most mobile artillery the world has ever known. In other wars artillery was shifted by horse or by hand. In this war some of the lighter guns are automobile guns, and they can be transferred from one point to another while horses are being brought up.

The Belgians have built many barbed-wire entanglements, and so have the French; but gasoline makes these seem like paper obstructions. The Germans have heavily armored automobiles with great knives in front and steel frames running back over the tops of the cars. With these tremendous clippers they charge full tilt at the barbed-wire obstructions and dash through them. The knives on the fronts of the cars cut the wires and the steel frames protect the men operating the cars. Also, there are armored automobiles that dash about the country carrying riflemen, and light rapid fire guns that do their share of execution. Automobile trucks bring up the ammunition.

It is in the commissariat, however, that the automobiles are most useful. They prove that the army travels on its gasoline. Great trucks bring supplies of food to certain bases. Light automobiles take loads of this food, and distribute it along the line, scooting back and forth, from base to given point of deposit and back again, making quick trip after quick trip, and covering the distances and doing feats of delivery that would be impossible for horses. Thus, too, by means of the smaller autos the men at the front are in constant and rapid communication with all points in the rear. The mobility of these great armies has been doubled and probably tripled by the gasoline engine.

The German system is evidently the result of long preparation. The Germans were ready. When their army is moving there is a constant procession of small automobiles—or comparatively small ones—running back and forth between front and rear, in certain well-defined lanes, bringing up whatever may be needed from the big trucks that labor behind but move far faster than any teams of horses could. The Germans use automobiles for every possible contingency save the shifting of their great siege guns. These are so big and so heavy that they are driven by thirty horses.

It is not only for trucking or for transportation purposes that gasoline is indispensable. Gasoline is the motive power for the engines of the aeroplanes. As warfare is now conducted the flying corps of each army is one of the most useful arms of the service, if not the most useful. The airmen perform prodigies of valor in scouting, in determining locations, in finding ranges, and in plotting out the lay of land. It is a good example of the repression of the British War Office that none of the English papers printed a word about the flight of the English aeroplanes to France.

That was the most inspiring sight of this war. Fully thirty of them—perhaps more—rose one day and flew, like a great flock of white-winged birds, straight across the Channel and landed without a mishap. Since that time these aeroplanes have been hovering over the lines of the enemy, finding ranges for the artillery, and doing many other hazardous things. The French have a greater number of them and so have the Germans. The aeroplane as a factor in war is as common as the automobile.

Shooting Into the Air.

The greatest value of aeroplanes is in finding ranges. In these days, in the formal engagements, the riflemen and the artilleries shoot at marks they cannot see. A man shooting from the ground can see about fifteen hundred yards. Frequently he is shooting at an enemy two thousand yards away. The artillery is behind the rifles. So the airship flies straight over the enemy's line, determines the range, flies back and communicates it to the artilleries. Then, with the range determined, the artilleries can land their shells at any given point with the utmost precision.

The bomb-dropping feature of airships of whatever sort is rather futile. Though an airship can find a range for a gun, it cannot apparently drop a bomb with any precision from any considerable height. Such bombs as have been dropped have evidently been dropped in the hope that they might hit something, rather than in the expectation that any precise thing aimed at would be destroyed. But the menace of the airship is strong in the minds of the people, especially in London. After one or two bomb-dropping experiments by the Germans from aeroplanes over Paris the Parisians discovered there was little danger from that sort of warfare, and watched the maneuvers of the German Tauben with interest but without much fear. However, the English have had no experiences as yet, and they are afraid of airships and of Zeppelins.

An item of news that was not printed in the English papers, but that had wide circulation none the less, concerned an alleged statement by Count Zeppelin. He was asked when he intended to send some of his airships over to London. "That will come in due course," he is said to have replied. This, combined with statements that many new dirigibles and many more airships are being made by Germany, caused considerable nervousness in London and made that warning by the Admiralty rather necessary; for all airships look alike to a scared com-

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munity, and there is no doubt there would have been an attempt to destroy any that should appear.

Without gasoline, these huge armies would be practically helpless, for in a battle line as far flung as is the present one, and as will be the battle lines of the future if this battle is not decisive, the delay in communication would be fatal; in fact, such battles would be impossible, because of the lack of the mobility of the troops. It is true that the soldiers, after railroad trains have been used to their extreme advantage march many miles, just as did the troops of a hundred years ago, both in the advance and in retreat; but the number of men engaged in any battle in the world's history was so much smaller than the number engaged in the battles of to-day that there can be no analogy drawn.

Gasoline is the most powerfully utilitarian of the non-human factories in this war. Without gasoline the present plan of war would be impossible. With gasoline, and the resultant uses of gasoline engines for every sort of propulsive demand, it is feasible for a general to attack with a million or two of men along a battle front of two or three hundred miles, and for another general to defend with similar numbers.

With the aid of gasoline these vast armies can be fed and moved, kept in communication, and their numbers discovered and determined. A modern army travels on its gasoline. If you have watched the dispatches you will observe that the men in charge know this, for gasoline is the first on the list of stores to be commandeered, is first of the tributes demanded from the conquered people, and is more important than food or ammunition, for without it food and ammunition would be tardy if not impossible.

Excessive Lubrication.

A repair man who specializes in Ford cars advances a very good reason for oil finding its way past the rings in the first and second cylinders of some Ford motors, particularly the first cylinder of cars that have seen considerable service, and states that it is not always necessary to fit new pistons and rings, drill the piston or to use a special plug or lubricating system. Excessive lubrication of the first cylinder is due, states the repair man, to the front end of the crankcase being lower than the rear, or in other words, the supply or level of the oil is such that the connecting rod of the first cylinder dips deeper than the others, resulting in over lubrication. The supply should be the same under each rod, but with the front of the crankcase lower than the rear, too much oil is trapped in front as it cannot very well run up hill.

The remedy is simple and inexpensive. It consists of leveling up the crankcase by raising and blocking up the front end of the motor. This can be accomplished by placing a pad under the crankcase front frame bearing. If there be a decided pitch to the crankcase it may be necessary to use a block that will require longer spring clips. The alignment of the motor and universal joint will not be affected; in fact, it will be improved.

Before beginning the work it is advisable to inflate the tires to their normal pressure, and there should be at least one person occupying the front seat. When the front of a car is lower than it should be it is generally due to the settling of the front springs and to wear of the spring perch bolts and their bushings.—Apco Ford Dealer.

THE LIGHTING SYSTEM.

Suggestions for the Care and Use of the Dynamo or Generator.

A careful user, by the exercise of a little commonsense, should have no trouble in maintaining any electrical machine in good order and condition, but since such machines, to the majority of motorists, are a new departure, a few timely hints relating to the care and upkeep of the dynamo or generator may be welcome.

"Do not over oil" might well be displayed on all dynamos and dynamotors used in connection with car lighting and engine starting sets. The majority of users are inclined to over rather than under oil, and although ordinary bearings do not, as a rule, complain if subjected to the former treatment, over oiling in the case of a dynamo is very apt to result in oil and grease collecting on the armature and field windings.

Apart from the mess and waste occasioned, the presence of oil is detrimental to the insulation, for rubber perishes after contact with oil, and the whole covering, owing to the disintegrating action set up, is soon destroyed, leaving the winding in no condition successfully to resist the leakage of current.

The shafts of all rotating machines should be fitted with oil-throwers, so designed that excess oil from the bearings is thrown off before it can come in contact with the windings. With large machines devices of this kind are very successful, but it is doubtful if, in the extremely limited space occupied by a car dynamo, they can be relied upon to cope successfully with any great excess of oil.

A coating of oil or grease always acts as a very good dust collector, and amongst the dust small pieces of metal, copper particles from the commutator for instance, will often find a resting place. In this way a more or less conducting layer is produced, and breakdown of the insulation may result.

Again, moisture, which is very detrimental to the insulation resistance of a winding, has a much greater tendency to collect and remain wherever dust or other small particles happen to be, and for the above and other reasons it should be quite clear that over oiling is to be avoided.

If, however, oil has collected on the windings it should be carefully removed and the cause of the trouble located. For instance, it not infrequently occurs that the bearings are dirty, and that new oil is simply thrown out as soon as it is provided. In such a case the application of a little paraffin to clear out the bearings, and a fresh charge of oil should remedy the defect, while careful attention to the lubricators and waste oil chambers should prevent a recurrence of the mischief.

Trouble with Commutator and Brushes.

Excess of oil or grease is the cause of much trouble with the brushes, or current collecting device, and the commutator. The brushes must bed down accurately on to the segments, and yet be free to move in their holders, or boxes, as they are generally called. Oil, acting as a dirt and dust collector, tends to clog the boxes, and the brushes can then no longer move freely in them, so that any want of truth in the commutator will result in sparking

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taking place, the result being that the copper segments will soon become pitted and burnt.

Sparking should receive immediate attention, and if it be found that the brush holders are at all dirty the brushes should be removed and the holders carefully cleaned, while further, the brushes should be watched to see that no slipping or jumping takes place, the latter often indicating that a spring has failed.

The springs are necessary to ensure good contact taking place between the brushes and the commutator, and the sparkless collection of the current. From numerous experiments it has been found that a pressure of some 2 pounds per square inch is required, and if the contact area of the brush is found, the necessary pressure can be applied with the aid of a spring balance, or judged merely by holding the brush spring off with the finger.

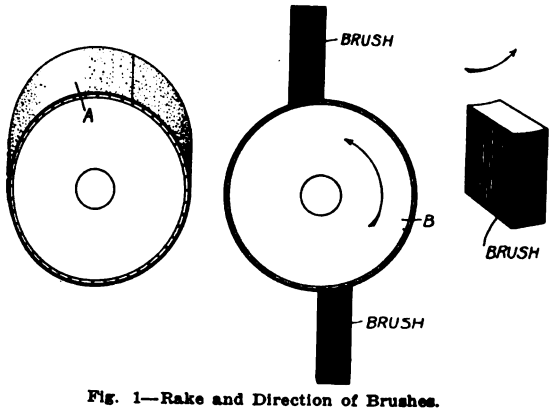


Fig. 1—Rake and Direction of Brushes.

If copper brushes be used they should be kept in perfect condition and well trimmed to ensure good contact taking place with the commutator. Carbon brushes are better, and good contact with the holder should be secured by copper plating the brush wherever it makes contact with the holder.

Insufficient brush tension makes the brushes liable to be affected by vibration, rattling taking place and the commutator frequently becoming scored, while if the springs press too heavily the commutator is worn into grooves. The contact surfaces of the brushes should be smooth and polished; if they are not, or if new brushes are required, careful bedding down is necessary.

Bedding-in the Brushes.

Select a piece of fine emery cloth of sufficient length completely to surround the commutator with its cutting surface outwards, and then fasten its ends tightly by overlapping them and joining the overlap with seccotine or some other form of glue or cement, as at A, Fig. 1. Replace the brushes, adjust the spring tension, and then slowly rotate the armature. The brush surface will be ground down to the correct shape and smoothly finished off, and it will then be in a condition to bed down correctly on to the commutator. Examination of the brushes will reveal the fact that they are generally raked as shown in Fig. 1 at B, and the direction of rotation of the armature should be such that the commutator always runs against the rake of the brush, as shown by the arrows. Further, to prevent the formation of ridges, it is necessary that the brushes should be staggered across the commutator, as in Fig. 2, for if they are placed in line half of the commutator will be worn down and a ridge be formed.

The condition of the brushes is very often reflected in the condition of the commutator, the surface of which indicates very clearly if the machine is in good running order. The color should be a rich dark brown, but a tan coloration, when there is no evidence of burning, indicates that a little oil or vaseline is required. An occasional rub with a piece of paraffin wax improves the surface, while a piece of pine makes a good burnisher for occasional use in order to keep the surface of the commutator clean and smooth.

Rough portions on the commutator must be removed by the use of glass paper, not emery cloth, and it is best to perform this operation while the machine is in motion. Dirt is also detrimental to good running, its presence being in general indicated by numerous small sparks passing from one segment to another. Dirt should be removed by rubbing, and it is very necessary to note that linen and not cotton waste must always be used.

Sometimes part only of the commutator will appear to be dirty. This is an indication of a flat, and unless it is removed by careful filing sparking will result. A fine cut file is necessary, and a circular motion must be communicated to it while in use, care being taken afterwards to remove all copper particles that have been produced. Filing up a commutator is, however, a delicate job, and it is better to put the work into experienced hands than ruin the commutator by crude handling of the file.

Chattering of the brushes indicates that the mica insulation between the segments is projecting above

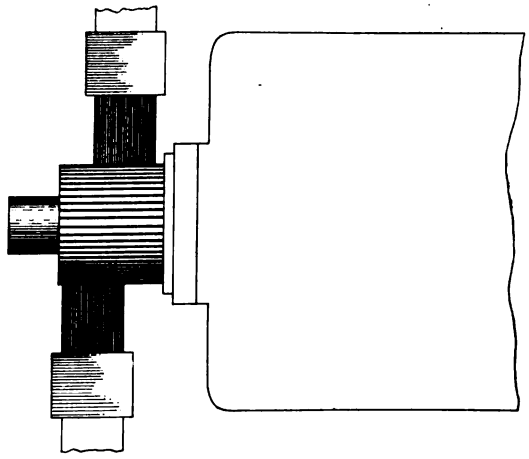


Fig. 2—Commutator and Brushes.

the level of the commutator. A few cuts with a very sharp knife is generally sufficient to remove the superfluous mica, and by placing the finger along the commutator and slowly rotating the armature any inequalities can readily be detected. A last word may be said with respect to the position of the brushes. They should be fixed and kept diametrically opposite to each other and the best position for sparkless collection of the current is to be found only by trial.

At least once in six months ball bearings should be inspected, the rough or worn balls replaced with perfect ones, and the ball run filled with graphite grease.

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NEW AND INTERESTING THINGS IN MOTORDOM

BUSINESS NOTES

No Refilling Deception.

Two decisions of considerable importance to retail automobile dealers and garages have just been handed down by United States courts. The pith of both decisions is that substitution, under certain circumstances, becomes the basis of damage suit against the dealer who practices it. In two of its suits, growing out of the substitution of refilled tanks in exchange for Prest-O-Lites, The Prest-O-Lite Company, Inc., asked for an accounting of all profits which the defendants had made through substitution and through misuse of the trademark on "Prest-O-Lite," and also asked for additional damages covering injury to its good will, etc. The court allowed an injunction compelling the complete and permanent removal of the Prest-O-Lite mark from such cylinders before refilling and also enjoining the defendants "from selling, or dealing in, or exchanging, or passing off any cylinders or gas tanks or packages filled or prepared by any person other than The Prest-O-Lite Company, as Prest-O-Lite tanks or exchanges, refills, or recharges, and from applying in any way or using said trade-mark "Prest-O-Lite" to describe or to sell or to pass off any of the said gas tanks or prepared packages filled by any person other than the complainant." The effect of these decisions is to make the refiller, and not The Prest-O-Lite Company, responsible for all exchange and repair service on "refilled" tanks. The present suits are intended to establish the point that compliance by the refiller is not sufficient, and that the dealer who is handling such tanks must also comply and market them without leading the automobile owners to believe that The Prest-O-Lite Company has any connection whatever with the refilled tanks or is in any way responsible for their contents, service, repair or exchange.

Remarkable Prosperity.

Reports from all sections of the industry reflect the remarkable prosperity now enjoyed by manufacturers of automobiles and accessories. The National Automobile Chamber of Commerce recently reported the establishment of new shipping records by car makers during the first three months of the present year, and last week a canvass was made of a number of the motor car and accessory factories in Detroit for the purpose of learning the increase in the number of men employed at the plants during the last six months or so. Every plant that has to do with motor cars and trucks or parts and accessories was reported as working at full speed, some of them overtime and others with night and day shifts. In all the factories the number of employes was being constantly increased.

Coupon Book.

J. P. Forbes, of Coshocton, Ohio, is making gasoline coupon books and auto supplies coupon books that are inexpensive and widely used. Those interested should address the firm as above for full particulars.

A Snag for the Jitney.

Insurance agents report that their home offices will not accept applications for indemnity contracts on jitney buses even at the high rate of $200 per $1,000 of liability. The question of whether or not the jitney bus is a common carrier or a public conveyance as contemplated in accident insurance policies issued to individuals has not yet been settled. In response to requests from Milwaukee, the Attorney General of Wisconsin has given an opinion to the effect that the jitney bus does not come under the provisions of the public utilities act, and therefore is not subject to regulation by the Wisconsin railroad commission. Attorney General Owen says: "The jitney bus, it seems to me, is to be classed with the taxicab and the hack. Cities are not asked to turn over streets for the purposes of transportation. The jitney bus business is essentially a private one."

Big Share for Employes.

Not long ago employes of the Neumann-Lane Co., Detroit distributor for Chalmers, Pierce-Arrow and Rauch & Lang cars, were the guests at a dinner given by Wm. F. V. Neumann and Geo. E. Lane. The feature of the family gathering was the sharing of profits with all those employes who had been on the company's pay roll at least one year. The checks amounted to 24 per cent. of the yearly salary of each employe. The workers were further gladdened by the announcement that Neumann-Lane has offered a cash prize of $100 to be given to the employe of the company who at the end of the year is considered the best in the concern's employ. The superintendents and foremen are barred from the contest. The winner will be decided through a vote of all the eligible employes.

All Out for Good Roads.

It is estimated that more than half a million men will work on the highways of Pennsylvania on May 26th, which is designated "Good Roads Day." An organization of 20,000 in Blair County is already enlisted. All the motor organizations and civic clubs are co-operating with the county commissioners. Automobiles will carry the workmen to all parts of the county and back to their homes at the end of the day's work. Similar organizations have been formed in all of the 67 counties in the State and for one day at least the State roads will get plenty of attention.

Timken Plants To Be Enlarged.

Ground is about to be broken for a new forge shop and power plant for the Timken-Detroit Axle Co., Detroit. This will double the present capacity of the concern for drop forgings and the like.

The site of the new buildings is approximately 1,000 feet long, facing the present plant and on the opposite side of the street, while it is about 500 feet deep, and it is probable that the entire space will be filled with buildings.

Timken-David Brown facilities are to be increased to about double their present capacity on worm gear making when a building now under way and three stories in height of brick is completed.

A Combination Car.

The Kearns Motor Car Co., of Beavertown, Pa., has brought out a combination car known as the Kearns Trio. It is a three-in-one car and will take the form of either a runabout, a touring car or a light delivery wagon. This three-body car is different from previous combinations because the entire body is not changed but the part back of the fore-door. By slipping on the extra rear portions of the different bodies, the three combinations are made. With this arrangement the car is always the same from the radiator as far back as the rear end of the door to the driver's compartment. Beyond this point the additions which are slipped in place make the car either roadster, touring or commercial. The car can be bought in chassis form without any of the bodies, or it can be bought with any one of the three or the complete outfit.

Dealers Organize.

Practically every automobile dealer in Milwaukee, Wis., is a member of the recently reorganized trade association, now known as Milwaukee Automobile Dealers, Inc., which has a membership of thirty-two concerns. Headquarters have been established in the Wisconsin Hotel. An insignia has been adopted which will be extensively advertised, being reproduced on the windows of the concerns identified with the association and on all of the cars of the members.

From "8" to "4."

The Cummins Auto Sales Co., of 402 Mt. Vernon avenue, Columbus, O., which January 30th, introduced the Monitor "Eight," the machine marking their entrance into the automobile manufacturing field, have decided to abandon the eight cylinder car and in the future will devote their entire attention to the turning out of a Four.

The New $490 Chevrolet.

Deliveries on the $490 car of the Chevrolet Motor Co., New York City, are now scheduled to commence. The car was disclosed at the New York show last Januarv and styled the "Four Hundred and Ninety," and is a five-passenger machine, with 102-inch wheelbase, 30x3-inch tires, 20 horsepower motor and a number of original detail features.

No More Half Registration.

One of the measures affecting automobiles that were passed by the New York State legislature was the Hewitt bill, striking out of the present motor vehicle law the provision that owners of pleasure cars were to pay only half of the registration fees for their car after they had been registered under the Callan law for four years in succession. Quite a number of automobile owners throughout the state were prepared to take advantage of this provision when it became effective this year, but because of the additional clerical work attached to check-

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ing up the vehicles eligible for the half registration fee opposition was offered by the Secretary of State's office, and the Hewitt bill was the result.

Over $15,000,000 in Ford Car Rebates.

It is announced that $50 will be repaid to every buyer of a Ford car during the year from August 1, 1914, to August 1, 1915. The plan called for a rebate upon the purchase price of each car if 300,000 cars were built and sold. It appears that this production is now insured and with a month to spare. If the production reaches 325,000, the fulfillment of the plan will mean the payment of $16,250,000 to purchasers.

Cartercar Plant to be Closed.

It is reported that the Cartercar plant, at Pontiac, Mich., will be closed about the 22d of May. It appears that it is the intention to manufacture in this plant a new light six car, which the General Motors Organization has now in the process of development. This car will probably sell for less than $1,000. Whether the principle of a friction drive car is to be abandoned is not stated.

Business Growth.

The Positive Supply Company, of Davenport, Iowa, manufacturers of portable steam tire vulcanizers have just moved into the new three story building, the Positive Building, at 209 East Second Street. They have increased their capitalization and have added to their line of goods.

New Car-Nation Model.

The Car-Nation Motor Car Co., successor to the American Voiturette Co., of Detroit, Mich., is busily at work turning out cars for the 1916 season in the plant at Lawton and Buchanan streets. The cars will be an entirely new model, of the low-priced light-car type.

A Premium Offer.

The National Auto Supply Company, 77 Chambers St., New York, have a free premium offer in their new 1915 catalogue, which will be sent to anyone who will address the firm as above.

BODY AND TOP

The Gemco Bumper.

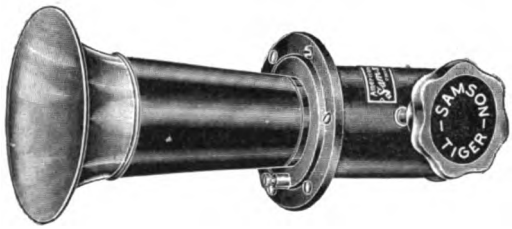
During the past two years the use of automobile bumpers as a protection has become almost universal. At first they were thought only necessary in the large cities but motorists everywhere now realize the advantages of this equipment. A substantial, well constructed bumper will protect the radiator, lamps, springs and wheels in severe collisions and many thousand dollars have been saved drivers by this protection. The Garage Equipment Manufacturing Company manufactures the "Gemco" Universal End Thrust Bumper which is applicable to all standard cars. The exclusive feature is the point of attachment. This abuts the end of the frame which is the strongest place. "Gemco" Bumpers are furnished with a large variety of bars, including diamond, channel, round and rectangular in different sizes. The Diamond Bar is a new bumper added to the line this season and, in addition to the protective value, lends greatly to the appearance of a car.

The Friction Shock Absorber.

It is beginning to be felt by car owners that shock absorbers are pretty nearly indispensable. This is especially the case with the low-priced automobiles where the wheel base is short. The Friction Shock Absorber Company, of Kingston, N. Y., are making a shock absorber which is placed near the axle where the rebound is greatest. This makes the rear seat as comfortable as the front seat and does away with the discomfort of riding just over the axle and rear wheels. A shock absorber of this sort also lessens the shock to the machinery and springs which in itself is a decided advantage. There is nothing that will rattle in this shock absorber and nothing that wears to any extent or requires care or attention. In sending inquiries the model of the car, the style of body and the year the car is made should be stated so that proper fixtures may be furnished to attach to the body or springs.

Dealer Co-Operation.

During the present chaotic conditions of merchandising, the automobile and accessory dealer will be pleased to learn that there are manufacturers who do not underestimate the value of dealer co-operation as an economic factor in distributing their product. There is only a very small percentage of the entire reading public that is interested in automobile horns. Who, then, pays for this wasteful, general advertising? Either the quality of the horn must be cheapened, a list price established entirely out of reason, or the dealer forced to be satisfied with less profit. Maybe all three factors stand their share of the burden.



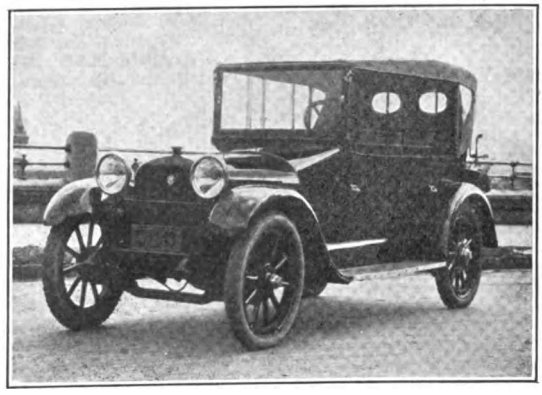
While Samson automobile horns, manufactured by the American Electric Company, of Chicago, are well known to the trade, and are effectively advertised to the consumer by "dealer helps" they are not advertised through general mediums. The policy of the manufacturer is to co-operate with the dealer by giving him a gross mark-up that will more than merely cover handling charges, and by giving him a horn with the greatest possible value. The Samson-Tiger hand horn which is being featured by the manufacturer is of a new type construction; simplicity is its most salient feature. There are no springs, plungers, dogs, levers, ratchets, or other complicated parts to give trouble, but is shaft driven. The advertising of the American Electric Company of Chicago, now appearing in a number of the trade journals, carries a vital message to the retail merchant that is full of truths.

New Ford Fenders.

A specially designed rear fender to be used on Ford commercial cars is being manufactured by the Superior Lamp Manufacturing Company, of 136 West 52d St., New York City. These "Superior" fenders are made up in pairs, with irons complete, all ready to attach to any kind of delivery body that may be put on the Ford chassis. The present rear Ford fenders are not practical where a delivery body is being used, and these specially constructed fenders are a necessity where a delivery body is used. They have the latest design curve, same as the 1915 rear Ford fenders, and are made of extra heavy steel metal to withstand the constant strain they are subjected to.

A New Convertible Top.

Neither the oppressive sun nor a sudden storm has much effect when using the new H-W All-Weather Convertible Top. It can be easily converted into a closed weather-proof covering in three minutes and it makes an unusually handsome appearance, as may be seen by the illustration. It takes just two minutes to put in or take out the eight windows. When not in use these windows are carried in a neat box placed



The Convertible Top.

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beneath the front seat. It really gives two cars in one, because with it the owner can have an open car for touring and a closed car for town use. Only the finest material is used in its construction and it is strongly guaranteed. It is made by The Hammons-Williams Convertible Top Company, 529 Marbridge Building, Broadway and 34th St., New York.

The Beartone Signal.

The Oakes Company, Indianapolis, Ind., manufacturers of the Beartone horn and fan combined, have announced that the price of this combination has been reduced for the Ford type. They state that for some time past they have been working day and night in order to meet the increased demand for this product. The Beartone is not only a reliable warning signal, but is also a fan which they guarantee. It is in the logical place for a fan, under the hood, in front of the motor. This is a motor driven horn without current consumption and does away with battery wires, etc.

The Friction Shock Absorber.

This is made by the Friction Shock Absorber Company, of Kingston, N. Y., and it is claimed with confidence that it will do the work required and stand the wear. It is placed near the axle where the rebound is greatest and where it can do the most work. It does not check the downward action of the spring until the end of the movement and will then convert the upward shock into an easy recovery and a normal position. Its simplicity and common sense construction should make it extremely popular.

Samson Automobile Horns.

This automobile horn was undoubtedly named properly. It is unusually strong and durable and attractively finished. The price is as low as any one can think of asking for an efficient signal. It is made by the American Electric Company, State and 64th Sts., Chicago.

GARAGE AND REPAIR SHOP

Steam Vulcanizers.

In view of the fact that vulcanizers can now be purchased at a very low cost and at a mere bagatelle of their usefulness, no car owner should neglect the small cuts in his tire casings. The Wizard automatic steam vulcanizer is adapted for both tubes and casings of any size. It is extremely simple in construction and there is no reason why it should not last practically forever. The manufacturers of this vulcanizer, The National Motor Supply Company, 5636 Euclid Ave., Cleveland, Ohio, offer to ship it by mail prepaid and allow a free trial for ten days. If it is not entirely satisfactory it may be returned and the money refunded.

Useful in the Garage.

The Weaver garage press is now used in a good many up-to-date garages and in the case of heavy repair work it is often almost indispensable. The leverage of this press is 1500 to 1, and it is easy to see the tremendous power that it will develop in straightening an axle of a shaft or in work that requires unusual power. It is strong, compact and light, considering the fact that it will enable one man to do the work of three. It is made by the Weaver Manufacturing Company, Springfield, Ill.

An Electric Vulcanizer.

The Corbett & De Coursey Company, Columbia Bank Building, Pittsburgh, Pa., make a portable electric vulcanizer, to operate on a 6-volt storage battery, which



Corbett and De Coursey Vulcanizer.

is common on automobiles. It is furnished complete with 6 ft. of flexible, reinforced cord and a bayonet type plug, which may be attached to the exploring or regular lamp socket. The vulcanizer costs very little to use, as it takes less current to operate than does the lighting of the car.

The total weight, including serviceable canvas bag, is only 2 lbs., and, as the vulcanizer takes up very little room, it may be easily carried in the tool box. A standard thermometer, with which it is equipped, allows the heat to be maintained constant at 275 degrees, and, as it may be used under any weather conditions, a patch can be vulcanized out on the road as well as in the garage.

Pipe Threading Tools.

A new attachment called the Internal Guide with Reamer Point, manufactured by the Greenfield Tap and Die Corporation, Greenfield, Mass., is attracting some attention and its success seems to be assured. This guide takes the place of the various forms of external or bushing guides which have been the only method heretofore of guiding the dies in pipe stocks for a straight thread. This guide not only guides the die in making its first threads, but reams the burrs from the inside of the pipe as it enters, and thus the extra cost of a burring reamer is eliminated. The Trio Pipe Stock, which contains three different cutting sizes of Little Giant dies, is now fitted with this form of guide as is also the Duo pipe stock, which contains two cutting sizes. In the case of the Trio stock the manufacturers claim that this tool takes the place of seven distinct tools that would otherwise have to be used, namely, three stocks and dies, three burring reamers and one tap and reamer wrench. This tool has a removable handle and the whole thing can be packed in a very small space in the workman's kit.



Trio Pipe Die Stock.

New Welding Outfit.

It seems to be generally admitted that anyone who has a garage or repair shop should, under no condition or circumstances, try to get along without a welding outfit. If he can get an outfit that will weld, cut and remove the carbon from the cylinders in one combination and at a low price all the better. The Imperial combination outfit made by the Imperial Brass Mfg. Co., Cor. Harrison & Racine Ave., Chicago, is here illustrated and shows a torch arranged for welding with the cutting attachment removed, and also a torch arranged for cutting with the welding head removed. With this apparatus there also goes a decarbonizing torch. An apparatus of this kind will soon pay for itself in an automobile repair shop. It will weld anything in metal and will cut any thickness in steel or wrought iron and of course is a great labor saver. It can be easily carried wherever the work is required and does the work at a very small cost.

Pitless Turntable.

A special size turntable for Ford cars has been placed on the market by the Pitless Auto Turntable Co., 24th and Broadway, Kansas City, Mo. The turntable consists of two runways centrally pivoted by a king pin and mounted on ball bearing wheels. There is a lock to secure it from turning in running on and off the table. When the track is set in concrete the turntable is ⅞ inch above the floor level, making it hardly noticeable in running on and off the table. This turntable was manufactured to meet the demand for a low priced product without sacrificing the quality.

Cuno Ford Timer.

Missing in your Ford car will be stopped if you install a Cuno Ford Timer. This timer is made by the Cuno Engineering Corporation, 80 South Vine Ave., Meriden, Conn., and it will be mailed on receipt of price, which is remarkably low, to anyone desiring it. Satisfaction is guaranteed. Jobbers and dealers should write for attractive proposition.

The Stewart Garage Heater.

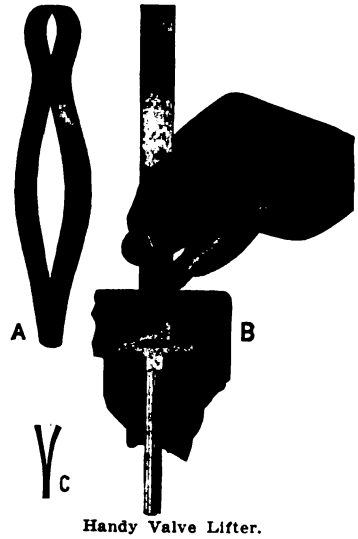
Although the warm weather is coming on it is well to install a garage heater now, when special low prices are being made. A catalogue of the Stewart garage heater gives a good deal of valuable information, and it will be sent free to any one asking for it, by addressing Fuller & Warren Company, 320 Madison St., Troy, N. Y.

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Will Pick the Valves Out.

The Fulton Company, Milwaukee, Wis., has recently placed upon the market a valuable tool known as the "Handy Valve Lifter." It is constructed of one piece of spring steel, as shown in the illustration. It goes in the port hole of an engine, and its knurled ends engage the sides of the slot in a valve by a slight



Handy Valve Lifter.

pressure of the fingers, and the valve may then be easily and securely removed as shown. The illustration also shows the ends of the tool that spread apart when the spring is pressed together, like sheepshears. These ends have a double knurling on the outside, which engages securely the sides of the slot in the valve. This handy valve lifter is something that is absolutely new. It is a labor-saving device that should be in every garage, and should be a part of every mechanic's kit.

The Eyes of the Auto.

Illustrated herewith is a tool which is called the "Red Devil" glass cutter, No. 263. It has a genuine hand honed steel wheel, tested and inspected by an expert and cuts circles from 2 to 22



A New Glass Cutter.

inches in diameter. Garage owners and repair shops would do well to provide themselves with one of these glass cutters and save money by cutting their own headlights. They are marketed by Smith & Hemenway, 179 Chambers St., New York.

FOR THE MOTOR

The Chain Carbon Remover.

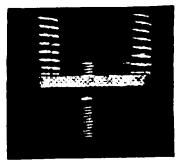
The Michener Chain Carbon Remover has been used for a good many years now and has always seemed to give the highest satisfaction. It has one special merit inasmuch as it is simple, and the engine itself really does the work. Probably a good many of our readers already have this carbon remover and do not need to be told anything about it. New readers may be glad to know that it is inexpensive and does the work thoroughly. In some cases, it is desirable to use two chains, as in a four cylinder motor, and three chains for six cylinder motor. This does the work more quickly and is sure to remove all carbon deposits. It is made by E. S. Michener, New Castle, Pa.

The New Ford Radiator and Hood.

The National "V" Type Radiator and Stream Line Hood adds a supreme touch and gives an air of distinctiveness and quality to Ford cars. The circulation of this radiator is rapid, the water will not boil and it has a great cooling capacity. It is stated freezing will not injure it. This radiator is made of polished brass or black enamel, and the price, complete, is small. The Stream Line Hood for regular Ford radiators can be purchased separately. The Universal Car Equipment Company, 62 Jefferson Ave., Detroit, Mich., are placing these Ford specialties on the market, and further information regarding them will be furnished upon request.

Valve Grinding and Removing.

The Perfect valve grinding set is a Ford specialty which actually saves money for the car owner and offers a means of obtaining the maximum efficiency from the motor at all times. The explicit instructions that accompany the set make it possible for the most inexperienced driver to grind the valves and remove the carbon from the motor and



Perfect Valve Remover.

on account of the ease and rapidity with which the valves may be removed with the Perfect valve spring lifter this most important work can be accomplished in a very short time. The advantage in keeping the valves ground and the cylinders clean is more power, longer life to the motor and more mileage per gallon of gasoline; also eliminates overheating and knocking when climbing hills, caused by the carbon deposit in the cylinders.

The valve spring lifter operates on an entirely different principle from any other tool made for this purpose. It compresses two springs at once and holds them up securely. A few turns of the nut are all that is required to raise the springs high enough to remove the pins or washers from the valve stems. The valves may then be taken out, ground and replaced without further troubling the springs. The valve spring lifter and grinding set are made by the Winton L. Smith Machine Works, 78 Clinton St., Newark, N. J.

The Peerless Piston Ring.

This new piston ring has a lock joint that makes the leakage of compression practically impossible. Moreover these piston rings are what may be termed eccentric rather than concentric and this ensures uniform pressure at every point of the cylinders. It is easily installed, easy to sell because there is a money back guarantee that goes with it, and there are no loose pieces to drop out. Judging from an examination of this piston ring it is in every way suited to the requirements for gasoline motors and it has strength and flexibility. It is made by Larson and Hilker, 19 South La Salle Street, Chicago.

No-Leak-O Piston Ring.

The No-Leak-O piston ring, manufactured by the Automobile Accessories Company, 816 West North Ave., Baltimore, Md., and which is illustrated herewith, is made in one piece and has no crevices to absorb oil, creating carbon to destroy the efficiency of the ring. They



are individually cast and finished in the very best manner. These rings give high and lasting efficiency and are backed by strong testimonials. They save gasoline, oil and repair bills, as well as time, and the price is right. A special proposition is made to jobbers and those interested should address the company as above.

The Micro Piston Ring.

Automobilists seldom realize the direct and grave influence of piston ring construction upon the performance of their cars. Perfect compression is essential and the piston rings should adequately perform their function in confining the explosive mixture to secure it. Owing to the fine uniform grain of these piston rings they can be taken off the piston any number of times without the slightest danger of breakage. Shipments of small orders by parcel post is most economical, and can be obtained by addressing the Micro Piston Ring Company, 1960 Broadway, New York.

Carbon Removed Quickly.

It is claimed that by the use of the carbon remover made by the American Oil Products Company, Buffalo, N. Y., the job can be done in from ten to twenty minutes, and done satisfactorily. The firm has some splendid endorsements as to its effectiveness and the price is low. The cost of removing carbon by this means is said to be from 5 to 12 cents per cylinder.

Perfection Piston Rings.

The name of these pistons rings was chosen because it indicates their quality. They are said to be absolutely perfect. They are put on the pistons without being stretched and this is something that is not possible with a one piece piston ring. They are made by the Automobile Construction and Eng. Company, 3326 Ludlow St., Philadelphia, Pa.

Repair and Assembly Parts.

A wide variety of repair and assembly parts for storage battery can be secured by addressing Walter L. Thompson, 655 West 43d St., New York. These parts include plates, jars, separators, terminals, solution and sealing compound.

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CARBURETION AND IGNITION

Spark Plug Business.

Recently papers were signed which transferred the entire business of the Frontier Specialty Company, Buffalo, N. Y., to the Champion Spark Plug Company, Toledo, Ohio. This very naturally marked the dismissal of the suit brought against the Champion Company by the Frontier Company, in November, 1914, for infringement of the Simms and Shea patents, which cover priming plugs.

The Champion Spark Plug Company states that the licenses issued by the Frontier Specialty Company to the Benford Manufacturing Company, Sharp Spark Plug Company, Emil Grossman Manufacturing Company, Rajah Auto Supply Company, Bigsby Manufacturing Company, Reflex Ignition Company and A. R. Mosler Company for the manufacture of their respective priming plugs, will still remain in force under the same conditions as before. The "All-In-One" plug with priming cap, will henceforth be manufactured by the Champion Spark Plug Company, along with the rest of the well known Champion line.

The Benton Spark Plug.

This spark plug is claimed to minimize or entirely avoid common defects, to resist fouling and to permit easy cleaning without breakage or injury, and is made with variations to assure constant high motor efficiency under all conditions. The insulator is extremely thin sheet mica



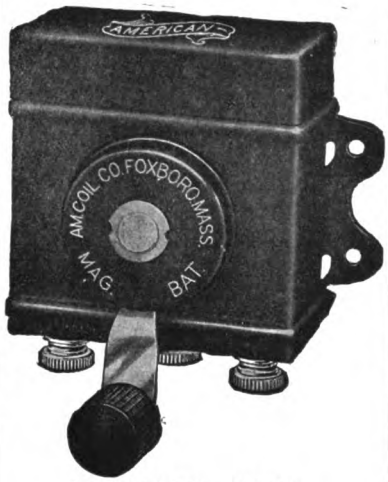
spirally wound upon the central electrode and forced to a permanent gas and oil tight joint within a steel bushing. The layers of mica extending each way from the bushing overlap each other and cannot become loosened or broken. The mica above the bushing is enclosed in a porcelain spacer which could be cracked or even entirely removed without short circuiting the plug.

The insulator is easily removed for cleaning. The cleaning operation can be repeated any number of times and the joint always closed gas-tight. Battering of wrench and thread surfaces is prevented by case-hardening.

The Benton Plug has been made slow to foul and overheat; first, by almost closing the shell and leaving little gas space within, which minimizes heat generation and carbon formation here; second, by a heavy metal shell in contact with the cylinder to conduct the heat away rapidly; and third, by shaping the internal passages so that exploding gas blows away from the insulator a large percentage of the carbon that would otherwise be deposited. The Benton Plug is made by L. F. Benton Co., Vergennes, Vt.

The American Master Vibrator.

This is made by The American Coil Company, Foxboro, Mass., and has some qualities of decided and unique merit.



American Master Vibrator.

It can be attached to the coil in place of the switch and thus is easily understood. It is well finished and designed especially for Ford cars.

Monarch Indestructible Ammeter.

The Hercules Instrument Company, Inc. of Mount Vernon, N. Y., have acquired from the Benford Manufacturing Company of that city the sole rights to manufacture and sell the Monarch Indestructible Ammeter, and also all patent rights. The new company announces that they intend to put the ammeter before the market in a way which no other ammeter manufacturer has ever before attempted. In addition to marketing the Monarch Ammeter, the new company is also placing on the market an indestructible voltmeter and an indestructible battery tester.

A New Spark-Plug Guide.

A. R. Mosler & Co., of Mount Vernon, N. Y., have just issued a booklet with the title of "Mosler on Spark Plugs." The publication, which is attractively printed and arranged conveniently in size and shape suitable for pocket use, contains an interesting statement by A. R. Mosler himself, explaining the why and how of the spark plug, and also lists all prominent makes of pleasure and commercial vehicles and motor cycles, in handy index form, giving the kind, type and size of plug recommended by A. R. Mosler & Co. for use in connection with each engine. The booklet is intended for free distribution. A copy will prove useful to the dealer and his clerks, as well as to the car-owner, and we prophesy a ready welcome for it.

The Easily Cleaned Spark Plug.

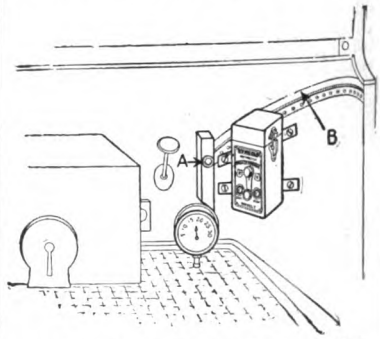
The Stonebridge spark plug can be cleaned without removal from the car. It is said to need no adjusting whatever and can be tested without the use of a tool of any sort. The manufacturers have a proposition to make which they say means cash to dealers. This proposition is of the co-operative kind and as the demand for this spark plug is increasing it will pay dealers to write for particulars, addressing the Stonebridge Sales Company, 10 Wall St., New York.

Lighting and Starting.

The Lead Batteries Company, of Chapel Street and Lister Avenue, Newark, N. J., renews the standard makes of batteries and has some territory for live agents to use their device and system. The business ought to be a good one, for instead of going out of existence the battery seems to be gaining in popularity.

Master Vibrators for Ford Cars.

The illustration shows the position occupied by the New York Coil Company's master vibrator on the 1915 Model T Ford cars. It will be seen that provision is made whereby the bracket may be shifted higher on the right hand side, which allows screws to find a solid foundation in a wooden sill provided under the upholstery. In this position the vibrator is readily accessible and does not take up any leg room in the car. Wires provided with connections are supplied with the vibrators, which enables the owner to make the proper connections to the magneto to secure



N. Y. Coil Co.'s Master Vibrator on New Ford Model.

the best results from both ignition and the lighting system. All models put out are equipped with these additions so that they will fit either the old models or the new 1915 model, enabling the dealer to supply all models from one stock.

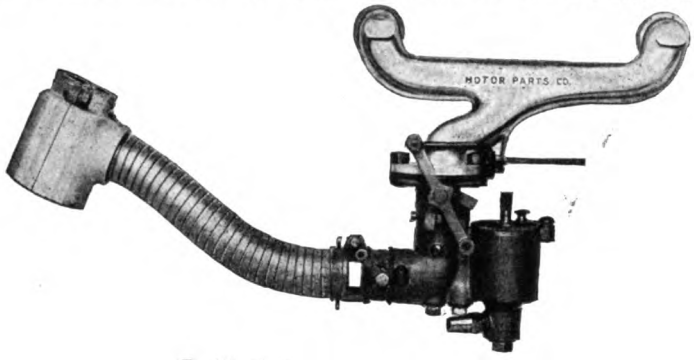
Two New Spark Plugs.

The Perpetual Spark Plug Company, of Dunmore, Pa., make spark plugs which they claim do not depend upon the electric spark to ignite the gas. They likewise maintain that these spark plugs cannot be short circuited in a Ford car. They are useful in the case of scored cylinders, resulting in poor compression, as this will not have a tendency to foul them. They are on sale at most first-class garages, but if your dealer does not have them, write to the address above and ask for particulars concerning their free trial proposition.

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A New Carburetor.

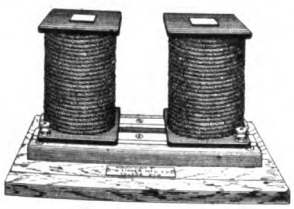
The Model O 4 Zenith with special manifold and other attachment makes it possible to equip a Ford car with a carburetor which insures easy starting, good low throttle and slow speed running conditions, quick pick-up and getaway, and the maximum speed and power with minimum gasoline consumption. The strongest appeal of the Zenith to the motorist lies in its absence of moving parts and adjustments. There can be no wear in the elements which give automatic carburetion. Economy is another strong feature of the Zenith. It cannot waste fuel because a definite rate of flow determined by the manufacturer follows with exact precision the needs of your motor. The compound nozzle of the Zenith covers every range of speed from high to low. The Zenith on your Ford car means more power, speed, flexibility, easier starting and quicker pick-up. The outfit consists of Model O 4, 1-inch Zenith carburetor, special manifold hot-air drum and tube and special gasoline and throttle connections. The attachment is readily placed without adjustment or any changes whatsoever. It is made by the Motor Parts Company, 818 North Broad St., Philadelphia, Pa.



Zenith Carburetor and Attachments.

A New Magnet Charger.

We have had a good many inquiries in relation to magneto chargers, and for information as to how this work can be best done. The Quality magneto charger, made by the Sypher Manufacturing Company, Toledo, Ohio, is a result of long experience and careful study. It is so simple that a novice can do the work and is strongly constructed, so that it will stand up under much abuse. It weighs 20 pounds and has all the strength that is ever needed. It is wound for 6 volts, 110 volts and 220 volts. It will not operate on alternate current. The firm furnishes a set of pole pieces by which a set of Ford magnets can be recharged without removing them from the flywheel. It is guaranteed for five years and garage keepers ought to be able to get enough work to pay for it quickly.



Quality Magneto Charger.

The Pumpelly Battery.

This new battery takes a long step in advance and is marvelous, efficient and durable. It has been submitted to the most searching tests and is receiving nothing but high praise and friendly words. It competes in price with the old type batteries of an inferior quality and it is made for every type of automobile starter and every make of car. The manufacturers are making a special proposition to garagemen, and they would do well to write the Pumpelly Battery Company, Indianapolis, Ind., for full particulars.

The Right Spark Plug.

The Jumbo spark plugs, made by Gibson-Hollister Company Co., 3389 Washington Street, Boston, Mass., is designed to cover everything that is needed in the way of an ignition plug, and they are sold with the strongest sort of a guarantee that they will answer all requirements. It is said to behave all right under all sorts of conditions and it is jumbo big, bull strong and dirt cheap.

The Handy Valve Lifter.

This is a small tool and will save its price in a short time in any garage. It will remove the valve of an automobile in a half a minute and is made by The Fulton Company, 723 National Ave., Milwaukee, Wis.

Marko Storage Batteries.

It is undoubted economy to use the best batteries that money can buy. This automobile owners are beginning to understand, and when the spring overhauling of automobiles is at hand, it is a good time to stock up with batteries of this sort. The Marko storage batteries are made by Paul M. Marko & Co., 1191 Bedford Ave., Brooklyn, N. Y.

A Good Spark.

The Platinum Point Perfector is designed to clean spark plug points and is far superior to a file or emery. It is made by the Hinsdale Auto Co., Hinsdale, Ill., and costs little.

Save Your Gasoline.

Undoubtedly the greatest waste in running a car is in the unnecessary consumption of gasoline. This not only occurs from bad compression of the motor, from carbon, and faulty carburetion, but especially in the lack of proper vaporization of the fuel. A new appliance for the complete vaporization of the fuel is called the Carburette Vaporizer, and it is claimed it will save 25 per cent. of the gasoline consumption. It also acts as a filter, and of course makes more power and a smoother running car. The price of this appliance is a mere bagatelle compared to its value. It is made by the Perkins Appliance Company, 539 Worthington St., Springfield, Mass.

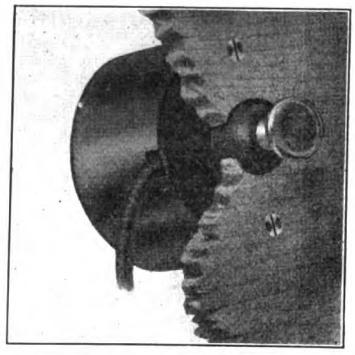
STARTERS AND LIGHTERS

Glare Protection.

The E. G. Staude Manufacturing Co. of St. Paul, Minn., has placed upon the market something which they call a "Glare Stopper." A good many different kinds of dimmers are already made for headlights, but this device protects the driver. It can be adjusted to any kind of windshield and is easily installed. There is no reason now why a car driver should feel like a blind man from the glare of an approaching automobile, but he can be confident he will not have a collision because of dazzled eyes. It is worth something for a man who drives at night to know exactly where he is going.

Dimmed by a Kick.

You can now dim your headlight or shift from headlight to sidelight by simply a touch of the left and free foot. The new device is called the Kickover, and it may be attached to any electrically lighted car in conjunction with the regular lighting switch. It is designed for dimming the headlights by throwing them in series but may be used for dimming through resistance or for directing the current from head to side lights or vice versa. It enables you without the slightest inconvenience to change your lights going in and out of cities and to perform the highly appreciated courtesy of dimming or extinguishing your glaring headlights when meeting other cars—meanwhile affording a driving light. It is made by the H. P. B. Electric Company, Inc., 500 Fifth Avenue, New York.



Dimmer Attached to Footboard.

Electric Lighting and Starting.

Ford car owners desiring a splendid electric lighting and starting system that is simple, steady and sure and is sold at a low price, should communicate with the Disco Sales Company, 969 Jefferson Ave., Detroit, Mich. This firm makes starters for all other kinds of cars.

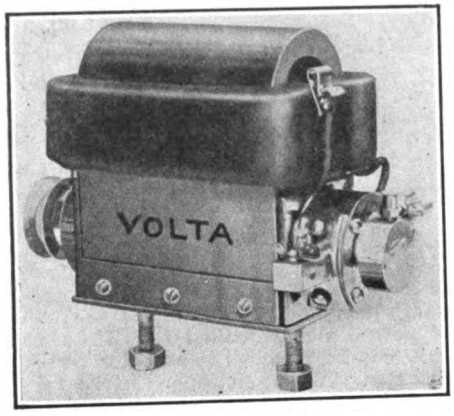
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A New Starter.

Automobile starters are as thick as "leaves of a Vollombrosa" and some are of undoubted merit. Now one is on the market of which the manufacturers say "it took 90 days to dominate the field." Whether this be so or not this new starter, which is called the Genemotor, is becoming rapidly known and it is unusually compact and has the appearance of being practical and effective. It is made by the General Electric Company, and this is a guarantee that it will do whatever is claimed for it. The agents are A. J. Picard & Co., 1720 Broadway, New York.

Volta Electric Lighting System.

The Irwin D. Groak Engineering Company, Monadnock Block, Chicago, Ill.,



have placed on the market a lighting system which is most economical. The Volta Electric Lighting System is cheap and cannot be surpassed for steadiness, brightness and ease of manipulation. In installing this system of lighting, your gas lamps can be used, as silvered parabolic reflectors, properly wired with sockets can be inserted in the gas headlights and will give good service. These lights are simple in design, no fuses, relays, bucking coils, rheostats, dimmers or other cumbersome paraphernalia to annoy. Everything required is inherent in the generator and the system itself. The care of the Volta system is simple yet it can always be relied upon. Only a few hours time is required to change your old system of lighting into a modern, convenient, safe electric lighting equipment. If your car is wired and you are now using a storage battery, you can simply install a Volta generator. The Ford can be completely equipped for electric lights in about three hours. The Volta is illustrated herewith.

Kemco Starting-Lighting System.

This machine is so designed that it cranks your engine by duplicating the movements made when cranking by hand. When you press the starting button, the same starting clutch you have always used instantly slips into engagement with the crank shaft. When the engine speeds up, the starting clutch is automatically thrown out, whether you release the button or not. The starter puts each cylinder over the compression rapidly. No changes in your car are required in attaching the starter other than removing the crank handle and mounting the starter in place of it. The entire equipment, starter, dynamo, lamps, battery, switches, instruments, wiring, etc., can be installed on your car in a few hours. Those desiring this equipment should address The Kemco Electric Mfg. Co., Cleveland, Ohio, and it is absolutely necessary in ordering to give the year and model of your machine.

For Motor Car Headlights.

A new appliance for the protection of motor car headlights is called Klearglow, the auto light diffuser. Automobile owners as well as garage men, chauffeurs, accessory dealers, police officials and others cannot fail to see its many advantages. It is designed to eliminate the dangerous glare which causes so many accidents. It does this without cutting down the light, as with dimmers and similar appliances. Pedestrians and motorists approaching your car on the road become half blinded when a glaring light is cast into their faces and cannot see you coming. No motorist can afford to assume these risks. Neither does an automobilist care to be arrested and fined for the violation of the various laws covering automobile headlights. Klearglow is made entirely of glass and can be put on in ten minutes, in place of your present headlight glass. It can remain on permanently for city or country driving, and does not have to be removed in order to get enough light on dark, rough rural roads or dimly lighted city streets. Klearglow is handled by H. G. Paro, 30 North Michigan Boulevard, Chicago, Ill.

The Pres-Toe Starter.

A good many automobile starters need something more than a press of the toe



to make them effective. The one made by W. Robertson Machine and Foundry Company, 32 Greenwood Place, Buffalo, N. Y., does just what is claimed for it. It is designed especially for Ford cars and is simple, effective and of low cost.

One Tree Brings $100.

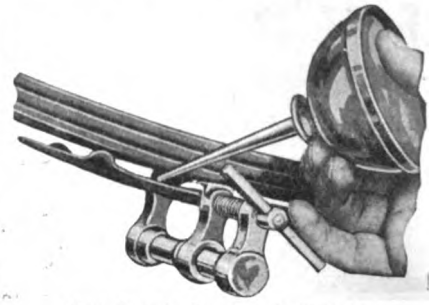
The Government has received $99.40 in settlement for a single sugar pine tree which was cut in trespass in the Stanislaus National Forest, in California, and which yielded more than enough actual lumber to build a good-sized suburban house. The tree scaled 18,933 board feet and was valued at $5.25 per thousand feet. Not many trees contain enough lumber to build a two-foot board walk nearly two miles long, and this is believed to be the first case on record in which a single tree felled in a National Forest was valued at almost $100 on the stump, although National Forest timber is frequently sold at considerably higher rates.

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LUBRICATION

Low Cost Spring Lubricator.

Whether your car is in daily use or in storage, its springs must have attention. If neglected they rust and freeze or adhere to each other. Occasional oiling will prevent this, will lessen breakages and effectually stop all squeaks. It spreads the leaves just enough to insert the lubricant, without marring the paint. The damaging cold chisel and hammer and the jacking up of the car are no longer necessary. The Spring Leaf Lubricator Company, Ann Arbor, Mich., manufacture the Knowlson leaf



Knowlson's Spring Lubricator.

spreader, and they have so much confidence that it will please users that they will send one, charges prepaid, with the understanding that it may be returned, and the amount paid for same refunded, if it is not entirely satisfactory.

A Novel Grease Cup.

The Klicket Ratchet Grease Cup is replaced free if a cup is ever lost or any parts break. It is made in all sizes and in three styles. The price is nominal, and it will save grease and give a much improved lubrication. In writing for a sample give the inside diameter of the cup, size of the pipe thread required on the bottom of the cup, or the diameter of the bearing hole. The firm also has an attractive dealers' proposition. This grease cup is made by the American Stamping Company, 600 Burchard St., Battle Creek, Mich.

Efficiency Gas Defined.

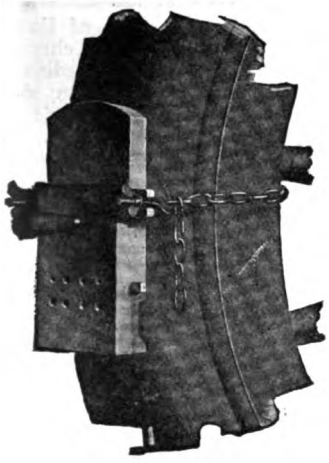
Efficiency gas is called gas because it goes into gasoline. It really is a lubricant. It has been known to the gas engine world for a long time that, if possible, a great advantage would be obtained by lubricating by way of gasoline. However, this was a difficult thing to accomplish as it was necessary, first, to construct a lubricant that would uniformly expand or mix in a body of gasoline; secondly, it was important to produce a product, a small quantity of which must have a tremendous spreading quality. Another difficulty, the most important, was the fact that this oil must be heat resisting sufficient to live in the combustion chamber of a motor. The molecules of the oil had to be reduced to about the equal size of gasoline. It also had to be an oil that would not gum up the needle valve of a carburetor. But it has finally been accomplished with a product that will thoroughly mix with gasoline without stirring and that can be evaporated with the gases and uniformly introduced into the combustion chamber of a motor.

The continuous use of efficiency gas

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WIZARD AUTOMATIC STEAM VULCANIZER

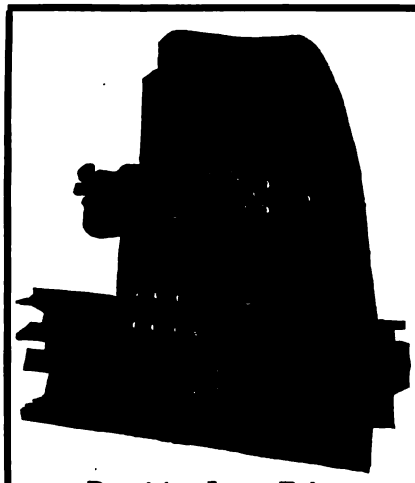
NEW PRICE ONLY $3.50, BY MAIL PREPAID



Repairing Casing

By manufacturing these vulcanizers in such mammoth quantities we are now able to sell them at only $3.50—you can save this amount in repairing just a few tires.

Don't ruin your casings by neglecting those small cuts—they mean the loss of real dollars to you. Vulcanize them full of new rubber, and MAKE THEM LAST TWICE AS LONG. Ask any tire manufacturer if this is not so. The small cuts admit water and sand to the fabric and the tire soon blows out at this weakened spot.



Repairing Inner Tube

10 DAYS' FREE TRIAL We will ship this vulcanizer by mail prepaid. Try it for ten days and if you are not entirely satisfied, return it, and we will refund your money.

The WIZARD AUTOMATIC STEAM VULCANIZER is adapted for BOTH TUBES AND CASINGS OF ANY SIZE. It is a metal body filled with water at factory and never needs refilling. Steam generated by a small flame which is entirely enclosed. Burns gasoline with a blue flame and no smoke. Heat is automatically controlled. Requires no watching. Vulcanizing face (curved to fit casing) 3 x 6 inches. The Wizard is highly polished and nickel plated. Can be used on the road or anywhere. Pays for itself in a short time and will never wear out. Thousands in use. ANY BOY CAN EASILY OPERATE THE WIZARD. Sent by mail prepaid, upon receipt of the price. Full instructions, rubber, shears, cement, etc., furnished with each outfit. Remember, money back if not entirely satisfied.

PRICE COMPLETE, PREPAID, $3.50

Manufactured by

The National Motor Supply Co.

5636 Euclid Avenue CLEVELAND, OHIO

Branch Office, 2204 Michigan Avenue, Chicago, Ill.

Enclosed find money order for $3.50. Send me by mail prepaid a Wizard Steam Vulcanizer. You agree to refund my money if I am not satisfied after ten days' trial. (Write plainly.)

Name.....

Address .....

.....

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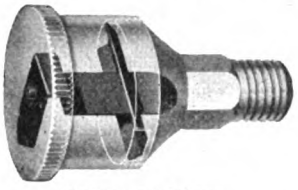
in gasoline, kerosene and distillates results in an actual economy in fuel of many times its cost and the manufacturers are so confident of its merits that they will refund your money upon the receipt of the empty can and a statement from you to the effect that efficiency gas does not produce the results claimed for it.

Noise Eliminated.

The Badger gear compound made by the Wadhams Oil Company, Milwaukee, Wis., keeps the rear axles and transmissions quiet and is said to be a splendid lubricant. It does not run thin and never packs onto the sides of the gear case. All this is important. Those wanting more information should address the company as stated.

The Klicket Grease Cup.

The manufacturers make a broad guarantee to replace, without charge, any "Klicket" Grease Cup which becomes broken or from which the cap is lost. The simple, durable ratchet device is placed within the cup itself and there are no outside wires or springs to become bent or broken. It can be turned down as easily and accurately in the dark as in the daylight and the operator knows exactly how much grease has been forced into the bearings, as the number



Cut away View.

of "clicks" indicates the number of turns which he has given to the cup. The Klicket Ratchet Grease Cup is made in all sizes, to fit all cars, including the Ford, cycle cars, etc. This grease cup has been manufactured for some time by the American Stamping Company of Battle Creek, Mich.

THE RUNNING GEAR

A Compact Shock Absorber.

There are no wearing parts or friction surfaces on the Flaum shock absorber. It is claimed it will instantly adjust itself to all conditions of either road or load. It requires no oiling and there is no reason why it should not last the lifetime of the car. It is made by the Flaum Shock Absorber Corporation, 173-5 Hudson Street, New York, N. Y.

Tires and Tubes.

The Walsh Tire & Rubber Co., 400-440 Hanover Street, Pottsdam, Pa., is now allotting to jobbers and dealers the sale of their tires and tubes. They are making very liberal dealer discounts and will brand these goods with the name of the dealer if desired. These tires and tubes are said to give the maximum of service at the minimum of price. Application for samples and prices will be given prompt attention by addressing the manufacturers as above.

A New Light Weight Tire Protector.

A new Woodworth Tread has just been placed on the market called the Light Weight Tread, which has many advantages and sells at much lower price. The protector is held on the tires by coil springs, placed about a foot apart along each side and connected by strong, inelastic fabric strips. These are fastened to the leather in such a way that they hug very closely against the sides of the tire. These springs automatically adjust the treads, keeping them always



Woodworth Tread.

perfectly tight so that there is no danger of the tire being chafed and consequently overheated. The tread is made of one ply of leather throughout its width and is studded with from three to six rows of steel-studs on the middle portion, according to the size. The leather is practically puncture-proof; it is permanently water-proofed so that it always remains flexible and as the treads are very light they have no noticeable effect on the power or easy riding qualities of the car. A circular telling all about these treads has just been published and can be obtained by writing to the manufacturers, the Leather Tire Goods Company, Niagara Falls, N. Y.

The Lund Shock Absorber.

This shock absorber is manufactured by H. Lund Smith, Paterson, N. J., and is adapted to any car, being made in



various sizes and can be applied to any shape or form of spring. It is claimed that it will give greater speed to a car because it tends to prevent skidding as well as to eliminate vibration. The firm has received a good many testimonials from well known men in the locality of Paterson, and they offer to send a set of these shock absorbers and allow them to be used ten days. If not perfectly satisfactory and all that is claimed for them, the money will be refunded without question. The illustration gives a good idea of the sturdy construction of this shock absorber.

The Standard Tire Pressure Gauge.

The Twitchell Air Gauge is a good one to use and a good one to sell. It is good to use because it completely answers the purpose and is good to sell, not only for this reason, but because the demand for it is bound to be large. The firm manufacturing it formerly had difficulty in supplying the demand, but they are now in a position to fill orders quickly and they solicit inquiries from those who desire to sell them. The gauge is already in the hands of a good many jobbers, dealers and garages and is made by the Twitchell Gauge Company, 1213 Michigan Ave., Chicago.

A New Tire Tread.

The Armor Tread Company, of Hartford, Conn., make a tire tread of chrome tanned leather to slip over the ordinary rubber tire casing. It prevents rim cuts and blowouts and is said to add to the appearance of a car as well as to prolong the life of the tires. There is not the slightest doubt concerning this last named claim for the leather is unusually tough and strong and these treads can be used on well worn old casings if the fabric is in a fairly good condition. They are made in all sizes and for all models of cars.

A Rim Contractor.

There is being made and rapidly put on the market a tool that does not touch



the tire, but opens the rim lock and will permit the immediate removal and replacement of tires in an upright position. There is nothing to adjust. Its weight is practically nominal and it will fit into the tool box. It removes the rims instantly and is on the whole a decidedly labor-saving invention. It is made by the Friestedt Rim Contractor Company, 2931 West Lake St., Chicago.

The New Differential.

Technical writers and automobile engineers have long acknowledged the drawbacks of gear differentials, but since differential action is considered essential to a motor car, the disadvantages have been accepted as necessary evils. There is now, however, upon the market a device which seems to have overcome the difficulties experienced with former substitutes for the gear differential. This is the latest development of the Gearless Differential Company, Detroit, Mich. The new mechanism takes the place of the gear differential at the center of the rear axle,

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Here is the new Mosler guide which tells at a glance just which kind, type and size of plug is **right** for each engine. Compact, handy, complete, authoritative. Send today for your free supply—just tell us how many copies you can use as a starter and they'll come to you free and quickly.

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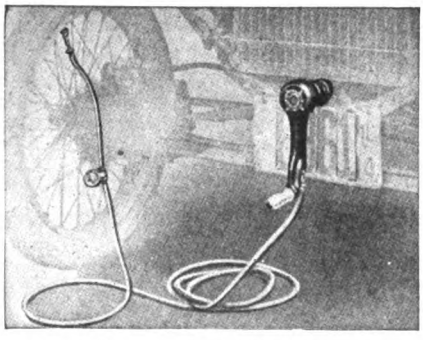
and in the case of the model "T" size can be substituted in a Ford rear axle without in any way altering the axle housing, ring gear, shafts or bearings.

The claims of superiority over the gear differential are numerous, and are substantiated by the testimony of many prominent users, who say that this device does all that is claimed for it. Some strong claims are made for this device, as to its strength and efficiency, over the differential gear. A positive drive to both rear wheels is transmitted, therefore one rear wheel cannot spin on a slippery surface, and the other stand still. Dangerous skids are eliminated, and a Ford car has a positive service brake on both rear wheels, regardless of road conditions. There being no sideway at high speed, the danger of overturning is great diminished. A saving of fuel and tires is effected by absence of slipping, acceleration when one wheel is thrown from the ground, and tendency of back wheels to get out of line (using power to bring them back), also the driving on the wheel traveling the shortest distance, all mean less revolutions of the motor, thus an actual saving in fuel, and wear on tires.

Tire Pump and Crank Combined.

This is a new device made to replace the starting crank furnished with the car, providing a quick and convenient method of inflating tires. The pump is inside of the crank and to use it for inflating tires requires only the forward movement of one nut with the thumb and finger after attaching tube. It can be installed on a Ford car in about one hour, no machine work of any kind being necessary.

In the manufacture of this pump only fine materials are used and each part is made with mechanical precision. The piston and piston rings are ground to the exact size of the cylinders, cylinders are lapped to a glass finish. All bearings



Tire Pump and Crank.

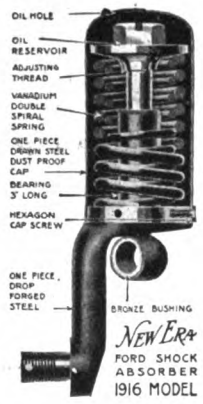
are made of phosphor bronze and the crank shaft of high carbon steel, tempered in oil. No leather washers are used. Each pump is furnished with hose and pressure gauge and the complete device is fully guaranteed for one year. The DeLaunty is manufactured by the Chicago Automatic Machine Company, Oakley Ave. and Kinzie St., Chicago, Ill.

Don't Be Wasteful.

There is probably more money wasted on tires than in any other part of the automobile. Worn shoes are thrown away as if they had no value whatever, and thus tire service costs about twice as much as it should. Well-worn tires may be retreaded with Pacific Fibre Treads and thus they will have an additional service, in some cases as great as new tires. They expand or contract easily and thus are sure to fit. Another thing that is surely attractive is the fact that the manufacturer will ship them on approval, pay express and take all the risk. When tire expense can be cut from $50 to $500 a year it pays to give the subject a little thought and attention and to use any saving device that is practical and bids fair to do all that is claimed for it.

New Era Shock Absorber.

The New Era Elliptic Shock Absorber, illustrated herewith, for light, medium and heavyweight cars, will appeal to the vast number of owners needing more comfort and at the same time save the car from excessive shock. The New Era gives great resiliency and absorption of constant vibration from small de-



pressions of the road. The best material obtainable is used in the construction of these shock absorbers and they are permanently guaranteed against defects. These shock absorbers are especially designed for Ford cars and more complete information regarding them will be furnished by the manufacturers, the New Era Spring and Specialty Company, 864-878 Woodward Ave., Detroit, Mich.

Yankee Folding Tire Pump.

The Yankee folding tire pump is clamped, when not in use, to the running-board of the car, so that it is not necessary to use any energy in holding it while pumping, and the user stands in a natural, upright position, working a long lever. When not in use the pump is doubled up and goes easily into the tool box. The device is manufactured by the Eugene Atkins Co., Elkhart, Ind.

A Tire Pump and Crank.

These useful devices are combined in what is called the DeLaunty Tire Pump and Crank. It will be sent on 30 days' trial and is made by the Chicago Automatic Machine Company, Oakley Ave. and Kinzie St., Chicago.

The Right Shock Absorber.

A special shock absorber for the cars from 1,800 to 3,200 pounds in weight has been put on the market under the trade name of the "Right" Shock Absorber. It is designed especially to meet the requirements of medium weight cars and has a resilient action of two inches. It is capable of absorbing even the most violent road shocks. The strain of the shock is reduced to a minimum, with a consequent saving of tires and the whole car. Periodic swaying of the main springs at high speed is absolutely eliminated. All wearing parts are provided with bushings, which can be replaced at slight cost. The list price of



Unusual Resilient Action.

the Right Shock Absorber is very low, and special care has been taken to make it an easy proposition for the dealer and jobber to handle. It is manufactured by the Right Motor Specialties Company, 1320 Michigan Ave., Chicago, Ill.

More-Room Steering Wheel.

By the use of the More-Room steering wheel, illustrated herewith, getting in and out of the car is easier and stout people will not find it necessary to squeeze into the driver's seat. It is said to give eight inches more room than with the ordinary steering wheel. This steering wheel can be attached in fifteen minutes and is two inches larger than the regular Ford steering wheel. The illustration will give some idea of

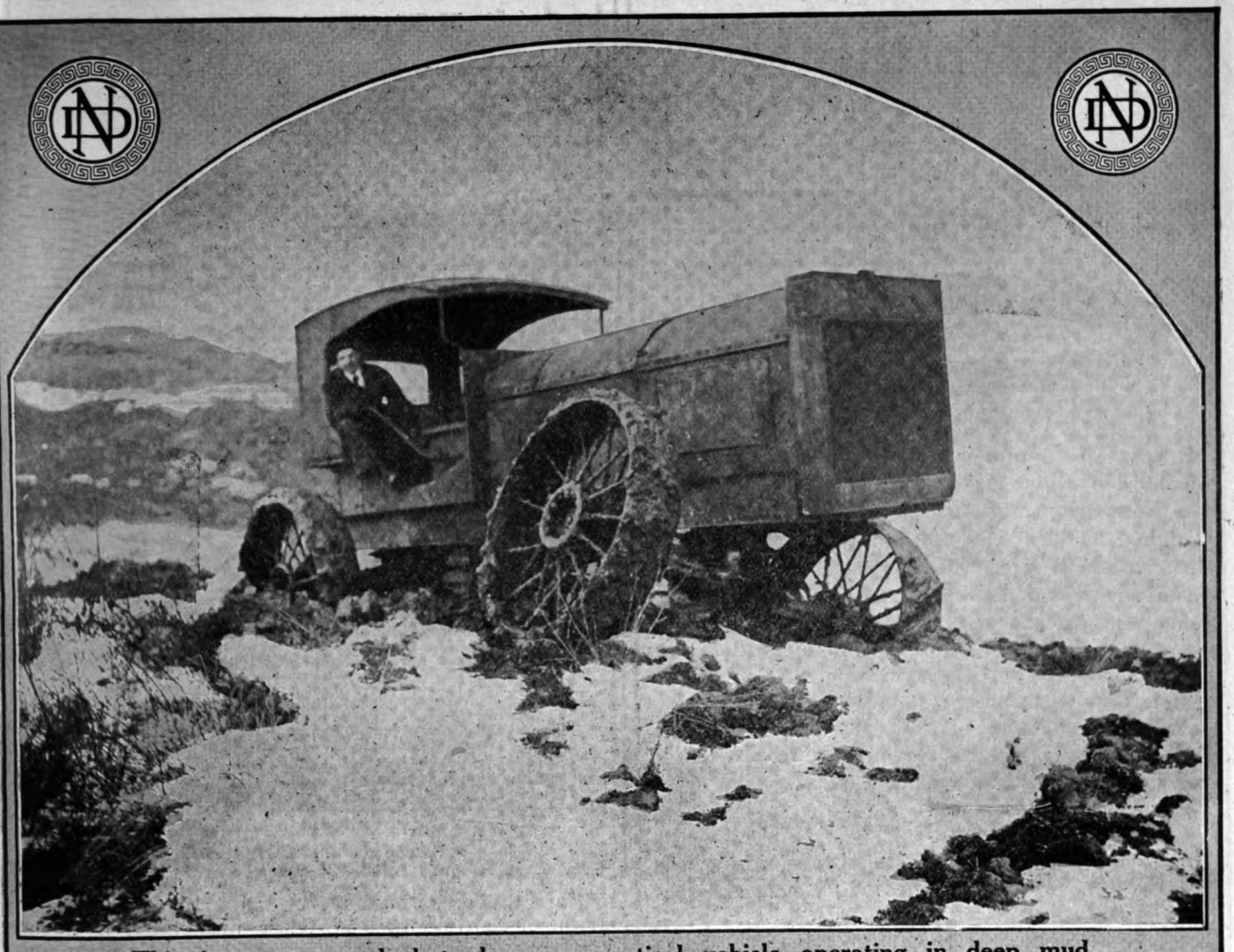


Extra Room Shown

its appearance. It is fitted with a corrugated rim to insure a good grip and is machined to fit the regular steering column of the Ford car. It is made by the Neville More-Room Steering Wheel Company, 714 David Whitney Building, Detroit, Mich. The wheel is furnished with ebony finish solid rim and polished aluminum spider.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

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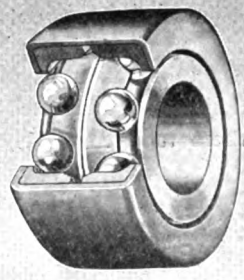
This is not a wreck but shows a practical vehicle operating in deep mud

NEW DEPARTURE BALL BEARINGS

American Made for American Trade

ARE used as the bearing equipment in the wheel hubs and in the transmission of this worm gear drive, Morton Giant: Four Wheel Drive and Four Wheel Steer, Sixty Horsepower Gasoline Tractor,

Accepting every thrust, strain, wedge, or shock, vertical, angular, or horizontal, under every condition of road or load, minimizing power waste, increasing the life of the vehicle and reducing its consumption of gasoline and oil and general up-keep cost.



New Departure Ball Bearings do all this, not only for the time being, but throughout the life of the vehicle itself.

Let us tell you more of these "Quality Bearings" through our catalog. Send for a copy.

THE NEW DEPARTURE MFG. COMPANY,

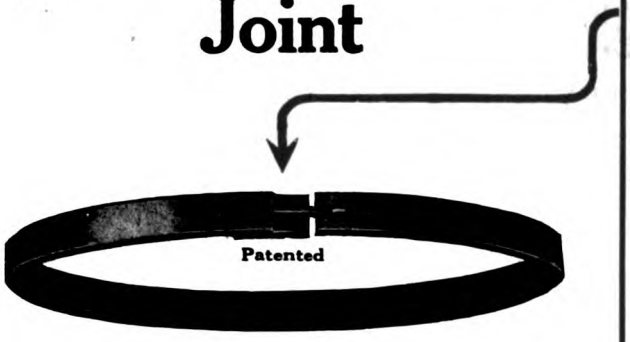
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It's All in the Lock Joint



If years of compression practice have taught the motor and engine makers that a piston ring should be **Eccentric** and not concentric—and that the original foundry scale of the metal should *not* be removed from the inside of the ring, why should a motor or engine owner install another type of ring when he can get the **Peerless Piston Ring?**

A one-piece, eccentric piston ring that is absolutely compression tight and carbon proof.

Its lock joint is integral with the ring—no loose pieces to drop out—no multiple parts.

The Peerless is an eccentric, one-piece ring, made from close-grain gray iron—the type of ring which years of compression practice with steam and gas has proved best.

Its opening is sealed by the patented Peerless Lock Joint—and compression leakage is impossible.

Peerless rings are accurately made with the original foundry scale of the metal left on the inside. This means strength and flexibility.

They are **Eccentric,** which allows a uniform pressure on every point of their periphery.

The Peerless is easier to install than any multiple-piece ring—easier to carry in stock because rings never become separated—easier to sell because they are sold on a money-back guarantee.

Deliveries can be made at once in any quantity, in standard sizes. Prices will interest you. Write us about them today.

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The Lower The Cost Of The Car The More Vital The Need Of

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE



The metals of gears and bearings must absolutely be kept from contact or quickly wear and ruin result. NON-FLUID OIL is especially adapted to the lubrication of low-price cars, because it provides a permanent, pressure-resisting cushion between all contact surfaces, thereby reducing friction to the minimum and prolonging the life of the gears and bearings. Why don't you try it?

"K. No. 00 Special" grade for sliding gear transmission.
"K. No. 000" for differential compression cups and all bearings.
Reduced prices for 1915. Ask your dealer.

Sold by dealers everywhere in orange-colored cans with above trademark.

New York & New Jersey Lubricant Co.

165 Broadway, New York. 1430 Michigan Ave., Chicago, Ill.

Cheap Pressure System.

From E. W. T., California.—It may be of interest to Ford owners who have occasion to drive in the mountains, to know that they may have a valve stem from an inner tube inserted in the filler cap of the gasoline tank, thereby having an inexpensive pressure system which will enable them to ascend grades which they could not do with a gravity feed. Drill a hole in the filler cap, insert the valve stem (one from a motorcycle tube is better being smaller) put on gaskets above and below and washers and nuts to make it air tight. A piece of string packing or a waxed cord around the filler cap next to the tank will stop the leaks there. A stroke or two of the pump attached to this contrivance and you can climb "straight up." Be careful and not put too much pressure on the tank, a very little will be sufficient.

Pumping the Tire.

Before starting to pump air into a tire which needs more pressure, it is a good plan to insert a piece of iron or copper wire into the valve and depress the plunger. If air has not been pumped in for some time, the rubber end of the plunger is apt to stick to the seating. If it is not first loosened by direct pressure, the result is that such great pressure is put on the pump connection that it may burst and the pump connection be rendered useless or at least faulty. If there be a gauge on the pump, this, too, will probably be strained badly. Possibly this is a well known "tip," but many beginners do not know of it.

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MILWAUKEE
TRADE MARK
"THE SIGN OF SATISFACTION"

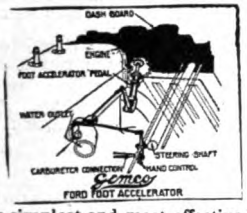
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The Big Line of
POPULAR FORD SPECIALTIES

For the Jobber---Dealer and Ford Owner



Combination Rear End Tire Holder.
Complete with Straps.....$3.95
Without Lamp and License Bracket..... 3.20



The simplest and most effective Foot Accelerator on the market. It is positive action, easy to attach and is proving a tremendous seller. Directions for attaching furnished with each Accelerator.

Price, Complete.....$1.50



Pneumatic-Springs are real Shock Absorbers that belong on every Ford car. Mechanically perfect and thoroughly guaranteed.
Price, Per Set of Four.....$15.00

Illustration at right shows the Gemco Mechanical Starter—Shock Absorbers and F-10 License Clamp and Bar. These are three important Ford Accessories.
Starters..... $15.00
F-10, Complete..... 1.00

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The most complete line of high-grade Ford Specialties to be had.

More than fifty different articles, including:

Starters	Radiator Caps
Shock Absorbers	Spark Plugs
Tire Holders	Anti-Rattlers
Bumpers	Truss Rods
Steering Wheels	Wheel Pullers
Brake Bands	Robe and Foot Rails
Brake Shoes	Chain Grips
License Brackets	Mud Hooks
Wind Shields	Foot Accelerators
Lamps	Cutout and Horn Outfits
Radius Rods	Standard Bolts and Nuts
Radiator Cradles	Tools, Etc.

The best proposition offered the live dealer this season—Quick Sales, Good Profits and Satisfied Customers. Sold by leading supply houses throughout the country.

Send for Ford catalog today.

The Latest and One of the Most Important Ford Parts

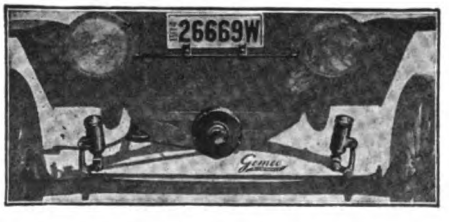
The Gemco Quick Detachable Transmission Bands

20 Minutes to Attach the New Band.
(See Illustration and Description.)

THE OLD WAY	THE NEW WAY
Means Tearing Down Transmission Case — Three or Four Hours' Time and Several Dollars Expense.	Open Case Cover—Insert Gemco Quick Detachable Band (See Illustration). 20 Minutes' Time. Practically **No Expense.**

The Garage Equipment Mfg. Company

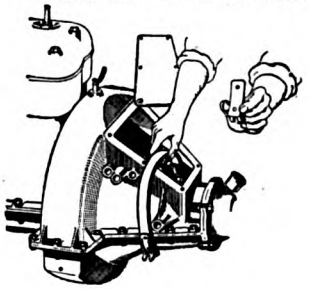
764 So. Pierce St., Milwaukee, Wis.

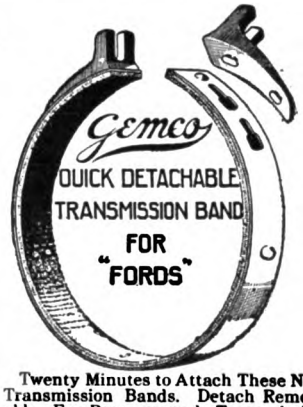


17" Tilting Steering Wheel for Ford Cars



Easier Steering—Greater Leverage—More Room.
17 in. Stationary, Plain..... $3.60
Corrugated..... 4.50
17 in. Tilting, Plain..... 4.50
Corrugated..... 5.50





Twenty Minutes to Attach These New Transmission Bands. Detach Removable Ear-Pass around Transmission and Lock (See Illustration).

The initial expense of this new Band is about one-third of the cost to install the old Band These Bands can be relined at a small expense and will last the life of the car. Prices:
Gemco Quick Detachable Bands, Lined .....each, $1.50
Lining Only, Three in a Box, with Rivets..... 1.00

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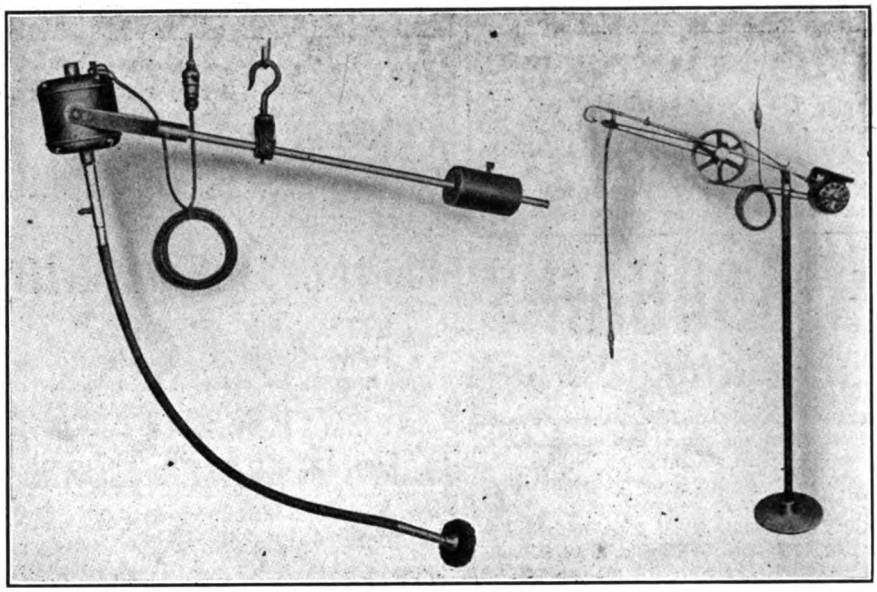
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Utility Tools with Flexible Shafts.

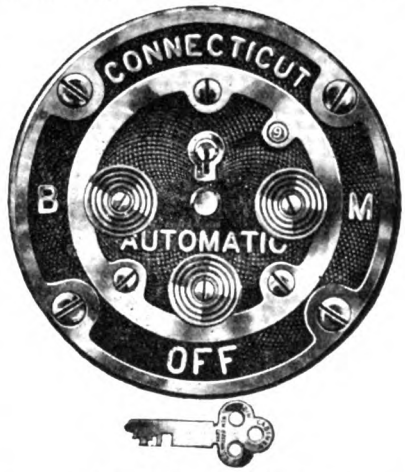
In meeting special orders for motor-driven tools equipped with flexible shafts for use in die sinking, grinding, buffing, polishing, etc., the Stow Manufacturing Company, Binghamton, N. Y., has developed a number of electric tools of great utility, two of which are illustrated herewith. It shows a tool which is especially applicable where a wide range of flexibility and speed is desired. It consists of an adjustable standard upon which is pivoted the main rod having at one end a Stow flexible shaft and at the other end a motor, the latter serving both as power unit and counterweight. By means of the countershaft and pulleys three of the latter being interchangeable, a range of speed between 400 and 7,000 revolutions per minute can be obtained, thus making the machine suitable for drilling in wood or steel and similar work. The tool can also be dismounted from the standard, and suspended from the ceiling, similar to the Stow suspended-type direct-connected tool shown. When one speed alone is desired for grinding or buffing, or light drilling, the suspended type without countershaft is recommended. This tool is very serviceable in assembling work, since it has a large radius of action and can be mounted over the work so as to be out of the way and yet quickly accessible. Both these tools are made for 110 or 220 volts direct current and for similar voltages on 60-cycle single-phase current.



Two Labor-saving Devices.

A Novel Automobile Lock.

The Connecticut Telephone and Electric Company have just placed on the market a new type of lock as applied to their automatic switch controlling their automatic igniter system. This lock is different from the ordinary ignition lock inasmuch as the key is required only to unlock it, the switch being locked by means of a small plunger directly over the right hand button. With this arrangement it is possible to carry the ignition key on a bunch as it is not necessary to leave it in the lock when the car is being used. In order to operate the locking feature, it is simply necessary to press the small button after the switch button has been released and the ignition shut off. It is so designed that it is not possible to lock the ignition until it has been thrown off. It is simple in construction and fool-proof. The keys are not interchangeable as is the case with most ignition locks, which is a decided advantage as it is not possible to unlock it with one common key which largely destroys the effectiveness of a lock of this nature.



The Lock and Key.

Increase of Reos.

March production figures issued by General Manager R. H. Scott of the Reo Motor Car Company, of Lansing, Mich., show a 50 per cent. increase in business over March, 1914. Last year in March the Reo turned out 1,792 pleasure cars, while this year's March production aggregated 2,589 cars.

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Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange, at the uniform price of five cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 75 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Special rate of 25 cents per nonpareil line for each insertion if taken for 12 consecutive times.

After June 15, 1915, the yearly rate will be advanced to 30 cents per nonpareil line for each insertion.

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Classified Advertisements

Auto Accessories

FORD OWNERS

Write for CATALOG No. 17

Tires, Tubes and Accessories, all at "CUT PRICES." We carry a full line of APCO goods; get our prices. A post card brings this to you free.

UNITED AUTO SUPPLY COMPANY
88 Chambers Street NEW YORK CITY

BIG BARGAINS

For Quick Sale

Our recent $100,000.00 fortunate purchase, at Receiver's Sale, of the entire stock of the C. E. Bonner Tool Co., places before you high grade drop forged tools at tremendous savings.

10,000 Automobile Tool Kits embodying different assortments of proper tools, 6 to 14 tools in each set. Priced as low as, per set **75c**

7500 Engineers' and "S" Wrench Sets, 5 and 6 wrenches in a set. Made from drop forgings with case hardened jaws and nicely finished. Priced as low as, per set.....**47c**

Alligator Wrenches; Ball Pein Hammers; Adjustable Automobile Wrenches; Wire Pliers; Goose Neck Claw Bars and other handy tools for all purpose work suited to the uses of the best equipped garages and repair shops. Big money saving prices. **Write today for free complete bargain list No. MA-100.**

Lathes, Drills, Shapers, Grinders and all needed Garage tools and equipment. Biggest selections at all times at lowest prices. **Ask for free complete Garagemen's list No. MA-99.**

Gasoline and Storage Tanks of all kinds, 50 to 10,000 gallon capacity.

A limited number of used **Milwaukee Motor Co.'s Automobile Engines, 35 H.P.** Splendid condition. Big snap.

325 Brand New Standard Electric Motors, ⅛ and ¼ H.P.; 110 volt; A.C.; single phase; speed 1800.

290 ¼ H.P.; D.C.; 110 volt Brand New Standard Electric Motors.

Above motors offered for quick sale at big sacrifice prices.

HARRIS BROTHERS COMPANY
Owners of CHICAGO HOUSE WRECKING CO.
35th and IRON STS. CHICAGO, ILL.

BUY WRITE

Get Our New Catalog before placing your orders.

New York & Brooklyn Auto Supply Co.
1717-1719 Broadway New York
Established 1905

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $25.00 Models $7.50 Complete

Including all necessary attachments.

STEWART HAND OPERATED HORNS

Complete with attaching brackets, $3.00

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

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All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.
Broadway & 63rd St. New York, N. Y.

Auto Accessories

TIMES SQUARE AUTO CO.

Price Wreckers on *AUTO ACCESSORIES*

Our daily sales far exceed those of any other supply store on Broadway. There must be a reason. We believe it is our prices. Following are a few examples:—

Standard speedometers, all sizes, $6.50; E. Presto tanks, $10; tool boxes, $1.35 up; tire trunks, $4; Brown, Jr., spark plug pumps, $4.10; swivel searchlight, $5.50; racing seats, $18 per pair; summer lap robes, $1.25; steamer rugs, $2.25; dusters, $1 up; electric headlights, $4.50 per pair; side lamps, $3 per pair; tail lamps, 85c.; mechanical hand horns, $2.45; summer gloves, 75c. per pair; tire pumps, 75c.; magneto, complete dual systems, $17.

We have a special department devoted to parts not carried by any other supply store, such as gasolene tanks for roadsters, $4.25; carburetors, all kinds, sizes and styles; radiators, all kinds, $15 up; transmissions, $40 and $45; steering wheels, $1.50 up; spark plugs, 20c. each up, standard make; cushions for all cars, $2.50 to $5.

Bearings at ridiculously low prices; send in your old bearing and we will match it and save you 50 to 75 per cent. Our line of tools contains the best quality.

FORD SPECIALTIES:—Brown sub-base oiler; Breeze carburetors, $6.50; seat covers complete, $7.50; tire covers, 75c.; shock absorbers, $3.50 set; combination windshield and cowl, $12; one-man tops, $25; Ford radiators, $16.75; stream line hoods, $8; demountable wheels and rims complete, $16.95.

Tires and tubes—guaranteed quality.

Size.	Plain.	Non-skid.	Grey tube	Red tube.
30x3	$6.90	$7.50	$1.80	$2.00
30x3½	8.60	9.35	2.15	2.40

Jacks, 50c.; channel bumpers, $4; complete speedometer with all fittings, Stewart make, $6.65.

Thousands of other bargains in supplies, bodies, tops, windshields, motors, axles; complete cars, etc.

TIMES SQUARE AUTO CO.
WORLD'S LARGEST DEALERS
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1208-1210 Michigan Avenue, Chicago

AUTOMOBILE ACCESSORIES

ELECTRICAL SUPPLIES

Batteries REPAIRED RECHARGED REPLACED

Distributing Agents for Gould Storage Batteries.

MANUFACTURERS DISTRIBUTING CO.
OF AMERICA
246 West 56th Street NEW YORK CITY
Just West of Broadway

THE GWILLIAM COMPANY

ENGINEERS
Specialists in Bearings

The New Departure Service Station
253 West 58th Street at Broadway New York
Branch, 1314 Arch Street, Philadelphia

AUTO DEALERS, AND REPAIR AND GARAGE MEN
New Catalog and Lists ready May 20th,
Send for copy. Wholesale only
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1777 Broadway New York City

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

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Auto Accessories

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Formerly 20 years on Chambers St., N. Y.,
now located at
1254 Bedford Avenue BROOKLYN, N. Y.
Tires and Supplies, inside prices.
Our only store. Low Expenses, Low Prices.
Mr. Manufacturer, anything you have, let me know.
SPOT CASH PAID.

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FOR SALE.—25 Lincoln milling machines; $55 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

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MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

"THICK-O GUM SHELLAC."
Absolutely pure Orange Shellac (no rosin), cut very thick and heavy in denatured grain alcohol, put up in double friction top cans. One Doz., ½ pint, $1.30, you pay charges. One Doz. ¼ pint, .90, you pay charges. THINK OF IT—Shellac positively guaranteed to be cut at rate of six pounds to a gallon.
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Princeton, Illinois.

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PISTON RINGS
Ues Peerless Positive leak proof when overhauling your motor, more power on less fuel guaranteed. Write for circulars and net prices.
PEERLESS PISTON RING CO.
99 Lafayette Street NEWARK, N. J.

ANOTHER GREAT PURCHASE
Cut Price Auto Supply Co.
With their tremendous stock of
TIRES, TUBES
And GENERAL LINE OF ACCESSORIES
Send For Our Inventory Of This Stock.

Some of the Real Bargains.

New Michelin Type Non-skid Clincher Tires, 32x3½	each	$6.00
34x3½	each	6.00
32x4	each	8.00
35x4	each	8.00
And many other sizes.		
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GARFORD "30" & "40" Parts
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Write for list and prices
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Bowser Gasoline Wheel Tank
Cut 122—Practically New.
LIST, $235.00
Will sell for $160.00
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AUTO-TIRE REPAIRING
Tube Vulcanizing, 15c.
Use Roll-in-White, it Preserves your Tires, 25c. per pint.
1092 Bedford Avenue BROOKLYN, N. Y.

Parts For All Makes
Motors, Transmissions, front and rear Axles, Carburetors, in fact everything for any automobile made, at sacrificed prices.
NORTHERN PACIFIC MOTOR CO.
212A West 50th Street New York City

FOR BARGAINS in Screw Cutting Engine Lathes write South Bend Lathe Works, 625 E. Madison St., South Bend, Ind.

LIGHT CAR PARTS—Motors, Transmissions, Rims, Wheels, Steering Gears, Front and Rear Axles. Catalogue free. Palmer Brothers, Coscob, Connecticut.

FOR SALE—One New 15 Amp. Wagner Rectifier with rheostat for charging batteries. Worth $70. Price $50. P. W. Frey, 951 Court St., Allentown, Pa.

U-KAN-PLATE—The polish that silver plates. Easily demonstrated on your car; unusual side-line opportunity. Infico Company, 431 Presser Bldg., Philadelphia, Pa.

FOR SALE—Mazda Electric Light Bulbs, at bargain prices, for Automobiles, Vehicles, Motor-Boats, Motorcycles, Flashlights, House or Factory Illumination. Write for prices to Robert Ross Jones, Harrisburg, Pa.

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USE AN AIR-FRICTION CARBURETOR 1915 Improved Model C or G. Increases power and economy of motor one-half. Absolutely impossible to load or choke. Starts easy warm or cold weather. Uses either high or low grade fuels with finest results. We fit all motors and guarantee definite results or refund money if returned within thirty days. Liberal exchange allowance on other carburetors or old model Air-Frictions. We also make and absolutely guarantee the Air-Friction Spark Plug. Sold in sets of five only at $3.00 per set. The Air-Friction Carburetor Co., Dayton, Ohio.

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MAGNETOS REPAIRED BY A MAGNETO SPECIALIST. Expert on Bosch, Elsemann, Remy. Magnetos bought, sold, installed and repaired at short notice. Agent for New York Coil Co.
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1093 Bedford Avenue
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All Makes of Magnetos, Self-Starters and Lighting Systems Repaired and Sold

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ANY SIZE CAR
CAN now be made with assurance that your customer does not invite a repetition of the trouble if you buy
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Starting —and— Lighting
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OUR repair work on all makes of batteries is the conscientious kind. We have always specialized in repair work and we know every make of battery intimately.
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Sole Manufacturers
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The Oldest Ignition Expert asks you to Avoid Expense on Your LIGHTING SYSTEM, SELF STARTERS, MAGNETOS AND COILS OF ALL MAKES, and ship any troublesome apparatus Direct to our Service Station, where repairs are made by experts at shortest notice and Reasonable Prices.
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THE BOSCH MAGNETO
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YOUR OWN STORAGE BATTERIES

STORAGE BATTERIES made with our Assembly Parts, efficient for every purpose, such as Auto Ignition, Lighting, Cranking, House Lighting, Electric Vehicles, etc.

We Furnish Instructions.

SEND FOR PRICES.

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PUMPELLY BATTERIES
FOR
Lighting, Starting and Ignition

Most Satisfactory Battery on the Market.

Now is the time to look after your Batteries.

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Size	Tires	Tubes	Size	Tires	Tubes
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30x3½	7.50	2.42	34x4	9.75	3.35
32x3½	8.00	2.55	36x4	10.00	3.58
34x3½	8.50	3.00	34x4½	11.50	4.24
30x4	8.00	2.97	36x4½	12.50	4.55
32x4	8.50	3.17	37x5	14.75	5.30

Tires are sent subject to examination, C. O. D., 10% deposit required. **Tubes are guaranteed.**

TUXEDO AUTO TIRE EXCHANGE
896A Eighth Avenue NEW YORK CITY

Tires

DOUBLE TREAD TIRES

By using our double tread tires you will save 75% on your tire bills.

These are our prices for double tread tires in stock.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

DOUBLE TREAD TIRES

All sizes up to 38x5½
Guaranteed for 3500 Miles

Size	Plain	Non Skid	Pure Gum Tubes	Red
30x3	5.00	5.50	2.04	2.64
30x3½	6.00	7.00	2.55	3.20
32x3½	7.00	8.00	2.70	3.44
32x4	8.00	9.00	3.35	4.14
33x4	9.00	10.00	3.46	4.14
34x4	9.00	10.00	3.58	4.36
35x4	9.00	10.00	3.68	4.56

These tires are **Absolutely Puncture Proof.**
Be sure to state whether regular Q. D. or straight bead.

WHY PAY MORE?

Will outwear any make of tire at a saving of 75% of your tire bills. **Send us a trial order today.**

THE DOUBLE TREAD TIRE CO., Inc.
'Phone, Col. 8681 116D W. 52d St., New York City

Double Tread Tires

All sizes up to 37x5
GUARANTEED

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.50	$9.50
30x3	$5.00	$5.25	36x4	8.75	9.50
30x3½	5.75	6.25	34x4½	9.50	10.50
32x3½	6.50	7.00	35x4½	9.50	10.50
32x4	8.00	8.50	36x4½	9.50	10.50
33x4	8.00	8.75	37x4½	9.50	10.50
34x4	8.00	8.75	37x5	11.00	12.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
243a West 56th Street NEW YORK

DOUBLE TIRES GIVE 6,000 MILES

35% to 60% SAVED. Absolute (Written) Guarantee of 3500 miles. Some prices.

32x3½, $9.25 34x4, $12.00 36x4½, $15.25

Cash Profit Sharing Coupons that further reduce price to you. Send for particulars. NOW! State size.

ANGLO TIRE COMPANY
838-840 SEVENTH AVE. NEW YORK

DOUBLE TREAD TIRES

Order your double tread tires at once and save money.
ADINOFF & POSNER, 134 W. 50th Street, NEW YORK CITY

Tires

BIG INTRODUCTORY SALE
ON
Double Tread Stitched Tires
For the Next 30 Days
25% off our Regular Price List

SIZE	Tubes Reclaimed	SIZE	Tubes Reclaimed
30x3	$3.75	35x4	$6.75
30x3½	4.50	36x4	6.75
32x3½	5.25	34x4½	7.50
34x3½	5.25	35x4½	7.50
36x3½	5.25	36x4½	7.50
30x4	6.00	37x4½	7.50
31x4	6.00	34x5	7.50
32x4	6.00	35x5	7.50
33x4	6.00	36x5	8.25
34x4	6.75	37x5	8.25

NON-SKID SIZES $1.00 EXTRA
Reliners from $1.00 to $2.50

Watch for our weekly announcements in The Automobile also.

LEON JAFFESS
252 West 55th St. New York City
5019 Euclid Ave. Cleveland, Ohio

CUT YOUR TIRE BILLS
BY USING
Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

We pay express charges on receiving your old tires and return C. O. D. subject to inspection.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain Tread	Non Skid	Size	Plain Tread	Non Skid
28x3	$4.00	$4.50	34x4	$9.00	$10.00
30x3	5.00	6.00	35x4½	10.00	11.00
30x3½	6.00	7.00	36x4½	11.00	12.00
32x3½	7.00	8.00	37x5	12.00	13.00

For all other sizes write for prices.
Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN
27A East 110th St. NEW YORK CITY
Branch: 205 W. 48th St., New York City

PACKARD TIRES
(Honest as the dollar that buys them.)
Write for Free Circular.
INDIAN HEAD TIRE CO., 161 W. 51st St., NEW YORK CITY

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Tires

A GREAT TIRE & TUBE SALE
100 Makes—15,000 Tubes & Shoes
New and A1 Stock
AT ☞ RIDICULOUSLY LOW PRICES!
Saving from 40% to 70%
Magnetos, Lamps, Horns, Speedometers, Carburetors, Race Seats, Tanks, Windshields, etc., at most alluring prices!
Used But Good Shoes, $3, $4, $5, $8
Try Us First and Then Compare Prices.
"Cheapest House in the City"
JANDORF AUTOMOBILE CO.
TIRE & SUNDRY DEPARTMENT
1764 Broadway New York City

DOUBLE TREAD

Points the way to tire satisfaction and will surely save you 75% of your tire expense

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.
Terms C. O. D. 10% deposit.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
New York City
The Home of Double-Tread Tires

AGENTS AND DEALERS WANTED FOR
STAR SOUND TIRES
Guaranteed 4000 miles.
Good proposition for live agents, and dealers.
STAR RUBBER COMPANY
1781 Broadway NEW YORK, N. Y.

TIRES TIRES TIRES
Automobile Dealers Take Notice.
We now offer for sale our Henschel Special tires in all sizes and types. Write for our special dealers' proposition.
HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

STODDARD FORD TIRES. 25% OVERSIZED.
GUARANTEED. "HEAVY TIRES FOR LIGHT CARS."
30x3, $6.90 30x3½, $9.80
TRADE DISCOUNTS UPON REQUEST
STODDARD RUBBER & TIRE COMPANY
1777 Broadway New York City

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MAGNETO PARTS

We manufacture parts for all types of
Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos
Liberal discount to the trade.
Illustrated Catalogue on request.
MAGNETO PARTS CO., Inc.
1790 Broadway New York City, N. Y
If interested in agency write for particulars.

Miscellaneous

CYLINDERS REBORED AND REGROUND and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.
McCADDEN MACHINE WORKS,
St. Cloud, Minn.

PAINT YOUR OWN CAR
We supply material and instruction. Write for particulars. ECONOMY SERVICE CO., Indianapolis, Ind., 2714 Boulevard Place.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

TOPS BUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REGROUND
and fitted with new pistons and rings for $5 to $11 per cylinder. We do this class of work exclusively and give you the highest quality of work at these prices. Ford cylinders reground and fitted with pistons, rings and wrist-pins for $20, discount to dealers.
CROWN MACHINE SHOP
Crown Point, Ind.

SCORED CYLINDERS
We fill your scores with a silver composition by patent electric process. No heating to warp cylinders. Welding in all its branches. L. Lawrence & Co., Newark, N. J.

CARBON REMOVED—Economy, convenience. Ball Carbon Remover keeps your cylinders free of carbon; does the trick quickly, effectively, inexpensively. Investigate now. The Bowling Green Sales Co., 323 Decatur St., Brooklyn, N. Y.

NEW SUBSTITUTE FOR WELDING ALUMINUM
by our aluminum solder (German process) at only fractional cost of welding, as evidenced by favorable notices in Automobile Magazines. Territorial Rights negotiated. Big money for repair shops.
German-American Aluminum Co.
25 WEST 42nd ST. NEW YORK CITY

CYLINDER GRINDING
NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
Prompt and reasonable.
NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

WE SPECIALIZE IN CYLINDER GRINDing, pistons and rings. First class equipment, 20 years' experience make low prices possible. Ford and Metz cylinders reground, new pistons and rings, $20. Bridgeport Piston Ring Co., 346 Connecticut Ave., Bridgeport, Conn.

SO-LUMINUM—ALUMINUM SOLDER
WHY WELD when you can do better work in one-fourth the time—at one-fourth the price by using the latest great discovery, SO-LUMINUM—*The Aluminum Solder.* Does away with welding. No oxidization. No flux necessary. Runs at extremely low temperature. Easily applied. Gasoline torch only thing needed. Twice the strength of aluminum and much harder—never breaks at soldered point. Convince Yourself by Trying It. Price $4.00 per lb. Tested or used already by Locomobile, Packard, Stanley, Pierce Arrow, Brewster, Demarest, Studebaker Simplex and many other companies.
SO-LUMINUM MFG. & ENGINEERING CO., Dept. B, 1790 Broadway, N. Y.

PAINT YOUR OWN CAR
FOR $4.00. Write for interesting booklet and color card. We can save you money.
ECONOMY SERVICE COMPANY
2714 Boulevard Place Indianapolis, Indiana

CYLINDERS REBORED & REGROUND
Fitted with my heat treated light weight pistons and patented three section rings. From $6 to $15 per cylinder. Ford cylinders reground, fitted with new pistons, rings, bushings and wrist pins, $20.00.
TRUMP MANUFACTURING CO., CROWN POINT, INDIANA

Miscellaneous

CYLINDERS REBORED
Best quality piston and rings fitted, any make and size. $3.00 and up.
KENNEY COLWELL CO., NORFOLK, NEBR.

GET A RUFF-FORD POWER TRANSMITTING ATTACHMENT and utilize the power of your car for most any purpose. For descriptive circular address Tire Trading Company, Newark, N. J.

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.
HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATORS OF QUALITY
WRIGHT HAS IT IN STOCK
Abbott-Detroit, 30-1910-11; Ames, Buick, 16-29-39; Cadillac, 1909-10-11; Chalmers, F30-1909, 30-1912; Cino, Courier, 1910; Flanders 20, Ford T, Henry 40, Hudson 33, Hudson 54, Hupmobile, 20-1910-11; Hupmobile 32, Imperial 30-1910; Little Four, Marion 30-1911; Michigan F, 1911; Moline 30-1910; Nyberg, 1912; Oakland 40-1910 Oakland 30-1912; Oldsmobile Special, 1910; Overland 51-56-1911; Premier 4-40-1910; R.C.H., 1912; Regal 20-30, Richmond K, Studebaker Garford 40-1910; Studebaker 1913; 25 H.P., Velie 30, 1909; Warren-Detroit 30, 1910, and many others. New Radiators built to specifications in 2 days. Fully guaranteed.
WRIGHT RADIATOR & HOOD MFG. CO.
1253-55 S. Michigan Ave., Chicago

COLUMBIA LAMP WORKS
Radiator specialists. All makes repaired on short notice. Manufacturers of fenders, all styles and shapes. Lamps that will stay lit. Over 1,000 pairs to select from. Plating and polishing, silver, nickel and brass enameling, sprayed or baked. The oldest and most up-to-date metal workers. 243-245 W. 47th St., New York City. Telephone Bryant 4266.

WE Repair Lamps, Radiators, Windshields, of every description. Also Repair, Rebuild and adjust Carburetors. Special attention given to enameling and nickel plating.
INTERNATIONAL AUTO RADIATOR AND LAMP REPAIR CO.
1085 Bedford Avenue Brooklyn, N. Y.
Branch at 338½ Gates Ave., Brooklyn, N. Y.

Parts

RIMS
ALL MAKES AND TYPES
Also parts for all old types including Goodyear '07 parts.
LARGEST DISTRIBUTORS.
DEALERS—Write for Prices.
CITY AUTO TIRE & SUPPLY CO.
2352 Euclid Avenue Cleveland, Ohio

WE CARRY IN STOCK
STODDARD-DAYTON PARTS
DAYTON AUTO REPAIR COMPANY
353 West 52nd St., New York City

We carry in stock
PACKARD GEARS and PARTS
ALSO REGAL GEARS IN STOCK
Write for Discount
Auto Parts & Accessories Co.
1933 Broadway NEW YORK CITY

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Welding

SEE OUR ADVERTISEMENT on page 157 regarding cylinder regrinding and welding broken cylinders or crankcases. Waterbury Welding Co., Waterbury, Conn.

WELDING PLANTS THAT ARE SAFE—$50.00 to $175.00. Carbon remover with each welder. Your credit is good with us. The welder pays for itself and you save the middleman's profit. Write for terms. Address Manager, Dept. B, Bermo Welding Apparatus Co., Omaha, Neb.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WELDING, BRAZING AND SPOT HEATING
BY THE
SCHAAP FLAME WELDING SYSTEM
Our charges are nominal—all work guaranteed.
An expert for each metal.
SCHAAP AUTOMOBILE CO.
Owners Schaap Flame Patents
344 Cumberland Street BROOKLYN, N. Y

WE DO WELDING others cannot do. Send your worst smashed crank cases, transmission housings and broken cylinders made of aluminum or cast iron. Jobs finished up so do not show repair, and painted. Finest equipped plant west of Chicago. Hobbie Welding Plant, Hampton, Iowa.

OXY-ACETYLENE WELDING

Crankshafts, crankcases, connecting rods, pistons.

SCORED CYLINDERS

made equal to new with our new silver iron process—USE THE SAME PISTON AND RINGS.

POWELL-ELLIOT AUTO REPAIR CO.
143 Rogers Ave., Cor. Sterling Pl.,
BROOKLYN, N. Y.

CYLINDERS REBORED
Including new pistons and rings, $7 to $11 per cylinder. General overhauling and repairing.
WELDING
Cylinders, crankcases and crankshafts welded.
STERLING ENGINE COMPANY
331 S. Clinton Street Chicago, Ill.

Patents

RIGHT WITHIN CALL—Beekman 3396
It may save a good invention, ensure a good patent and save you money to enquire about any patent matters before action. No charge, but information gladly furnished.
Patent Attorney, JAMES F. DUHAMEL, 132 Nassau St., New York City

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building, Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

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COMMERCIAL BODIES FOR FORD CARS
Write for pamphlet and prices. Economy Service Company, 2714 Boulevard Place, Indianapolis, Ind.

FORD PLEASURE BODIES—Make your old car a new car by putting on a brand new 1914 Ford body. We have them at prices that will appeal to you. London Auto Supply Company, 2548 Wabash Ave., Chicago, Ill.

Agents Wanted

TO SELL ELECTRIC VULCANIZER operating on 6 volt storage battery. New idea. Quick seller. Every owner buys. Absolutely guaranteed. Can make $50 weekly. Exclusive territory to producers. Corbett and De Coursey Co., Pittsburgh, Pa.

Vulcanizers

VULCANIZERS—Shop and individual use. A slightly used shop vulcanizer; A1 condition. Write at once. Vanderpool, Springfield, Ohio

Auto Lists

200,000 1915 N. E. REGISTRATIONS $13.00
During 1915 from January 1st we shall publish in weekly installments and numerical order, all the motor registrations of New England as filed. Sub. $13.00. AUTO LIST PUB. COMPANY, 138 Pearl Street, Boston

MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. Motor List Co. of America, 1111 Locust St., Des Moines, Iowa.

1915 Automobile Registrations
NEW YORK STATE OR ANY OTHER.
supplied on sheets or cards. Addressing, folding and mailing to auto owners. Special lists promptly compiled such as Ford owners, dealers, chauffeurs, etc.
Daily Service Any State. First Twenty-Five Thousand New York State 1915 Registrations, $5.00.
NAT'L TRADE LIST & ADDRESSING COMPANY
ALBANY, N. Y.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

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REBUILT CARS, $200—$2500
Limousine, Laudaulet, Cab, Sedan Bodies, $100 to $600. Tops, $10. Top Covers, $1. Batteries, $10.
20th CENTURY CO., 1694 Broadway near 53d St., New York

Metal Spinning

METAL SPINNING
OF ALL KINDS
Parts for Auto Lamps made to order. Auto Lamps repaired and made as good as new. Experimental work a specialty. No job too small, or we will figure on large contracts for the trade. Send sample or blue prints and specifications for estimates.
COLLINS & HATCH CO.
150½ ELM STREET AMESBURY, MASS.

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"HOW TO RUN A LATHE"—A 50-cent book, 64 pages, 75 illustrations, sent postpaid on receipt of 10 cents. Stamps accepted. South Bend Lathe Works, 540 Madison St., South Bend, Ind.

COUPON BOOKS for gasoline trade. Sample free. J. P. Forbes, Coshocton, Ohio.

Wanted

WANTED—Old single cylinder DeDion, Renault or Peugeot cars. Any condition. Describe fully and state year made if possible. Address B., c/o Automobile Dealer and Repairer, P. O. Box 654, N. Y. City.

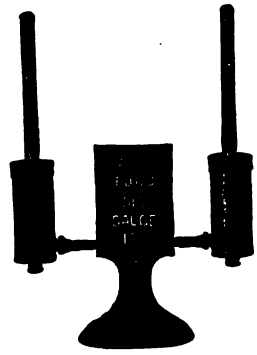
WANTED—Salesmen calling on the Ford trade to handle new line of Ford specialties as a side line. Goods guaranteed. Liberal commission. W. S. Graffam & Co., Northampton, Mass.

WANTED—Location to establish an Auto Repair Shop by practical automobile engineer and machinist. Both factory and repair shop experience. Good farming locality preferred. Address H, Box 654, New York.

WANTED—High grade traveling representative to sell a full line of Ford specialties to the jobbing trade; excellent opportunities for the right man. Apply with all particulars, etc. All applications will be strictly confidential. Address H, care Automobile Dealer and Repairer, P. O. Box 654, New York City.

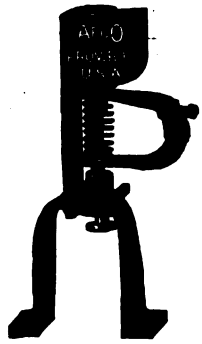
Useful Auto Parts.

Dealers and the trade will be pleased to learn that the Auto Parts Company, Providence, R. I., manufacturers of the well known line of Apco specialties for the Ford car, is supplying through the



Ford Oil Gauge.

jobber three display or demonstrating stands for showing the practicability of the Apco dash oil gauge, different types of anti-rattlers and valve spring remover. The stands are nicely made



For Valve Springs.

and finished and are of value to the dealer in that they serve as silent salesmen constantly reminding the customer of his needs. They are also valuable in arranging attractive window displays. The valve spring remover stands show the device for compressing a valve spring and includes the Ford pushrod, tappet, valve spring, etc. The oil gauge stand is equipped with two of these

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., OF AUTOMOBILE DEALER AND REPAIRER FOR APRIL 1st, 1915.

Published Monthly, at 71 Murray Street, New York City.

Required by the Act of August 24, 1912.

Editor—A. A. Hill, 559 West 183d Street, New York City.

Managing Editor—No other editor except Mr. Hill.

Business Managers—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 41 Pinehurst Avenue, New York City.

Publishers—Motor Vehicle Publishing Co., 71 Murray Street, New York City.

Owners—Motor Vehicle Publishing Co., 71 Murray Street, New York City.

Stockholders—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 41 Pinehurst Avenue, New York City; Mrs. A. Louise Girardeau, Monticello, Fla.; Mrs. Mildred Ulmer, Monticello, Fla.; Mrs. Harriet L. Johnston, Rochelle Heights, New Rochelle, N. Y.

Known bondholders, mortgagees and other security holders, holding 1 per cent. or more of total amount of bonds, mortgages or other securities: No bondholders, mortgagees or other security holders.

MOTOR VEHICLE PUBLISHING COMPANY,
F. R. WHITTEN, Secretary.

Sworn to and subscribed before me this 30th day of March, 1915.

[L. s.] (Signed) HARRY F. REISS,
Notary Public, No. 72.
(My commission expires March 30th, 1917.)

devices while four different types of Apco anti-rattlers come with the third stand.

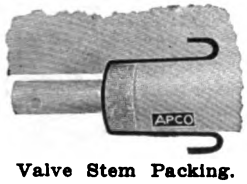
This firm has also perfected a device for overcoming the troubles experienced with worn valve stems and guides which allow air to be drawn in on the intake stroke, diluting the mixture. Much of



Anti-Rattler.

the missing at low motor speed and starting troubles are due to this condition.

The Apco valve stem packing consists of a steel stamping carrying a felt washer. The washer is pressed against the bottom of the guide and stem and is held in place by the spring. The device can be attached without tools, and one of its desirable qualities is that it



Valve Stem Packing.

keeps out abrasive elements. As the felt is oiled the stem and guide are lubricated, increasing their life. The packings come eight to the set, four being used on the intake and the balance on the exhaust. When fitted to the exhaust they eliminate the hissing noise caused by the gases escaping on the exhaust stroke. The Apco valve stem packings are sold with the Apco unqualified guarantee of "satisfaction or your money back."

Gasoline for Kerosene.

Thinking she had the kerosene can, Mrs. J. M. Lightner, of Hickman Mills, Mo., south of Kansas City, Mo., poured some on a smouldering fire. The can contained gasoline and exploded with terrific force, burning her so badly that she died a few days later after great suffering. A husband and five little ones mourn her loss.

C-C SHOCK ABSORBER

Why you should sell this Shock Absorber

1st. They satisfy the customer. There are thousands of C-Cs in use today and every one is making good.

2nd. They are a quality product. All working parts are of special heat treated steel made to stand abuse. Incorporated in the C-Cs are mechanically correct features that make for efficient shock absorption.

3rd. The price is right. At $10.00 set of two, complete for the rear, the C-Cs will be attached to hundreds of automobiles in your vicinity. It is only due to enormous production that this exceptionally low price is possible.

4th. The profit for you is big because of the demand which has been created through the extensive advertising we have been doing.

Are you going to take advantage of the results of the thousands of dollars that are being spent to advertise C-Cs?

FORD MODEL $8.00 Set of Four—$4.50 Set of Two

Thousands in use today with exceptional results in comfort and reduction of upkeep expense.

Write for dealer's proposition.

COX BRASS MFG. CO.

Established 1872

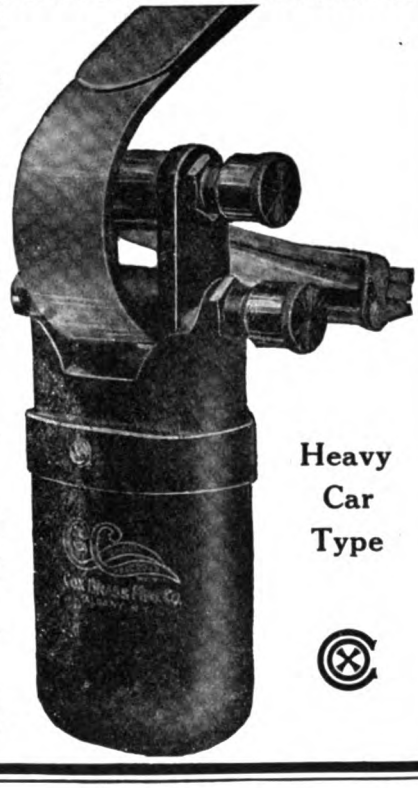
ALBANY, N. Y.

1777 Broadway, New York City — 2129 Michigan Ave., Chicago, Ill.

DISTRIBUTORS:

Boston, Mass., Philadelphia, Pa., Washington, D. C., Pittsburgh, Pa., St. Louis, Mo., Minneapolis, Minn., Davenport, Ia., Cleveland, O., Cincinnati, Columbus, Toledo. Buffalo, N. Y., Syracuse, N. Y., Sioux Falls, S. D.

Pacific Coast—San Francisco, Los Angeles, Oakland, Cal.



Heavy Car Type

$10.00 Set of Two Complete for the Rear **$10.00**

Life of Horses on the Firing Line.

That the average life of a horse on the firing line in France is about ten days was the astonishing declaration of a British army officer identified with the remount department. Horsemen were prepared to hear of unexampled wastage after reading about the havoc wrought by modern artillery and machine guns, but this report indicates such slaughter as had not been dreamed of in this country. In the civil war in this country the wastage of horses was at the rate of about 500 a day in the Union army, and the service of a cavalry horse under an active commander then averaged about four months. During his Shenandoah Valley campaign Sheridan required 150 fresh horses a day, and in eight months the cavalry of the Army of the Potomac was remounted twice, nearly 40,000 horses having been required. If the British officer's estimate of the wastage is not wide of the mark, it is a foregone conclusion that before the carnage ends there will be such a shortage of horses as Europe has never seen. As most of the animals now in the field were commandeered from farmers and others who had been using them in agriculture and industry, and this demand, added to that of the war, will, it is believed, seriously affect the price of horses the world over during the next few years.

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ECO MAGNET CHARGING AND TESTING OUTFIT

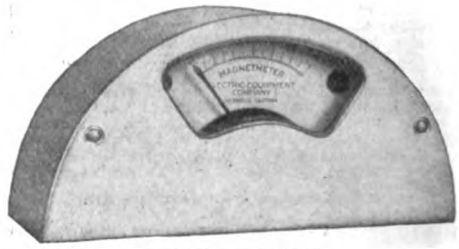


MAGNET CHARGER

The CHARGER operates on either a six volt Storage Battery or five dry cells, and is Guaranteed to charge all magnets to saturation point. The Charger is adjustable to magneto magnets of different sizes and curvature. Maximum results are obtained instantly.

It is a profit producer for any Repairman.

The MAGNETMETER or Tester shows definitely and positively the condition of the magnets and whether they have been properly charged.



MAGNETMETER

By the use of this outfit any Repairman can correct and repair difficult cases of Ignition trouble resulting from weak magnets.

WRITE FOR PRICES AND BOOKLETS.

LE MUNYON & BIDELMAN, 521 Black Building, Los Angeles, Cal.

BUSINESS READING

The business man should be a constant student of the thing in which he has invested his capital, his experience and his effort. To do this he must acquire the reading habit. If he neglects this he makes a costly mistake.

The man who imagines he is too busy to read should never go into business. The chances for his failure are too great, and at best his success can never be more than a half-success.

There is no better business reading than the advertisements in this number. They are full of information and no one who is interested in automobiles can afford to neglect them.

A New Axle Brace.

The M-G front axle brace and shock absorber for Ford cars it is claimed will not only prevent bending or breaking of the radius rod, but makes the car steer and ride better. It is sold under a money back guarantee and is manufactured by the Monnich-Gaylord Co., Hooper, Neb.

Circular Screwdriver.

Hess & Son, 1031 Chestnut St., Philadelphia, are placing on the market what is styled a pocket-piece screwdriver. It is made of steel, is circular in form, about the size of a quarter, and may be carried on a key ring. The outer edge increases in thickness around the circumference, so that the device will fit all sizes of screws.

A Big Chain Drive.

The largest chain drive in existence, three times greater in size than any previously built, is to be found at the Ox Bow Power Plant, on Snake River, Copperfield, Oregon. The plant consists of a 3,600 kilowatt generator, operated by two water-wheel units, each consisting of two pairs of waterwheels of the 48-inch horizontal type, operating under a 21-foot head. The speed of the waterwheels is 147 revolutions per minute, and each water-wheel unit is connected to the generator by four Morse chains, each 21 inches wide, the sprockets on the line shafting having a 2-inch pitch, and the shaft centers being 10 feet apart.

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ROMORT GUARANTEED SPECIALTIES

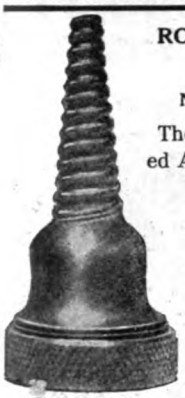
MR. JOBBER
MR. DEALER
MR. VULCANIZER
MR. TIRE MAN
MR. GARAGE
MR. MOTOR CYCLE
MR. CAR OWNER

ROMORT GUARANTEED SPECIALTIES ARE FOR YOU. MR. JOBBER, if your 1915 Catalogue don't list ROMORT GOODS, we invite you to write us. MR. DEALER, if your Jobber can't supply you, ORDER FROM US DIRECT. MR. GARAGE, VULCANIZER, MOTOR CYCLE, CAR OWNER—ROMORT SPECIALTIES will interest you. Each article is built for severe service, and sold only under a POSITIVE SATISFACTION GUARANTEE, or MONEY REFUNDED. There is nothing on the market "JUST AS GOOD," INSIST ON ROMORT GOODS. If your Dealer don't carry THE ROMORT LINE, DON'T WAIT—MAIL US THE COUPON BELOW—WE WILL PROMPTLY FILL YOUR ORDER DIRECT.

ROMORT STRAIGHT PUMP CONNECTION.

Price 25 Cents Each.

Not Automatic. **Patented.**



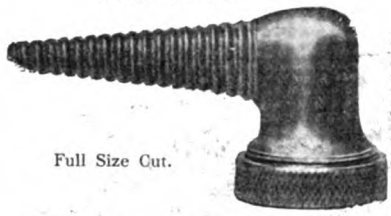
Full Size Cut.

The ideal Air Connection for use on direct Connected Air Pumps, hand and foot pumps, Spark-plug and Power Tire pumps. Solid Casting with Center pin. REPLACES THE AWKWARD AND INCONVENIENT SCREW CONNECTION. Has threaded taper stem to fit ⅛ to ⅜ inch tubing. Will not leak OR BLOW OFF, when connected to tire valve. If your Dealer is up-to-date he has them in stock, if not—Fill out the Coupon below—INSIST ON "THE ROMORT."

ROMORT ANGLE PUMP CONNECTION.

Price 40 Cents Each.

Not Automatic. **Patented.**



Full Size Cut.

Extra heavy solid bronze one-piece casting, with center pin. Designed for Direct Connected air compressors of all types. ESPECIALLY RECOMMENDED FOR POWER TIRE AND SPARK PLUG PUMPS ATTACHED TO AUTOMOBILES. Threaded taper stem to fit ⅛ to ⅜ inch tubing. HOLDS FAST TO TIRE VALVE WHEN ATTACHED. Your Dealer should have them, if not, order direct—See Coupon below. DON'T TAKE A SUBSTITUTE—GET A "ROMORT."

ROMORT AUTOMATIC AIR VALVE, STYLE "A."

Price $3.00 Each. **Patented.**



The Master Valve for Use of Free Air Stations. Stands the Hard, Rough Usage and Abuse.

Full Size Cut

PUBLIC AIR STATIONS, GARAGES, VULCANIZERS, TIRE SHOPS, all use it. IT WON'T WEAR OUT. ABSOLUTELY AUTOMATIC AND FOOL PROOF. AIR CANNOT BE WASTED. Attach it to the hose, kick it around on the cement walks and forget it. Always in order and ready. First Cost is years' total cost. NOTE THE TAPER SCREW STEM TO FIT ANY COMMON SIZE TUBING. Special Stem to fit extra large or small tubing, at no additional cost. ALL

PRICE LIST OF PARTS
See Letter On Cut

a—Body	- -	$1.50	each
b—Nut	- - -	.40	"
c—Spring	- -	.05	"
d—Plunger	- -	.50	"
e—Gasket	- -	.05	"
f—Cap	- - -	.50	"

LEADING JOBBERS AND DEALERS CARRY THIS VALVE IN STOCK—if yours does not, fill in Coupon below. GET THE BEST—GET A ROMORT, STYLE "A."

ROMORT AUTOMATIC AIR VALVE, STYLE "B."

Price $1.00 Each.

Patent Pending.

A High Grade Automatic Air Valve Designed to Meet the Popular Demand for a Small and Inexpensive Air Device.



Half Size Cut.

PRICE LIST OF PARTS.

Body - -	$ .50	Cap - -	$ .25
Plunger -	.30	Gasket - -	.05

Solid Bronze, one-piece casting, taper screw stem to fit any size air tubing. AUTOMATIC IN OPENING AND CLOSING AND POSITIVELY AIR TIGHT. We highly recommend this valve for use of private or public Garages, Vulcanizers, Tire Repair Shops, where the service does not require the use of a heavy valve. Ask your Dealer for a ROMORT, STYLE "B," or fill out Coupon below.

ROMORT AIR NOZZLE---CUSHION CLEANER

Price 25 Cents Each



The handiest little device ever invented for the purpose of **blowing the dirt and dust off cushion tops, foot mats, machinery, etc.** When attached to a Romort Automatic Air Valve, or Pump Connection, air flows out of the needle point **with terrific force**, forming a perfect and effective Air Cleaner. Ask your Dealer, or order direct.

ROMORT PUMP CONNECTION RUBBER---or ROMORT RUBBER WASHER

FITS ALL VALVES AND PUMP CONNECTIONS

One Dozen Rubbers to a Carton **Price 25 Cents per Carton**

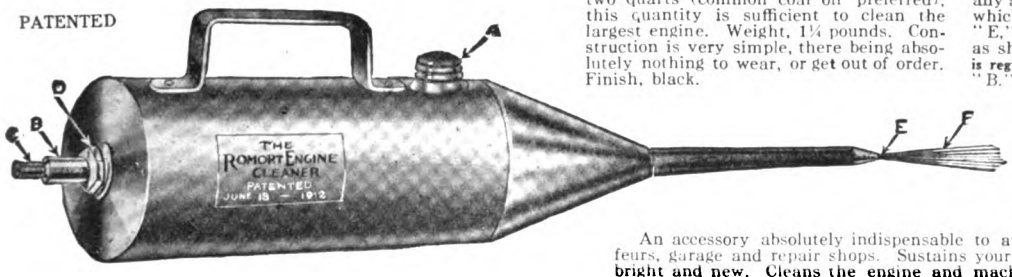


A scientific Romort design, made of a Special Compound of Rubber (not dope), has the best wearing qualities. Easily slips on the tire valve, **Will hold fast and will not turn inside out. Don't be misled by cheap inferior washers similar to Romort design—Genuine Romort Rubbers are stamped "Romort."** Leading Jobbers and dealers carry **Romort Rubbers** in stock—if yours don't, fill out Coupon below.

The Romort Engine Cleaner

PRICE $3.00 Each

PATENTED



DESCRIPTION

The Romort Engine Cleaner is 20½ inches long by 4 inches in diameter, a convenient size for carrying in a car. Fluid capacity, two quarts (common coal oil preferred); this quantity is sufficient to clean the largest engine. Weight, 1¼ pounds. Construction is very simple, there being absolutely nothing to wear, or get out of order. Finish, black.

HOW TO OPERATE

Fill the tank as shown in the cut at letter "A," attach the cleaner to hose or air supply at letter "C," (standard connection will fit any air hose). Turn knurled rod at letter "B," which opens valve and lets fluid out at letter "E," fluid is forced out in a very strong spray, as shown by letter "F." **Light or heavy spray is regulated** by a slight turning of knurled rod "B." The packing nut, as designated by letter "D," may be easily detached and repacked if found necessary.

NO DANGER OF EXPLODING

As the air does not enter the tank, but passes right through, picking up the fluid at letter "E," there is absolutely no danger of the tank blowing up—this being impossible.

An accessory absolutely indispensable to automobile and motorcycle owners, chauffeurs, garage and repair shops. Sustains your car efficiency by keeping the machinery bright and new. Cleans the engine and machinery perfectly without the use of rags, **waste or brush. Designed for the special purpose of cleaning automobile and motorcycle engines and machinery, it is constructed with a long spout or point, so the operator may easily reach every nook and part of the machinery, an impossibility with the old method of rags and waste. The dirt and grease readily disappear before a strong spray, which works under a very low air pressure. Use an engine-driven or spark plug pump, garage storage systems or in fact any air pressure system from 10 pounds to 200 pounds. It cleans the machinery of your automobile or motorcycle just as readily and with the same result as one would hose off the outside of the car. The Romort Engine Cleaner, one quart of coal oil and five minutes of your time will do the work.**

For sale by all up to the minute Dealers or order direct - See Coupon attached.

ROMORT MANUFACTURING CO., Mfrs. of Romort Guaranteed Specialties, **1322-1326 Michigan Ave., Chicago, Ill., and 1810 Westlake Ave., Seattle, Wash.**

Fill in and mail this Coupon to our Chicago or Seattle address, your order will have our prompt attention.

ROMORT MANUFACTURING COMPANY
1322-1326 Michigan Ave., Chicago, Ill. **1810 Westlake Ave., Seattle, Wash**

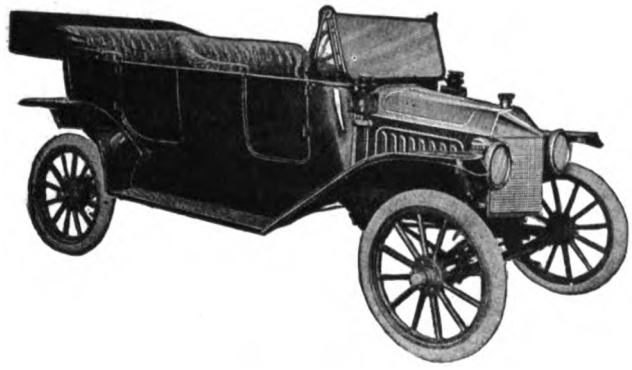
GENTLEMEN:—Inclosed find.....Dollars, for which please send me via post, mail or express, Prepaid

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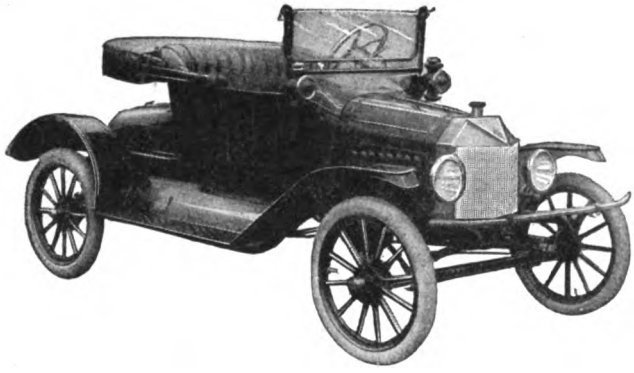
.....

NAME..... **ADDRESS**.....

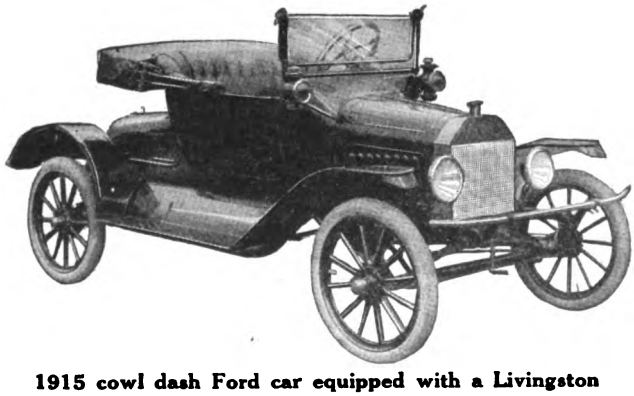
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1912-13-14 Ford car equipped with Livingston pointed front radiator and No. 1 streamline hood.



1915 cowl dash Ford car equipped with a Livingston V type radiator and No. 2 streamline hood.



1915 cowl dash Ford car equipped with a Livingston straight front radiator and No. 2 streamline hood.

Immediate Delivery

Livingston radiators are guaranteed to cool the Ford motor under any and all conditions.

Livingston hoods give the long streamline effect so much admired in cars of higher cost. Both add to the style of your Ford car by giving it longer lines, added beauty and individuality.

Livingston streamline Hoods are made in two types:

Type No. 1—Fits all Ford cars built in 1912-13-14 and up to February, 1915, and with this hood a "hood ledge" for the dash is included.

Type No. 2—Fits the new 1915 cowl dash Ford car. This hood fits around the curved cowl dash, and a "hood lug" for the top of the curved dash is included.

The 1915 car with the Livingston No. 2 hood attached, gives a perfect **streamline** from the top of the cowl dash to the front of the radiator.

Either hood is waterproof, preventing the water from reaching the motor.

The four "hood hooks" standard on the Ford car are used without changing their position.

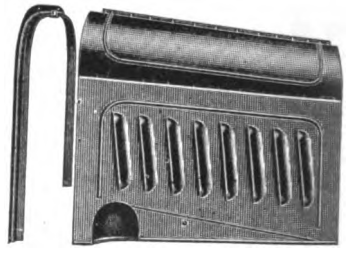
Either hood can be used with Livingston radiators or with the standard Ford radiator, and anyone who can handle a screwdriver can readily change hoods in fifteen minutes.



Pointed Front, $40.00
Including Extended Starting Crank.
German Silver, $5.00 Extra.
Water Capacity, 4½ Gals. Weight, 40 Lbs.
Shipping Weight, about 80 Lbs.



Straight Front, $35.00
German Silver, $5.00 Extra
Water Capacity, 2¾ Gals. Weight, 35 Lbs.
Shipping Weight, about 60 Lbs.



Streamline Hood, $8.00
Weight 14 Lbs.
Shipping Weight. 20 Lbs. Can be shipped by Parcel Post.

Ask Your Ford Dealer, Supply House, or Write Us.

LIVINGSTON RADIATOR & MFG. CO.

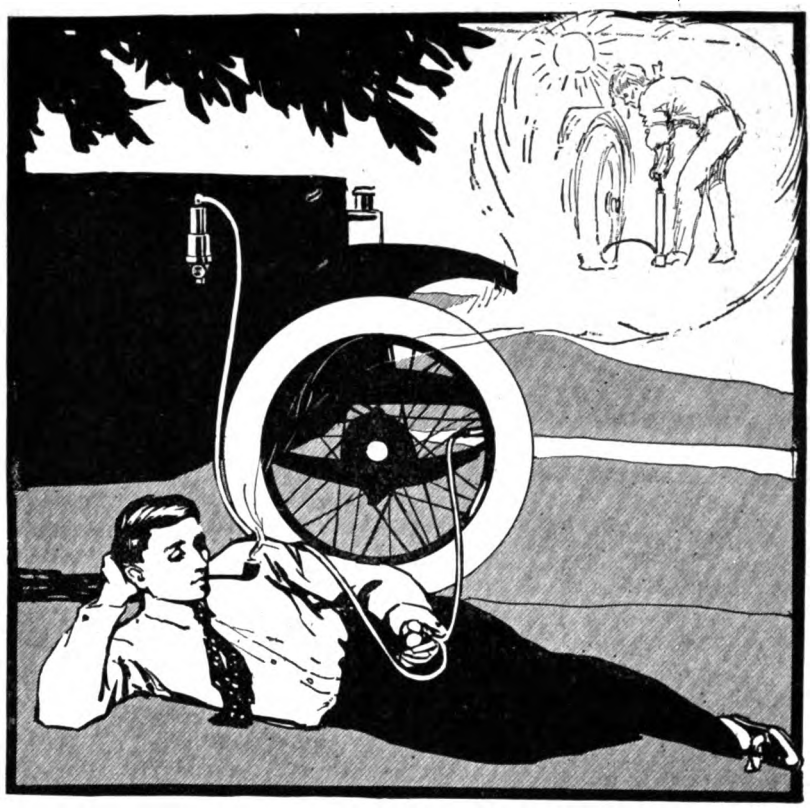
303 West 75th Street, New York, N. Y.

All types of Radiators built and repaired

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America's Pioneer Power Tire Pump

Send for Illustrated Pamphlet



Try One On Your Car For 30 Days

Send for Illustrated Pamphlet

Make Tire Pumping a P-L-E-A-S-U-R-E

There's a way to enjoy this summer's heat when a tire "goes flat." There's a way to laugh in the face of the hot sun, and make tire pumping—

A Recreation

—a chance for a quiet smoke, while a MAYO Spark Plug Pump and your motor, do the work.

MAYO SPARK PLUG PUMP

An Economy

—you can't afford to overlook. It costs much less than one ruined casing—and it can save many—while taking the place of backache-producing hand pump tussles.

The MAYO comes complete—**For $10**

—equipped with 12 ft. hose, gauge, and all connections. Pumps fresh, pure air only. Adapted to any car. Substituted instantly for any spark plug. Built with metal rings, like your motor—and lasts as long. You can test a MAYO—

On 30 Day Free Trial

$10

on your own car. MAYO Q. D. Spark Plug, $1.50 extra; MAYO Ford Pump, $8, complete; MAYO valve cap pump for permanent attachment to motor, $15, complete.



MAYO MFG. CO.

63 E. 18th Street Chicago

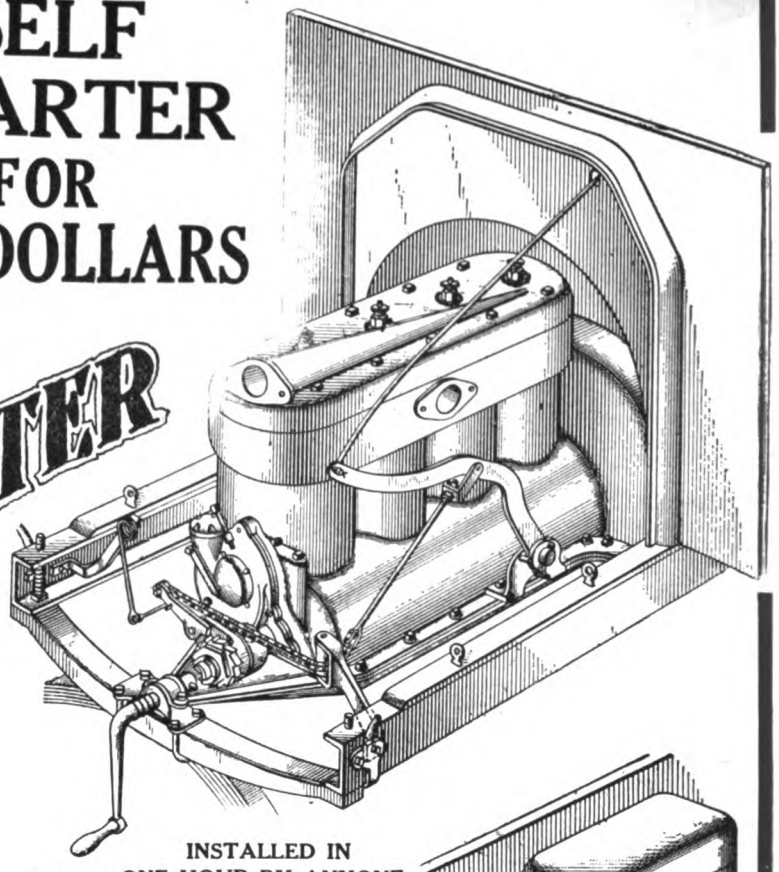
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$10

Think of it!

A SELF STARTER FOR 10 DOLLARS

The HUNTER



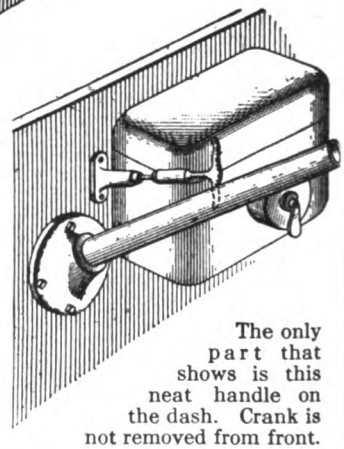
JUST WHAT THE FORD OWNER HAS BEEN LOOKING FOR

Complete with all attachments and instructions

At Last Mr. Ford Owner!

Your wish has come true. The best starter for a Ford car ever devised and costs less money. It gives you every convenience of the bigger, costlier cars (as you can use electric headlights on your magneto current).

INSTALLED IN ONE HOUR BY ANYONE



The only part that shows is this neat handle on the dash. Crank is not removed from front.

INCREASES THE VALUE OF A FORD THREE TIMES

Note the Advantages

Powerful—The straight pull and powerful leverage enable a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

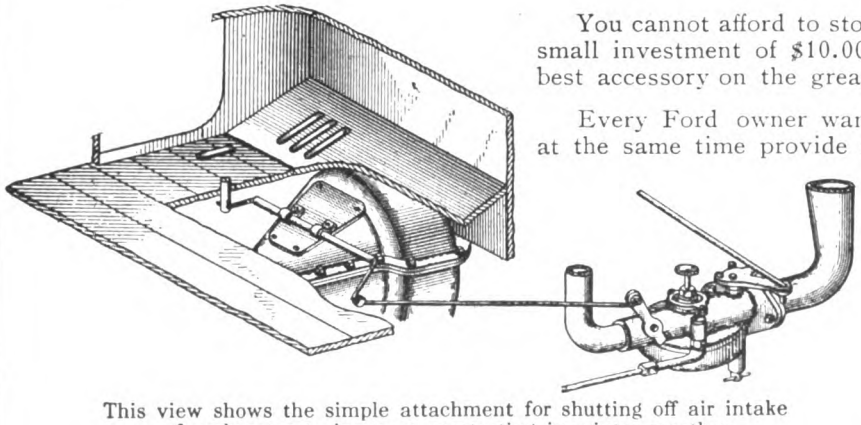
Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

You cannot afford to stop at the small investment of $10.00 for the best accessory on the greatest automobile on the market.

Every Ford owner wants to make his car up-to-date and at the same time provide for comfort.



This view shows the simple attachment for shutting off air intake of carburetor to insure easy starting in winter weather.

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS for FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. Price, $1.00. Quickly installed. Sold by leading dealers.

THE HUNTER AUTO SUPPLY CO.

4101-5 EAST RAVENSWOOD AVENUE CHICAGO, ILL.

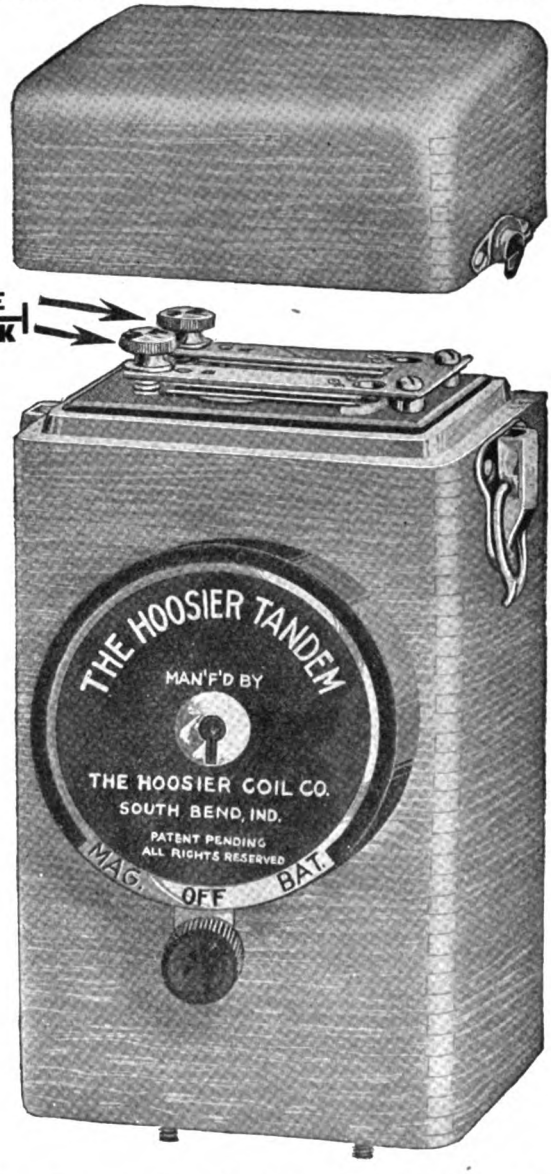
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A POSITIVE GUARANTY

THE STRONGEST EVER MADE

Guaranty

Every part of the Hoosier Tandem guaranteed absolutely for one year. This includes the contact points. Any necessary replacements will be made, free of charge, at the factory, the user paying simply the transportation charges.



HOOSIER TANDEM MASTER VIBRATOR

Dealers and Jobbers can now assure their customers of continuous satisfaction.

The Only Vibrator Which Cannot Stall The Car By Sticking.

The Hoosier Tandem has TWO PAIRS OF CONTACT POINTS—instead of one, as have all other vibrators.

Sticking points have always been the cause of vibrator troubles—of vibrator-equipped Ford cars stalling.

The heat produced by the sparking of the points is what makes single-point vibrators stick.

It's the tandem points that make the Hoosier different.

No other vibrator has them.

The kick switch has a removable key, preventing tampering with the car.

The case is solid mahogany, highly polished, 7 inches high, 4 inches wide and 3 inches deep.

The Hoosier Tandem points cannot heat to the sticking point—because they alternate the work of sparking. Neither operates long enough at a time to make sticking possible. The two sets of points are constantly automatically relieving each other under service.

Write us now, today, about your 1915 vibrator requirements. We have a proposition that means more vibrator sales and bigger profits to jobber, dealer and garageman.

If you dealer does not carry the Hoosier Tandem in stock, MR. FORD OWNER, order one direct from the factory. We guarantee it to you on a "money back" basis.

THE HOOSIER COIL COMPANY

118 EAST JEFFERSON BLVD., SOUTH BEND, IND.

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Champion

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"

What We Do

For Manufacturer, For Dealer, For Car Owner

For all three we make spark plugs that do the work and stand up under it.

We furnish Manufacturers with over 80% of all the spark plugs which goes into new American Made Motor Cars.

We furnish Car Owners with new Champions of identical efficiency, with which to replace the original Champions grown old in service.

We furnish dealers with a line of Spark Plugs unmatched for completeness.

We create and maintain for our product an insistent consumer demand by continuous, heavy advertising which is truly National in its scope.

We divide our profits with Dealers on an equitable basis in accordance with the service they render to us and to our consuming public.

And above all, by modern methods of quantity manufacturing, we keep the quality up and the costs and prices down.

A Special Word to Dealers

The only Spark Plugs on which the car owner is *already sold* is the Champion.

No customer ever yet refused to accept Champions—while most of them demand Champions.

If you keep your spark plug stock a clean Champion stock, there isn't a dead-piece or a sales-task in it.

If you ever have any complaint about a Champion Plug, settle it on the spot. Here's

Our Guarantee

We guarantee complete satisfaction to the user—free repair, replacement or money back.

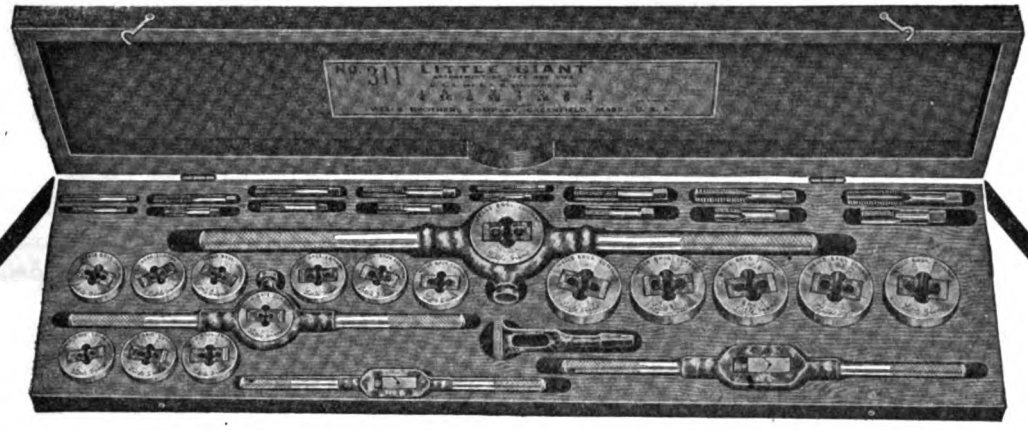
If we have not sent you our Profit Sharing Agreement, write for it today.

Champion Spark Plug Co.

2002 Upton Ave., Toledo, Ohio



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Little Giant **AUTOMOBILE SCREW PLATES**

GOOD WORK REQUIRES GOOD TOOLS

Now that the overhauling season is at full blast repairmen and garage owners need tools for cutting screw threads by hand and should have the best. Out of our large and varied list of assortments of taps and dies we want particularly to call your attention to the screw plates, one of which is illustrated above, called

Little Giant **COMBINATION ASSORTMENTS** (Containing both S. A. E. and United States Standard Threads.)

These assortments avoid the expense of buying a separate outfit for each thread standard and the expense of duplication of stocks and tap wrenches.

Little Giant **DIES CUT EASIER** Little Giant **DIES ARE MORE DURABLE**

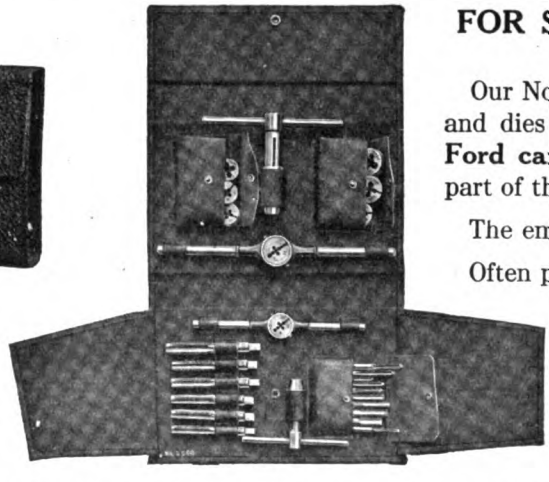
Impossible for them to tilt or get out of alignment. Increasing the working strain only tightens the grip of the collect upon the working parts of the dies. Send for circular, "Tools for the Automobile." A postal brings it.

WELLS BROTHERS COMPANY DIVISION

LIGHTNING **EMERGENCY REPAIR KIT**

FOR SCREW THREADS





Our No. 2500 assortment of taps and dies is designed especially for **Ford cars,** is equally useful as a part of the equipment of any car.

The embodiment of utility.

Often pays for itself on one job.

Genuine Goat Skin Leather, Canvas Lined Hardwood Case if desired

LIGHT, COMPACT DURABLE CONVENIENT

Has 16 taps, 16 dies, 2 stocks and 2 tap wrenches

Dealers will find a great demand for these sets and we are looking for live agents in every territory to handle them. Write for proposition today.

WILEY & RUSSELL MFG. COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

WELLS BROS. CO. DIVISION WILEY & RUSSELL MFG. CO. DIVISION A. J. SMART MFG. CO. DIVISION

SCREW CUTTING TOOLS AND MACHINERY

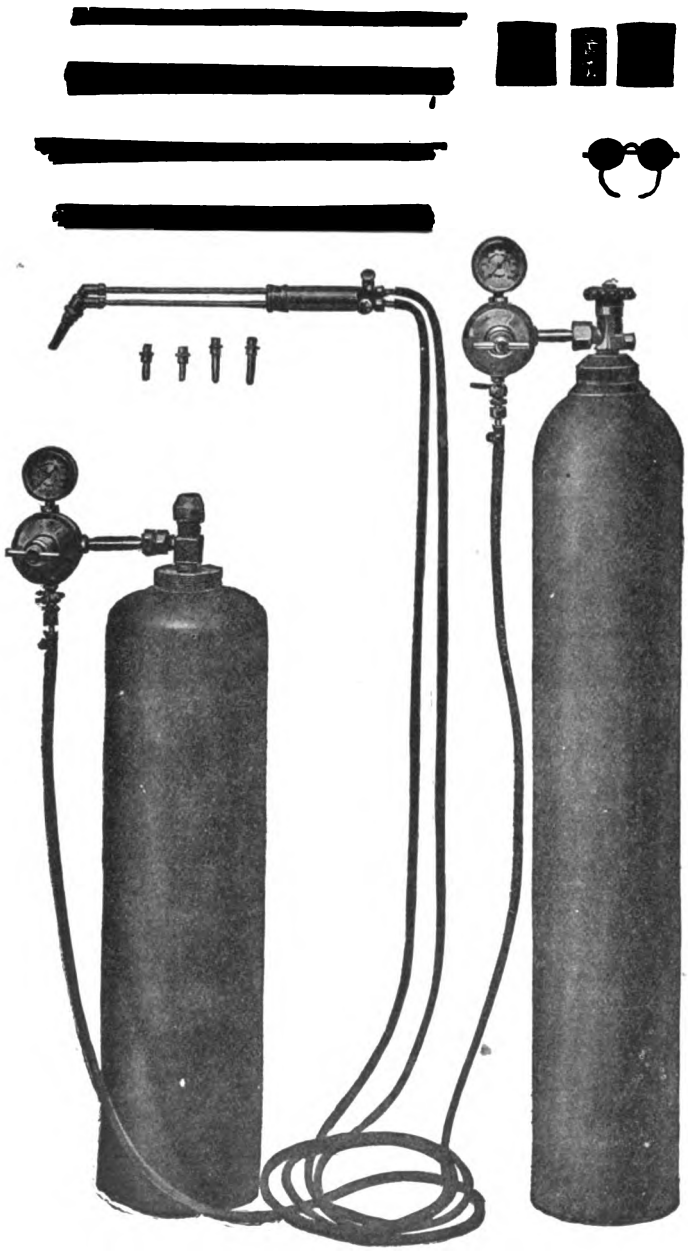
GREENFIELD, MASS.

New York 28 Warren St. Philadelphia—38 No. 6th St. Chicago 13 So. Clinton St.

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A BUSINESS FOR $42

Profits from the Trial Period will pay for it



FREE TRIAL OFFER

If at the end of two weeks' trial in your shop, you decide you do not want the outfit, ship it back to us and we will refund your money IN FULL. No strings to this offer. Not necessary to give any reasons.

COMPLETE WATERHOUSE WELDING OUTFIT $42

Waterhouse Outfit

	Value
1 B Welding Torch with 5 tips	$17.00
1 Oxygen Reducing Valve with 50 lb. line pressure gauge	10.25
1 Acetylene Reducing Valve with 50 lb. line pressure gauge	11.00
1 Set of Special Welding Hose (20 ft.)	3.00
1 Pair of Welding Glasses	.75
1 Carbon Burning Torch	Free
1 Set Instructions	Free
Net Cost Complete - - -	**$42.00**

Rods and Fluxes $4.50

What you get

1 Bottle Aluminum Flux
1 Can Cast Iron Flux
1 Can Copper and Brass Flux
2 Pounds Brass Welding Rods
5 Pounds Cast Iron Welding Rods
2 Pounds Aluminum Welding Rods
2 Pounds of Steel Welding Rods.

With a Waterhouse Welding Outfit, you can do work that no other concern can do unless it has a Waterhouse Welding Outfit. Can be efficiently operated by any intelligent mechanic.

Economy of time, metal, labor and machine and hand work after the welding process.

No aditional space or equipment is required. Needs but a small space to successfully operate on the largest work. Can be placed in a corner or carried anywhere.

Economical because there is no waste of time or fuel—the torch will not flash—it can be used all the time it is needed, absolutely safe.

With every Waterhouse Welding Outfit is given a free carbon-burning torch with which carbon can be removed from the cylinders of any car—an incidental but a substantial source of profit.

If you have a regulator for carbon burning, the oxygen regulator usually sent with the outfit is unnecessary, and a deduction of the price ($10.25) can be made from the price of the outfit quoted.

TERMS: 5% cash discount with order or C. O. D., or $20 cash with order, balance in two payments, first of $12 in 30 days, $10 in 60 days after receipt of outfit by you.

Practical instructions furnished free with every Waterhouse Outfit. These instructions deal with the treatment and repair of all kinds of metal. Be the first owner of a Waterhouse Welding Outfit in your community.

If you do not have at your service a welding shop, we will undertake to make repairs and restoration for prices that will be much less than the cost of new parts.

WATERHOUSE WELDING COMPANY

16 PELHAM STREET, BOSTON, MASS.

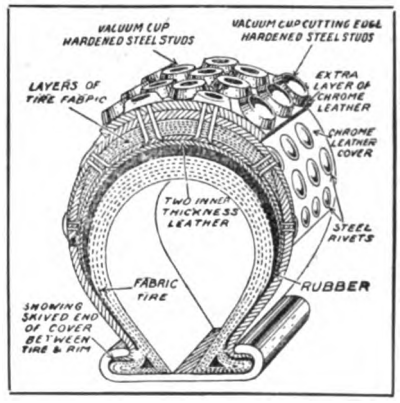
Established 1908 **Welding and Cutting Equipment Exclusively**

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10,000 MILES GUARANTEE BACKS THIS TIRE



TRY Brictson Pneumatic Tires at our expense. Don't pay until you are satisfied. At our risk find out for yourself what wonderful service Brictson Tires give—how resilient and easy riding they are. Get rid of punctures, blowouts and rim cuts. Brictson Tires are rut proof, oil proof and gasoline proof. They are sold under a specific 10,000 mile written service guarantee.



Read What One User Says

"Several months before beginning my trip from Detroit, Mich., to Detroit, Fla., I thoroughly investigated tires of several well advertised kinds. I finally decided for my trip that the Brictson was the most economical and durable tire that I could find.

I am daily asked if I have many punctures. I reply that I do not know what a puncture is. I am driving on all kinds of roads under all kinds of conditions and never have a thing to worry about.

I have been on the road since the 8th day of last October, and if all goes well will begin my Florida trip again about October 1st next. I consider the tires worth almost their weight in gold. I would not do without them at twice the price.

W. J. BREWSTER,
August 10, 1914. 236 Jefferson Avenue, Detroit, Mich."

Your Tires Rebuilt the Brictson Way

If the fabric in the tires you are now using is in good condition, we can take them, make them proof against rim-cutting, punctures, blowouts, side-wall breaks, skidding, ruts, oil, and give thousands of miles of additional service.

Sign and send back coupon for full information and details of our liberal Free Trial Plan.

THE BRICTSON MFG. CO.

155 BRICTSON BLDG., BROOKINGS, SO. DAKOTA

Mail Back This Coupon

Brictson Mfg. Co.,
155 Brictson Bldg.,
Brookings, So. Dak.

Please send me full particulars about Brictson Tires, explain your free trial plan, also explain how my own tires can be rebuilt the Brictson Way.

Size of Tires.....

Name.....

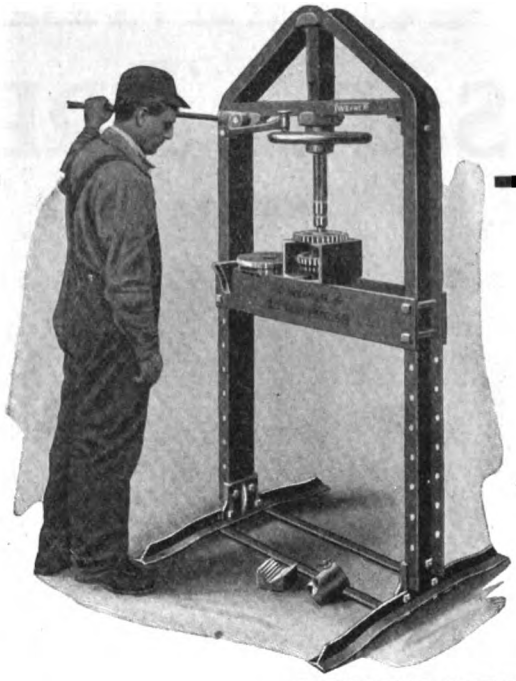
Address.....

Digitized by Google

$48.00 Will Earn $100.00

in three months if invested in a

WEAVER Garage Press



HUNDREDS of these Presses in Garage service have more than paid for themselves in thirty days—so why should YOU continue to throw money away by depriving yourself of this money-making equipment?

Every time you use a sledge to straighten an axle or shaft,—to force a gear or ball race or hub, you lose money in labor and time, to say nothing of the parts which you injure and are compelled to replace.

LEVERAGE 1500 to 1

The lever construction on this Press provides a leverage of over 1500 to 1, so that one man can develop a pressure of 20-tons with very little effort.



DESIGNED FOR GARAGE WORK

Crank shafts and similar bulky pieces can be very readily handled with this Press by reason of the divided bolster, as shown herewith. The bolster may also be adjusted to the extreme bottom of the frame, giving a capacity of 48 inches between it and the screw.

The frame of the Press is 32 inches in width, allowing it to receive the largest automobile wheels for pressing out hubs, bearings, etc.



VISE-BLOCK ATTACHMENT

A "vise-block" is provided which operates between the screw and bolster for the purpose of holding axles, shafts, etc., against a twisting strain.

CONSTRUCTION

The frame is one piece of heavy channel steel; the hand wheel is 15 inches in diameter and the weight of the wheel and screw is carried upon ball bearings. The hand lever has a leverage of over 1500 to 1. The thrust of the screws is directed against heavy Bronze Thrust Bearings. The screw is 2 inches in diameter with 3-pitch Acme thread, and has a range of movement of 12 inches. **The Screw Does Not Revolve.**

The bolster which carries the plate can be set at any desired height with extreme adjustment of 48 inches. The width between frame uprights is 32 inches, height 74 inches, floor space 36x36 inches, weight 425 pounds.

Net Price, Complete with Equipment $48.00

WEAVER Auto Ambulance

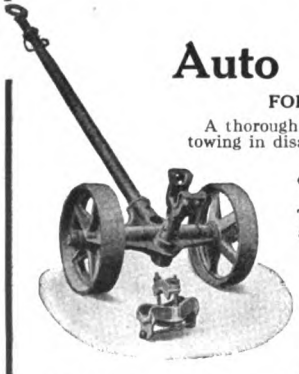
FOR CRIPPLED CARS

A thoroughly substantial and practical device for towing in disabled cars.

Strong, compact, comparatively light, enables one man to do the work of three.

Roller Bearing Cast Steel Wheels; Telescoping steel tongue; 1¼ inch steel axle; full range of adjustment.

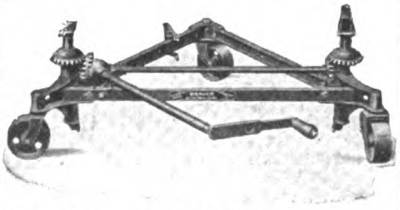
LIST PRICE, $30.00



WEAVER Auto Twin-Jacks

The one piece of equipment which enables one man to manipulate a car upon the floor in any desired manner.

Ball and roller bearing casters and lifting mechanism will handle extremely heavy loads with ease.

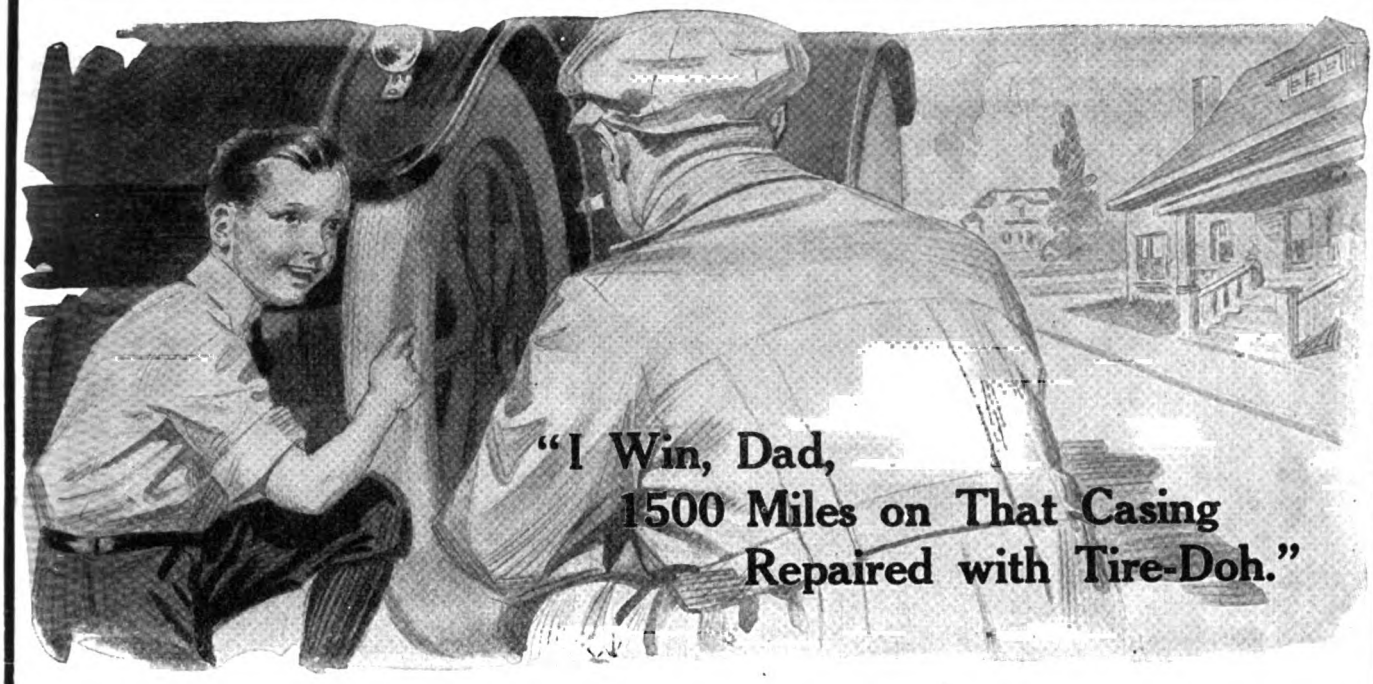


EXTRA HEAVY (Capacity 8000 lbs.)
PER SET (Two)..... $36.00 Singly..... $20.00
REGULAR TYPE (Capacity 4000 lbs.)
PER SET (Two)..... $20.00 Singly..... $12.00

WEAVER MANUFACTURING CO.

2175-79 SOUTH NINTH STREET, SPRINGFIELD, MASS.

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It's the cuts and holes in casings you must watch and repair, if you want the mileage you are entitled to out of your tires.

TIRE-DOH

is the best and easiest-to-use repair made for sealing up casing cuts and holes. It keeps out the water and dirt that rot and wreck the fabric. It is a marvel not only for preventing casing blowouts, but also for repairing them after they occur.

Anyone can easily repair damaged casings with Tire-Doh, and a repair thus made is good for hundreds of miles—for Tire-Doh after setting becomes as tough as the tire itself, and lasts—for

TIRE-DOH REPAIRS ARE PERMANENT REPAIRS

On account of its plasticity, Tire-Doh can be used to make repairs that are inaccessible to other repair methods.

Tire-Doh is particularly effective for repairing all inner-tube punctures and blowouts. It repairs easily and permanently the pin-point hole, or the tear as long as your arm—does it without heat or tools—anywhere—on the road or in the garage—and any time. The average inner-tube puncture repaired with Tire-Doh costs less than 2 cents.

WE MANUFACTURE
18 Other Tire-Doh Products
All As Good As TIRE-DOH

Silver Quick
Stop That Radiator Leaking
Day Tire Valve
Nomore Rust Rim Paint
Blac-Namel
Sunshine Metal Polish
Everwear Nickel Polish
Metal-Lac
Renew-O Leather Dressing
No-Leak Top Dressing
X-Ray Top Dressing
Nu-Stain Top Lining Dye
Preserv-O Tire Paint
Destroy-O Carbon Remover
Sta-On Engine Paint
See-Kleer
Chemico Blowout Patch
Body Gloss

Buy a Tire-Doh outfit today. Try it and you will understand why we guarantee it. Tire-Doh also mends other rubber articles—rubber boots, gloves, hot water bags, etc.

AT YOUR DEALER'S OR DIRECT FROM US, $1.00

DEALERS: Tire-Doh does the work—it sells—it repeats—it is advertised. All jobbers who handle automobile supplies sell Tire-Doh.

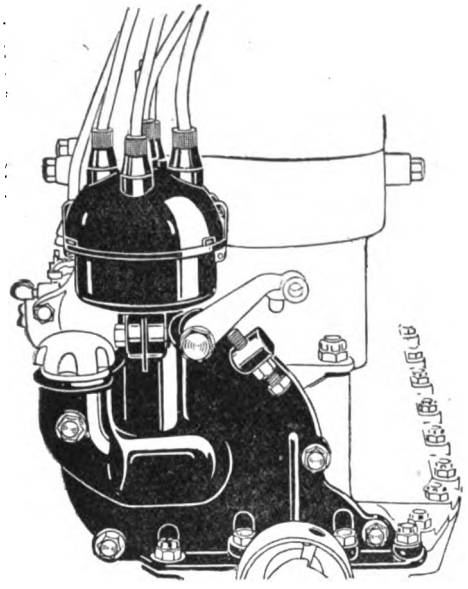
ATLAS AUTO SUPPLY CO.
3205 W. LAKE STREET, CHICAGO



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Atwater Kent

for Fords



During the last two years there has been a very rapid change by car manufacturers from the magneto type of ignition to the Atwater Kent System.

One-quarter of all 1915 "Made-in-U. S. A." cars (exclusive of Fords) will be Atwater Kent-equipped. Tens of thousands of Ford owners, by following the example of a hundred thousand enthusiastic Atwater Kent users, will discover for the first time the flexibility, power, speed and economy of which their motors are capable.

The Ford motor not only starts more easily, idles much more slowly and quietly and pulls harder and longer at all speeds, but its performance is better at every point of running. Gasoline economy is improved at least ten per cent., less carbon is deposited and acceleration is far more rapid.

The control of the spark is automatic, giving a positive retard for starting and advancing the time automatically and accurately to suit all running speeds.

The Atwater Kent System produces a single hot spark, timed with perfect synchronism and absolutely uniform, no matter whether the motor is being cranked or is running at top speed. A push button on the coil produces an extra hot, flame-like spark for starting "on compression."

Atwater Kent Ignition does not belong to the host of low-priced Ford "specialties"; it is unquestionably the best ignition equipment that money can buy, whether for a Ford or a Packard.

Become familiar with the famous Atwater Kent principle by sending for and reading the interesting descriptive booklet written especially for Ford owners, and then demand that your dealer show you the real Atwater Kent System.

TO DEALERS:

Every Atwater Kent Ford System which you sell adds another enthusiastic customer to your list. Atwater Kent Ignition is well and favorably known throughout the entire automobile field and is widely advertised in leading publications. Over five thousand well-known and prosperous dealers, jobbers and repair men throughout the country are specializing on Atwater Kent equipment. Are you getting your share of this business? Write today for the interesting and attractive booklet telling about the Ford System.

SOME REPRESENTATIVE ATWATER KENT USERS

Chalmers	Hupmobile	Monarch	Scripps-Booth
Davis Mfg. Co.	Imperial	Peerless	Sterling Motor Co.
Herff-Brooks	King	Pratt	Thomas
Enger	Massnick-Phipps	Regal	Velie
Grant	Meteor	Saxon	Vixen

Atwater Kent Mfg. Works

PHILADELPHIA, PA.

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"Just Like a Mirror!"



JOHNSON'S PREPARED WAX

is the standard polish for body, hood and fenders. It is quite **different from** the many liquid polishes on the market—most of **which contain acid or oil, and if they do not actually injure the finish—at least remain on the surface sticky and tacky—gathering every bit of dust.**

Johnson's Prepared Wax is not a new product—it has been on the market for twenty-five years. It is used every day in thousands of homes for polishing pianos, fine furniture, woodwork and floors. Our cherished reputation stands back of Johnson's Prepared Wax.



Send us the attached coupon together with 10c and we will forward postpaid a can of Johnson's Prepared Wax—sufficient for one application on a large car.

Agents wanted to sell Johnson's Prepared Wax.

S. C. JOHNSON & SON
"The Wood Finishing Authorities"
RACINE, WIS.

Johnson's Prepared Wax **cleans, polishes** and **finishes** in one operation. It preserves the varnish and protects it from the weather. It is in paste form—clean and easy to use and economical.

Does Not Gather Dust

Johnson's Prepared Wax gives a perfectly **hard, dry, glasslike** finish that cannot collect dust. It forms a thin, protecting film over the varnish—prevents checking and cracking and

"Sheds Water Like a Duck's Back"

It keeps **new cars** bright and good looking for an indefinite time—and will make **old cars** look as well as a coat of paint and varnish. Mud spots can be easily and entirely removed from cars which have been polished with Johnson's Prepared Wax. It imparts a velvety, protecting finish of great beauty and durability. It is impervious to dust, water, scratches, finger prints, etc.

1 pint by Parcel Post 60c—enough for a season's use.

I enclose 10c for a can of Johnson's Prepared Wax—sufficient for one coat on a large car.

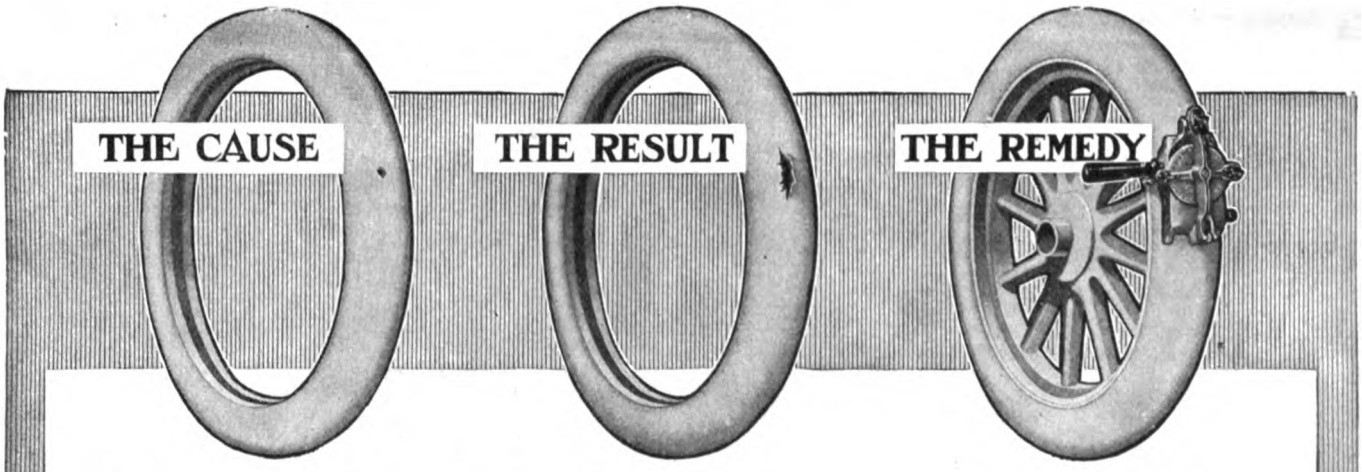
Name.....

Address.....

City & State.....

My Accessory Dealer is..... A D

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Stop the Hole—Save the Tire

Like a "stitch in time saves nine" so vulcanizing the small hole saves the blow-out later on.

These small holes when neglected expose the fabric. Sand blisters form. Water and moisture ooze through and rot the fabric. Then comes the blow-out—a big repair bill and usually a ruined tire. Stop this needless trouble and expense.

You can save your tires, save repair bills, increase your mileage and prevent tire trouble by vulcanizing the smal cuts and holes with a Shaler Vulcanizer You can keep your tires in perfect condition all the time.

SHALER Vulcanizers

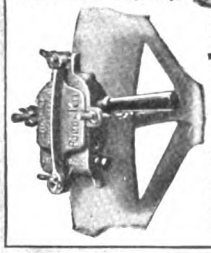
Increase Your Mileage—Save Repair Bills—Prevent Roadside Delay

SHALER

Tube-Kit $2.00

Does away with temporary patches for repairing tubes. Can be carried in the tool box for roadside repairs or can be used indoors. Is free from soot and smoke and the fuel cannot spill and flare up. Handle is detachable. Complete $2





SHALER

Ford-Kit $2.75
For Ford Tubes and Casings

This model, designed especially to fit Ford tires, makes every practicable tube and casing repair. Safe, simple, clean—no exposed blaze

will repair any puncture, rip, cut, tear or hole in casing or tube in a few minutes and make the repair the strongest part of the tire.

The Shaler is simple and easy to use. Anyone who can drive a car can easily and quickly vulcanize any tire with a Shaler. It requires no watching or regulating. You do not have to fear overcuriug or undercuring the rubber. The Shaler has an **automatic heat control** which provides the exact heat for perfect vulcanization—no more—no less. Shaler vulcanizers are standard. Their principle is correct.

We are the world's largest makers of vulcanizers and make a complete line for every need, in every type—Alcohol—Gasoline—Steam or Electric. We make small portable outfits for tourists—Tube Kit, $2.00, (for vulcanizing tubes), Ford-Kit, $2.75, (for Ford owners), Vul-Kit, $3.50, (To carry in tool box for roadside repairs to tubes and casings), Model D, $12.50, (Electric outfit for private garages) and Garage Outfit at $60.

Get This Book Free
"Care and Repair of Tires"

"Care and Repair of Tires" tells the proper inflation you should maintain in your tires according to weight, load and seasons. It describes fully how to protect the tires while car is idle in the garage—how to care for them in winter and extreme hot weather—how to avoid substances that rot the rubber and fabric. It gives splendid hints on the spare tire and its care—how to carry extra tubes. It is really a text book on the care of automobile tires. It also describes each Shaler Model in detail and explains how it operates.

To Dealers—Garages and Repair Shops

Garages can add $20 or more a day to their profits vulcanizing tires with Shaler Vulcanizers. Accessory dealers can greatly increase their sales and profits selling portable Shaler Vulcanizers to motorists. Every repair shop should have the Shaler Garage Outfit. Every accessory dealer should stock the tourist Shalers. Use the coupon today. Get our interesting proposition and read our free book "Common Sense About Tire Repairs" (for dealers only).

C. A. SHALER CO., 804 Fourth St., Waupun, Wis.

Canadian Distributors—JOHN MILLEN & SON, Limited
Toronto, Winnipeg, Montreal, Vancouver

SHALER

Vul-Kit $3.50



Fits Any Size Casing or Tube

Can be carried in the tool box. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. You can't overcure or undercure a repair. Handle always cool. Complete, $3.50.

Dealers—Garage Coupon

C. A. Shaler Co., 804 Fourth St.
Waupun, Wis.

Send me catalog, dealers' terms and free book, "Common Sense About Tire Repairs" (for dealers and garages only.)

Name.....
Street.....
City.....State.....
Do you sell accessories?.....
Have you a repair department?.....
Jobber's name.....

Car Owner's Coupon

C. A. Shaler Co. 804 Fourth St.
Waupun, Wis.

Send me your free book "Care and Repair of Tires" and catalog of Shaler Vulcanizers.

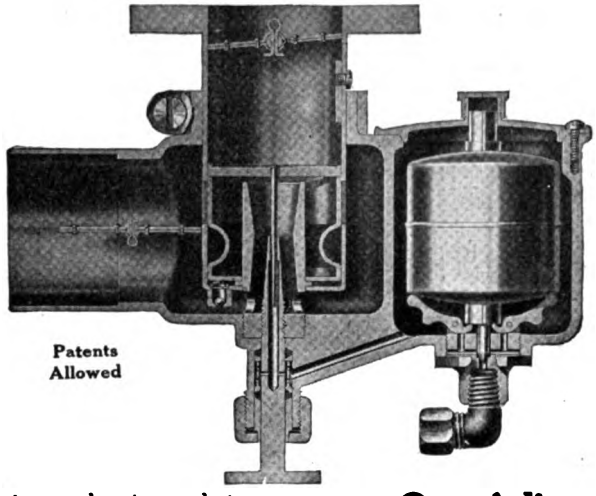
Name.....
Street.....
City.....State.....
From whom do you buy your Auto Supplies?
.....

DEALERS: This full page advertisement appears in May 15th issue of Saturday Evening Post.

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ANNOUNCING
The New FORD Model

Brad-Kent Carburetor



Patents Allowed

The *Brad-Kent* is the most efficient carburetor made today. Every test has proved its superiority to all other types—in ease of adjustment, quick starting, power, speed and economy of fuel.

And now we announce the new FORD Model. Where others promise—we guarantee. Every *Brad-Kent* Carburetor is guaranteed to live up to the statements made in our advertising matter. Prove it on your own car at our risk.

Adds 5 Extra H. P.

No matter what your present carburetor—we guarantee the *Brad-Kent* to increase the available power of your engine by at least 5 h. p.

It makes a quicker get-away, climbs hills more easily, and carries you through the hard places that stop you now.

And this extra power costs you nothing.

Gives 10 Miles Extra Speed

The *Brad-Kent* will get greater speed out of your Ford motor than any other known carburetor. This we guarantee and your speedometer will prove it. You may not need this extra speed often—but it's there when you want to use it.

And this extra speed costs you nothing.

Saves 2 Gallons Out of Every 5

Replace your present carburetor with a *Brad-Kent* and we guarantee that it will take you as far and as fast on three gallons of gasoline as you formerly traveled on five gallons.

In a recent official test conducted by Mr. F. E. Edwards, Official Observer for the Chicago Automobile Club—a fully equipped Model T Ford was driven over country roads for 102.1 miles—at an average gasoline consumption of *1 gallon for 33.12 miles.*

THE FROST MFG. CO., Kenosha, Wis.



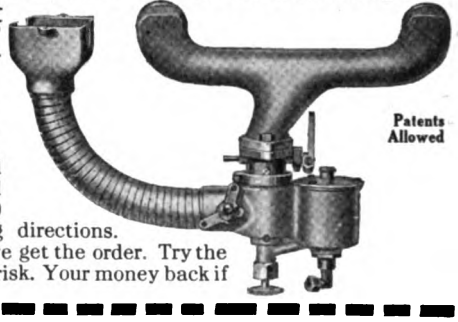
One Adjustment Only

The advantages we guarantee are far below best actual records for *Brad-Kent* Carburetors. You run no risk of disappointment, because our sweeping guarantee is backed by ample resources and responsibility. We refer you to Dun, Bradstreet, or any banker. And we run no risk in making this guarantee, because we know that the *Brad-Kent* is without an equal.

It is the only truly efficient and reliable carburetor having but a single adjustment. Much lighter and less complicated than other good carburetors. Built on an entirely new principle. Easiest to start in cold weather. But results count. And the *Brad-Kent* is guaranteed to give results.

30 Days Free Trial

The special Ford Outfit includes the carburetor, manifold, hot air tube and stove. It fits any Ford car and can be easily installed. The special introductory price for this complete outfit is but $12.50—money back if not satisfied. *$15.00 after June 1st.* For this small investment you get at least *5 extra h. p.*, at least *10 miles more speed*, and a saving of *2 gallons of gasoline out of every 5 that you now buy.*



Patents Allowed

Try It On Your Car

Mail the attached 30-Day Approval Blank with $12.50 and your shipping directions. We'll ship the day we get the order. Try the *Brad-Kent* at our risk. Your money back if you return it for any reason within 30 days. Get our interesting booklet. **Dealers:** Write for special proposition, prices and a sample *Brad-Kent* Ford Outfit on 30 days approval.

30-Day Approval Blank

THE FROST MFG. CO., Dept. 12, Kenosha, Wis.

Enclosed find Personal Check or Money Order for $12.50 for which please ship me a *Brad-Kent* Carburetor and complete outfit for a Ford car. My repair dealer is

.....

Ship to.....

Address .....

.....

I understand that I may return these goods to you within 30 days, at your expense, and get my money back if I wish to do so. (1)

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STA-TITE

THE RING *that holds the* KEY

to your MOTOR TROUBLES

DOES YOUR MOTOR LACK POWER?
Increase by using ☞

DOES YOUR MOTOR LOSE COMPRESSION?
Prevent by using ☞

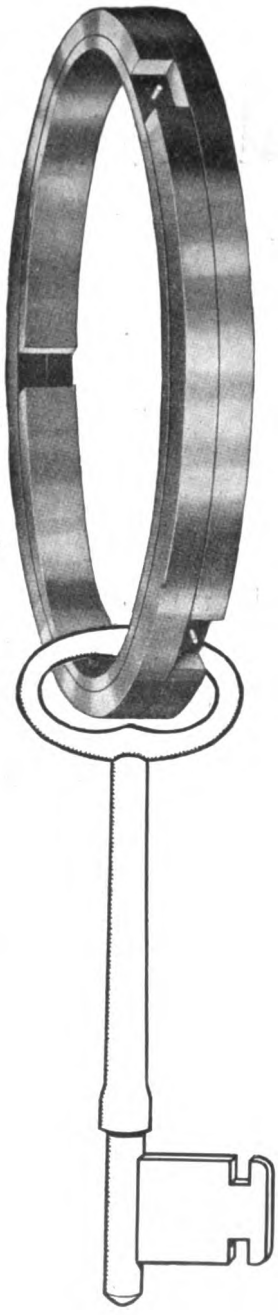
DOES YOUR MOTOR USE TOO MUCH GAS?
Decrease by using ☞

DOES YOUR MOTOR WASTE OIL?
Save by using ☞

DOES YOUR MOTOR SMOKE?
Stop by using ☞

DOES YOUR MOTOR FORM EXCESSIVE CARBON?
Eliminate by using ☞

DOES YOUR MOTOR FOUL ITS SPARK PLUGS?
Correct by using ☞



Liberate yourself from these troubles
We have given you the KEY

STA-TITE
The Eternally Tight Ring

THE PISTON RING COMPANY

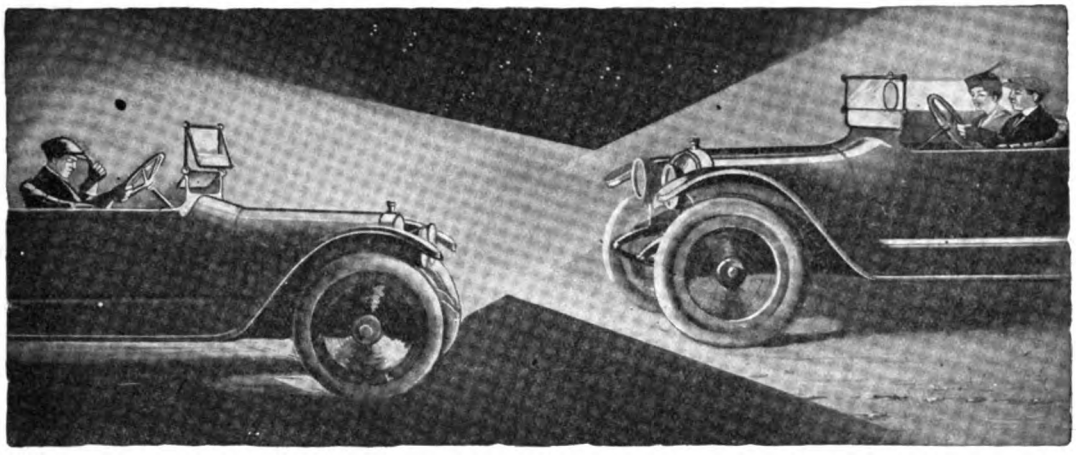
Specialists in Piston Rings

MUSKEGON, MICHIGAN

If not to be had from your dealer, write us direct

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THE STAUDE GLARE STOPPER



Without the Staude Glare Stopper—driving ahead in the glare like a blind man.

Protected by the amber glass of the Staude Glare Stopper—this driver sees exactly where he is going.

THE Staude Glare Stopper consists of a disk of pure amber glass, easily attached to the windshield of any make of car. It protects the eyes of the driver from bright and blinding lights, both by day and by night.

You may be able to sell dimmers for headlights where the law demands them, but the Staude Glare Stopper corrects the trouble at the right end, protecting the driver rather than reducing the light. You will find that the Staude is the only real practical solution of the danger from night driving.

The Staude Glare Stopper has been used in different experimental forms in the Twin Cities for over a year. This new model is the permanent development of experience.

The Staude can be adjusted to any make of windshield and clamped at the top or side for either a right or a left hand drive. It is easy to place, fits snug, and looks trim.

A specially designed joint in the arm allows the Staude to be kept perpendicular at all times without regard to the angle of the windshield. The heavy amber colored crystal lens glass is 6⅞ inches in diameter and is specially ground and polished.



(Patent Applied For)

The Staude Glare Stopper

The nickel plated clamp will fit on the windshield of any make of car. The heavy clear amber-colored crystal lens glass, 6⅞ inches in diameter, dissects the light rays and makes driving at night a constant pleasure instead of a constant fear

Retail Price

$2.50

THE Staude is sold on an absolute money-back guarantee. Every dealer is instructed to refund the full purchase price to anyone who, after using it, does not agree that it does everything we claim for it.

The Staude looks like a $5.00 automobile accessory. But, as we believe, within a short time no driver will any more think of doing without a Staude than he would doing without a horn, we have placed the retail price at $2.50 and still allow a liberal margin of profit both for dealers and jobbers buying in large quantities.

As the Staude is such a noticeable and distinctive part of a car, to be the first to introduce it in your city will be one of the best advertisements you can have. Everyone is talking about the Staude. We are planning an extensive consumer advertising campaign.

Write us today for prices.

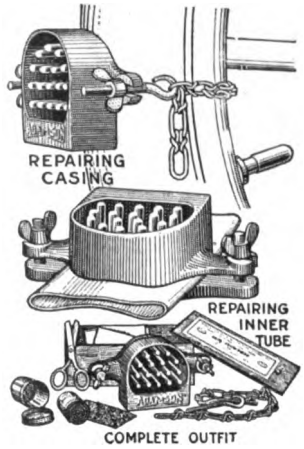
E. G. STAUDE MANUFACTURING CO.

Automobile Accessory Department A

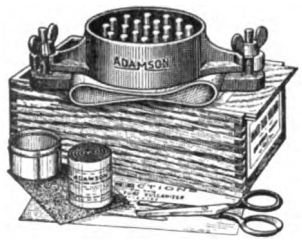
ST. PAUL, MINN.

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ADAMSON
VULCANIZERS



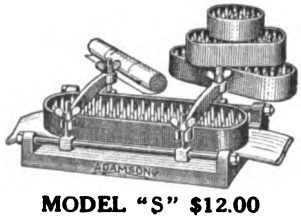
MODEL "U" $3.00



MODEL "T" $2.00



MODEL "M" $1.50



MODEL "S" $12.00

90% of tire troubles are saved by the use of an ADAMSON VULCANIZER "in time". The use is a simple process. No steam or electricity --no watching or regulating--it's automatic.

The simplicity of Adamson Vulcanizers and their very low cost, added to the INSTANTLY SATISFACTORY results secured from their use, has gained for the entire line a tremendous popularity. This, however, has only begun. Travel during 1915 will be the greatest ever! People will explore their own country. More than ever will they CONSIDER a practical Vulcanizing outfit---for the motorist wants to make repairs **"on the spot"**. That's why the ADAMSON is necessary. It makes instant repairs, regardless of where he may be, without trouble or danger, and at trifling expense. A quick, slick, permanent job---VULCANIZED, not "patched".

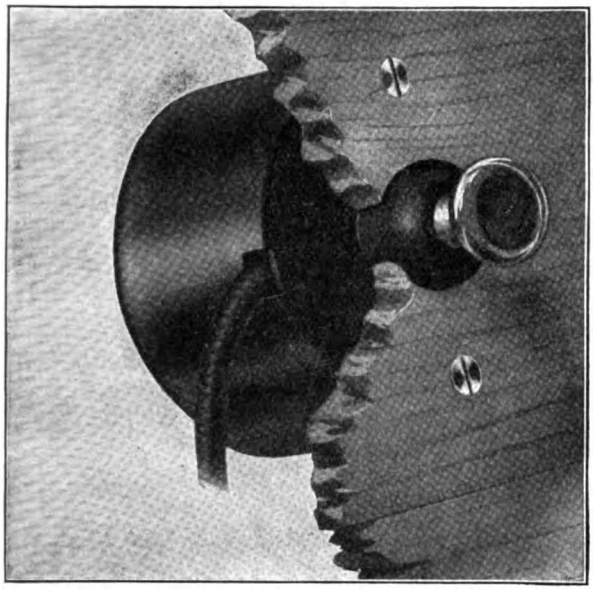
The ADAMSON is not an experiment, but the most extensively used Vulcanizer today. Over half a million motorists carry it in their tool kits---and they wouldn't think of starting a trip without it. It is, however, a distinctive Vulcanizer,---unlike all others and protected by patents. It is so simple, practical, certain in its operation that nothing equals it. And its price! It's so low that a motorist can't find an excuse for not buying it. It's the cheapest tire insurance obtainable.

There's a big opportunity for you to make good profits right **now** selling the ADAMSON. Its low price, great reputation and many advantages make sales come easy. Better start today.

ADAMSON MANUFACTURING COMPANY

Hamilton, Ont., Canada **East Palestine, Ohio**

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Dimmer attached to footboard

Dim Your Lights with a Touch of Your Foot

The H.P.B. Kick-Over Dimmer

The H. P. B. KICK-OVER is a switch, which when attached to the floorboard, footboard, or dash of your automobile will dim your headlights or change from headlights to sidelights by a slight pressure of your foot on the protruding knob. Kick the knob again and the headlights are on with their full power.

Why lean over and fumble for a lever or push button every time you want to dim you headlights? *Use your idle left foot.* The H. P. B. is simple and compact, and can easily be attached to *any* electrically lighted car with about one hour's work.

Dealers:—Write to the manufacturer for local advertising proposition.

Retail Price, $2.00

The H. P. B. ELECTRIC CO., Inc.

Bristol Bldg., Fifth Avenue and 42nd St., New York

WHOLESALE DISTRIBUTORS

Western

CHANSLOR & LYON
San Francisco and Los Angeles

FERRIS-DUNLAP AUTO SUPPLY CO.
Dallas, Texas

MOTOR & MACHINISTS SUPPLY CO.
Kansas City, Mo.

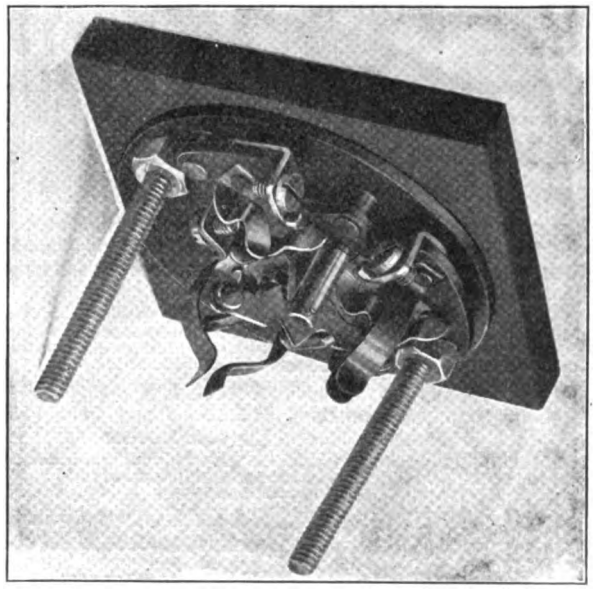
CENTRAL AUTO SUPPLY CO.
Des Moines, Iowa

OMAHA RUBBER CO
Omaha, Nebraska

Eastern

Manufacturers' Distributing Co. of America
New York

Showing strong phosphor bronze mechanism



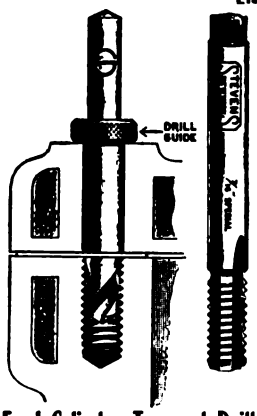
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FOR HIGH GRADE REPAIR WORK



The **Stevens Duplex Reamer** for Ford Steering Arm and Body Bushings Nos. 2713-2714. The spiral flutes will not catch in split bushings. Two high-grade tools conveniently combined at but little more than the cost of one.

List Price—$2.00

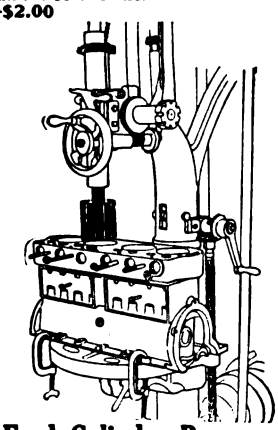


Ford Cylinder Tap and Drill Set

For removing broken cylinder head and water connection bolts in Ford cylinders. This outfit simplifies a very difficult job.

Set complete, consisting of special Drill Guide, Drill and Tap.

List Price—$1.00



Ford Cylinder Reamer

A new STEVENS REAMER for fitting 1/32" oversize Ford pistons. Can be used in any ordinary drill press and turns out a job as satisfactory as the factory.

List Price—$16.00

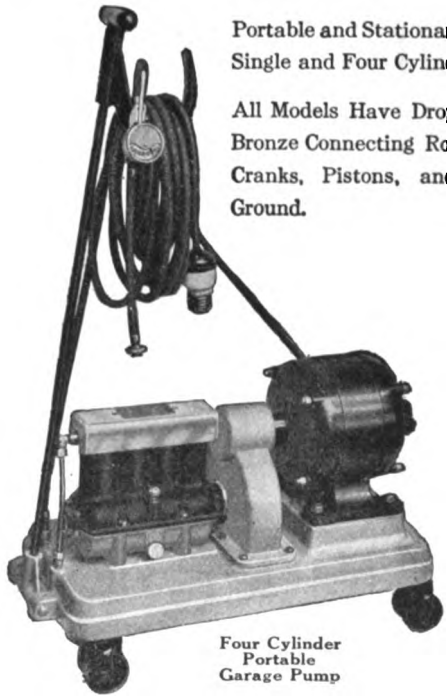


We can furnish a complete line of Plain and Expanding Reamers. Special sizes have Ford Bushing numbers and dimensions on shank. Also complete line of Tools, Taps, Dies, Piston Rings, Gaskets and Repair Parts.

Catalogue on Request.

STEVENS & CO. *The Name with a Guarantee Behind It* **375 BROADWAY, NEW YORK, N. Y.**

LIPMAN
ALL METAL AIR PUMPS



Four Cylinder Portable Garage Pump

Portable and Stationary Garage Pumps.
Single and Four Cylinder Tire Pumps.

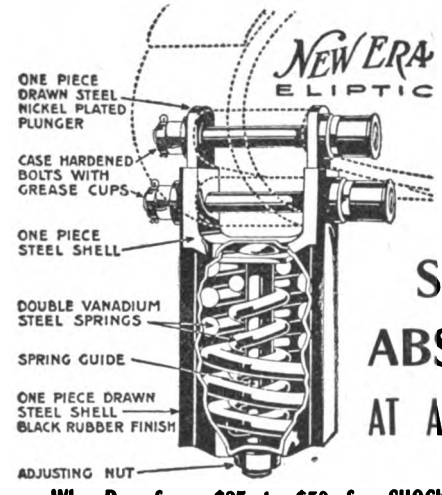
All Models Have Drop Forged Cranks, Bronze Connecting Rods and Bearings; Cranks, Pistons, and Cylinders are Ground.

Single Cylinder MODEL 21
With Fittings for Leading 1915 Cars
$15.00

We have 15 Models and Sizes of Garage Pumps

Send for New Catalogs

LIPMAN AIR APPLIANCE CO.
602 Pleasant Street BELOIT, WIS.



A High Quality SHOCK ABSORBER AT A LOW PRICE.

Why Pay from $25 to $50 for SHOCK ABSORBERS?

If the best materials obtainable can be used in the cheapest priced popular automobile why not in reliable Shock Absorbers, that the low price will sell, rather than immense advertising and added selling expense?

The widest range of cars can be supplied or fitted by dealers with NEW ERA Eliptic Shock Absorbers by the quick and simple change of bushings of different sizes, bolt holes and varying thickness. Sold on a 30-day trial by purchaser, or full purchase price refunded if not satisfactory.

NOTE OUR PRICES

Light Cars, $10. Medium Cars, $12.50. Heavy Cars, $15.

Guaranteed Permanently Against Defects.

CAR DEALERS—Don't you want to increase the comfort of your car owner—and your profits? Dealers supplied through most jobbers or us. Ask for nearest one.

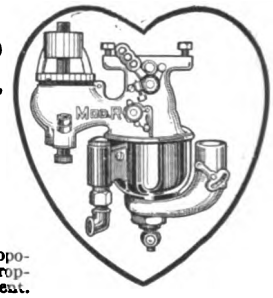
NEW ERA SPRING & SPECIALTY CO., (Smalley Daniels)
871 Woodward Ave, Detroit, Mich. 69-73 No. Washington St., Boston, Mass.

P. S.—Our 1916 Models of Ford Absorbers at $10 for 4—are ready—one sample set will get your further business.

SCHEBLER CARBURETORS

equipped the Stutz Car winner of second place in the

VANDERBILT AND GRAND PRIX RACES



This was the first American car to finish in both races and was of course

SCHEBLER EQUIPPED

Why not have a SCHEBLER yourself?

Ask us about our remarkable exchange proposition on new Model "R." Get our special proposition and particulars for Ford car equipment.

JAMES C. NICHOLS, Inc., Direct Factory Distributor
1673 BROADWAY Tel., Circle 1626 NEW YORK CITY

Trade Mark

"NO-LEAK-O"

A Scientific Oil Packing Piston Ring

A RING WITH A REASON

There's no mystery about "NO-LEAK-O" rings. A simple, plain, mechanical fact.

Piston movement, uneven expansion and contraction, makes perfect fitting impossible. It's the OIL that forms the seal, prevents escape of gas and lubricates.

It is only a question of how to keep a volume of oil between the rings and cylinder-wall, without waste. There's but one way; that's our way. Make oil grooves around the rings; simple, isn't it?

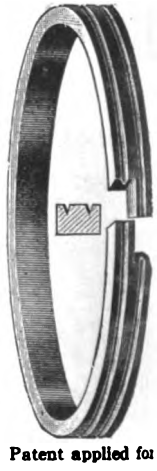
The grooves convey enough OIL to form the seal, which means perfect compression without WASTE; maximum power with less GASOLINE; perfect lubrication without CARBON, smoke, and oily plugs.

We absolutely guarantee each ring for QUALITY, ACCURACY, and satisfactory service.

One Piece, Low Cost, High Efficiency.

Carbon Eliminated by Controlling the Oil.

AUTOMOBILE ACCESSORIES CO.
816 W. North Avenue Baltimore, Md.



Patent applied for

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Big Money to Garages

A new source of big revenue for garages is opening up in the rapidly increasing use of ELECTRICAL STARTING AND LIGHTING EQUIPMENT, with the consequent necessity for repairs and adjustments, etc.

Are you prepared to handle this trade? Certainly not, if you are not properly equipped. If you go at it by hit-or-miss methods you will drive away your trade, and it will carry with it the general repair and supply trade of all kinds.

It is absolutely necessary that you be equipped with a

Weston

GARAGE TESTING INSTRUMENT

Model 280

A thoroughly reliable instrument of precision offered in a convenient size and at a price that enables you to obtain a full and permanent Electrical Testing Equipment at an insignificant cost.

In reality this instrument is the equivalent of six separate electrical measuring instruments of different ranges, and it provides a means of making any tests that are necessary on Electric Starting and Lighting Systems

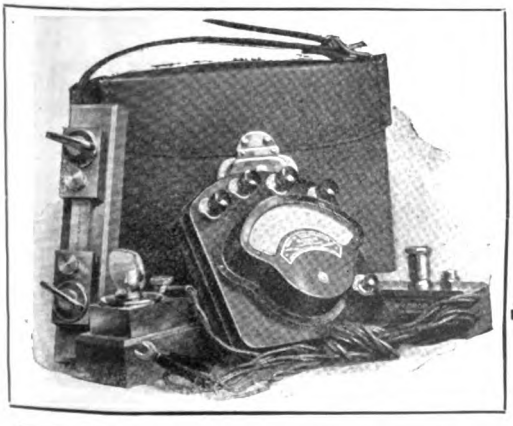
If you want to control the cream of high-class trade in your territory, write to us at once for our SPECIAL PROPOSITION.

Weston Electric Instrument Co.

2 Weston Avenue, Newark, N. J.

New York, 114 Liberty St.
Chicago, 832 Monadnock Block
Boston, 176 Federal St.
Philadelphia, 342 Mint Arcade
Birmingham, Amer. Trust Bldg.
St. Louis, 915 Olive St.
Denver, 231 15th St.
San Francisco, 682 Mission St.
Detroit, 618 Union Trust Bldg.
Cleveland, 1729 E. 12th St.
Cincinnati,
Toronto, 76 Bay St.
Montreal, Winnipeg, Calgary, Vancouver, } The Northern Electric & Mfg. Co.

Paris
Berlin
London
Johannesburg
S. Africa



Twitchell

The Positive Lock Stop

TWITCHELL AIR GAUGE

The Best Gauge to Use

Consequently the best gauge to *sell*—

The best way to secure the stocking of your goods by dealers everywhere is to make an article so satisfactory and so perfect that the demand for it will be universal.

Our experience during 1913 and 1914 has convinced us that we are manufacturing such an article in the

Positive Lock Stop TWITCHELL



Both this year and last year, we had difficulty in satisfying the demand.

Don't waste your time and strength trying to push something that is anchored and can't move.

Stock Goods for which there is a demand

Tire Insurance for $1.00

Our advertising in the Trade and National Magazines will be increased this year in order to stimulate this demand still further.

We can make immediate deliveries now. We may not be able to do so in June.

For Sale by Jobbers, Dealers, Garages, Etc.

The Twitchell Gauge Co.
1213 Michigan Ave.
Chicago

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JOIN THE "CHAIN GANG"

IT WILL SAVE YOU TIME AND MONEY

You don't clean your watch with a hoe, nor do you hold it over a flame to burn out the dirt. Why? Because your good common-sense tells you not to.

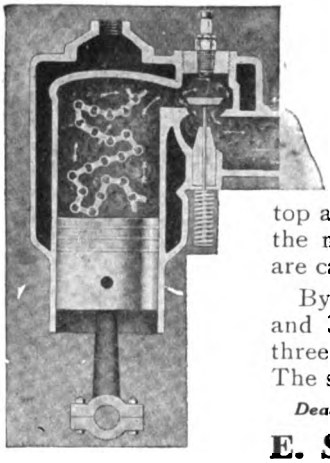


75c Each Insured
3 for $2 Postpaid

But how about the cylinders of your engine, with their polished surface and delicate adjustments? Do you allow the *hoe* or the *flame* method to be used when you have the carbon removed?

If you have the motor torn down, the adjustments and gaskets are disturbed. Or if the oxygen process—the "burn out the dirt" method—is used, you run two risks: (1) that of setting fire to the car, (2) that of cracking or warping the cylinder walls with the intense heat, which also destroys the lubrication of the cylinders.

TRY the Michener way,—the quickest, most efficient, cheapest, and the one absolutely harmless method of removing carbon. And—here's the point—with the **Chain Carbon Remover** you can do the cleaning yourself, on the road or in the garage, **in 20 minutes.**



Simple as A B C to use: the Chains are inserted through the spark plug holes, ignition cut off cylinders being treated, and the motor is run slowly for about three minutes with power from the remaining cylinders. The Chains are then readily removed with the hook which is provided for this purpose. The striking of the Chain upon piston head, top and sides of cylinder, as it is tossed about by the moving piston, loosens all deposits, which are carried off through the exhaust ports.

By using 2 Chains in a four cylinder motor, and 3 Chains in a six cylinder motor, two and three cylinders can be cleaned at one operation. The same Chains may be used again and again.

Dealers' Proposition Especially Attractive. Write for It.

E. S. MICHENER, JEFFERSON ST., NEW CASTLE, PA.

WARNING—*The making, vending, using or having in one's possession a chain of any description—other than the Michener chain—for the purpose of removing carbon deposits from cylinders, is an infringement of patents held by me and will be prosecuted.* E. S. ICHENER.

THE NORWALK TIRE & RUBBER CO.,
Manufacturers of "Norwalk High Pressure Tubes" and "White-Side-Wall" Black Tread Casings
One dealer in a locality, with exclusive sale
Send for Proposition and Samples.
Factory and Headquarters NORWALK, CONN., U. S. A.

For Bargains in Auto Supplies Write for our catalogue.
LIBERTY TIRE & SUPPLY CO.
102 Chambers Street New York

WITHERBEE Starting — Lighting — Ignition Storage Batteries.
Distributors—G. C. Collison, 1410 Eye St., Washington, D. C. Gray-Heath Co, 1429 Michigan Ave., Chicago, Ills. Heath & Carpenter Inc., 208 Jefferson Ave., Detroit, Mich Weinstock-Nichols Co., San Francisco, Oakland, Los Angeles, California
MEDER-STAUDT CO., Inc., Sole Manufacturers,
Factory—Springfield Mass 1876 BROADWAY, N. Y.

DURYEA TRUCKS
have 50% of usual parts. Good pay to live agents.
DURYEA LABORATORIES
Philadelphia, Pa.



It Pays to Advertise

IN THE

Automobile Dealer and Repairer

Write for Advertising Rates

Important to FORD Owners

THE BOSTON STARTER

Is a Time-Tried, Demonstrated Success

The **BOSTON STARTER** is guaranteed to turn the motor over as certainly as the crank, while the operator is comfortably seated in the car.

The **BOSTON STARTER** gives the Model "T" FORD CAR the same self-started appearance enjoyed by electrically started cars, at a fraction of the electric starting cost. No batteries, no wiring to require the services of an electrician.

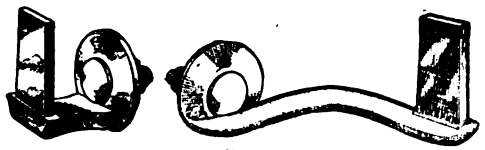
Ford owners—drive right up and ask your dealer or garage man. If he does not happen to know, write our distributor nearest you.

Manufactured by

AUTOMATIC APPLIANCE CO., 172 Columbus Ave., BOSTON, MASS.

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"SUPERIOR" STREAMLINE FORD HOODS



"SUPERIOR"

1915 Ford Lamp Brackets Will Enable You To Put On Any Stock Side or Tail Lamp.

"Patent Applied For"

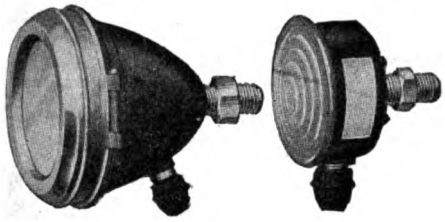
Furnished in "Malleable" Iron, 3 Brackets To A Set.

"SUPERIOR"

BOLT-ON 1915 FORD ELECTRICS READY TO ATTACH.

Attractively Designed—Complete with All Fittings

"SUPERIOR" BOLT-ON 1915 FORD OIL LAMPS NOW READY.



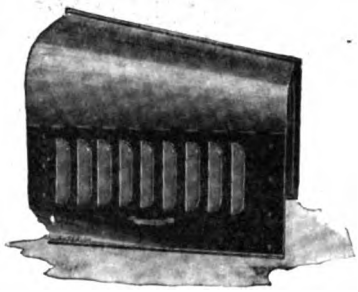
No. 801 No. 800

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are just merely painted and chip off easily.

IMMEDIATE DELIVERY

"SUPERIOR" FORD CROWN FENDERS NOW READY GET THE PRICE!



PATENT APPLIED FOR.

No. 1. FITS 1912-13-14 FORDS.
No. 2. FITS 1915 FORDS.

Price $8.00 Complete



"SUPERIOR" V-TYPE FORD RADIATORS.

Price—Brass $34.70 German Silver $38.00

GET OUR CREDIT ALLOWANCE ON OLD RADIATORS

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

SEND FOR RADIATOR AND LAMP CATALOGUE No. 3

A Blower and Tuyere Iron that Stand Without a Single Comparison for Producing a Strong Blast

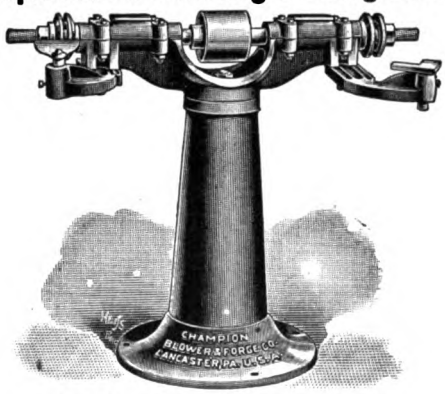
BE PROGRESSIVE, USE A No. 400



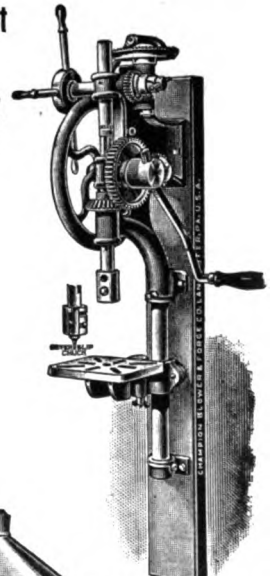
FAMOUS 400 Crank turns either way.

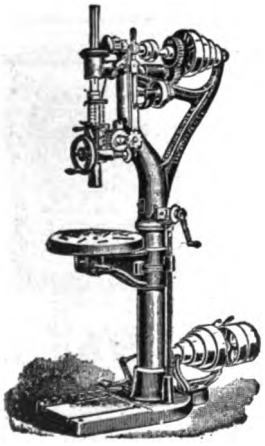


No. 408 Steel Blacksmiths' Forge. Over one-half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.



No. 1 Champion Upright Column Grinder. Capacity Two 18x3 inch wheels.





20-inch Drill.

20-inch Double Back Geared Upright Power Drill is furnished with three complete feeds and is suitably adapted for machine shop and garage use. If you are in need of a power or hand driven Drill write us for full information concerning our complete line.



Screw Plates made in four Styles, cutting from ¼ inch to 1½ inch.

Before purchasing a **Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower or Electric Blower, write for our free catalogue,** which always shows the greatest variety of improved blacksmith tools built under one control in the world.

THE CHAMPION BLOWER & FORGE COMPANY, LANCASTER, PA., U. S. A.



No. 97 Champion Hand-Feed and Quick Return Self-Feed Blacksmith Post Drill.

No. 440 Electric Forge.

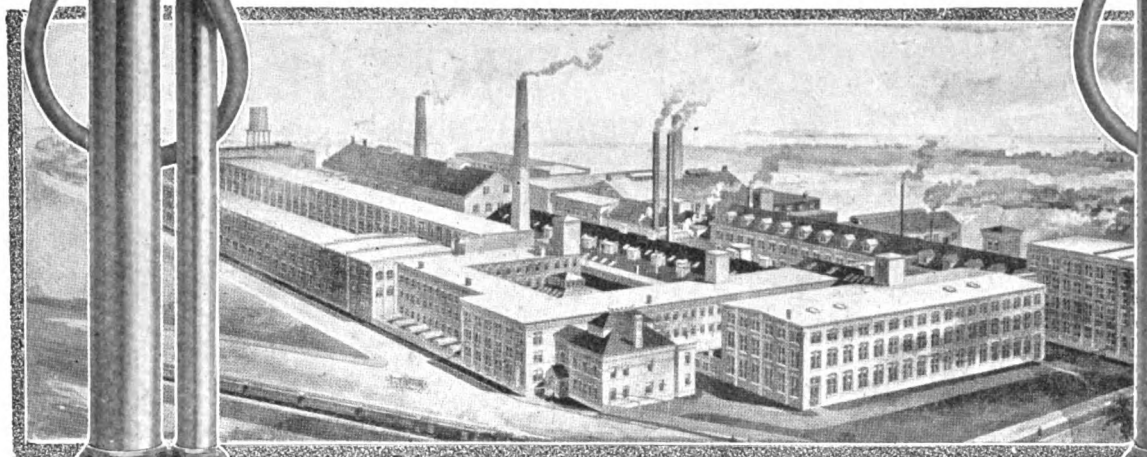
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BRIDGEPORT QUALITY & PRICES

OUR advice—as the largest producers of hand operated automobile tire pumps—is that you first select a pump which will inflate the largest tire in the shortest time and with the minimum effort.

Then consider its price.

Our immense manufacturing facilities enable us to guarantee better value at the same price or equal value at a less price.



Bridgeport Brass Company, Bridgeport, Conn.



"SLIKUP"

"SLIKUP" METAL FINISH

For lamps, horns, etc. Anyone can apply it. Goes on with a brush. Dries in a short time, leaving a smooth, hard finish without showing a brush mark. Will not crack nor peel.

Half-pint cans - - - 80 cents each



"SLIKUP" LEATHER KOTE

A coating prepared especially for leather or imitation leather seats, cushions, etc. It is applied with a brush; covers up all worn spots and gives a finish which is hard to tell from a new piece of leather. It dries in fifteen minutes and is guaranteed not to crack or peel.

Pint cans - - - 80 cents each





"SLIKUP" ENAMEL TOP DRESSING

Prepared especially to refinish shabby leather, pantasote, mohair and rubber fabric tops. Thin liquid dressing which penetrates, softens, preserves, and waterproofs the material, leaving a rich enamel finish which is lasting. Sun, heat or dampness does not affect it. It will not crack nor peel, always retains its lustre.

Pint cans - - - 60 cents each

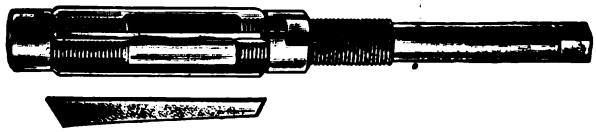
Write today for prices, discounts and proposition to dealers for our **"Slikup Salesman"**

N. B. ARNOLD, ONE SIGOURNEY STREET BROOKLYN, N. Y.

The best made for repair work

The Critchley Expanding Reamer

Try one and you will want more



Reams odd size holes

CHADWICK & TREFETHEN

32 BOW STREET **PORTSMOUTH, N. H.**

Badger Gear Compound

Stays where you put it, right square on the gear teeth. Will not pack the sides of the gear case. **Every ounce lubricates.** Makes your engine deliver its utmost efficiency, all the time.





"Always On The Teeth"

Never Runs Thin

STOPS NOISE—LESSENS WEAR

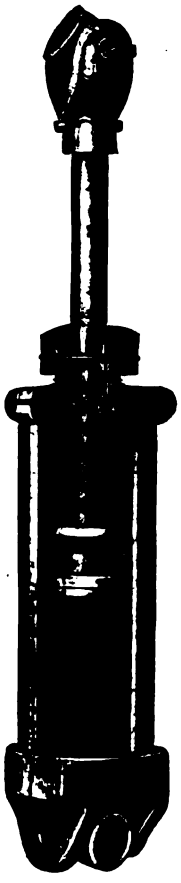
Keeps your car from getting old before its time. We also make the popular F. V. Motor Oil and the Badger Lubricants. See your dealer or write us.

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Coast Distributor: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver, B. C.

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A dust-proof cylinder with inside working piston attached by universal joints. Glycerine and air do the work. No springs to get out of order. Reduces wear on tires 50%.

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"Ideal" Transmission Brake Band

For Ford Cars



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With Detachable Lugs.

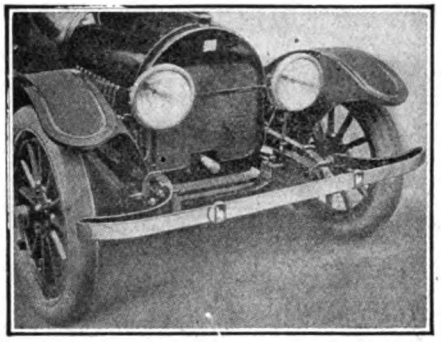
A three hour job done in 30 minutes.

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For FORD Cars

All parts fully guaranteed. Return if unsatisfactory for any reason.

Front Radius Rods, Differential Drive Gears, Drive Shaft Pinions, Connecting Rods, Rear Axle Shafts, Front and Rear Springs, Commutators and many other parts you won't believe we have until you see our price list.

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88 PEARL STREET, Corner HIGH STREET, BOSTON, MASS.

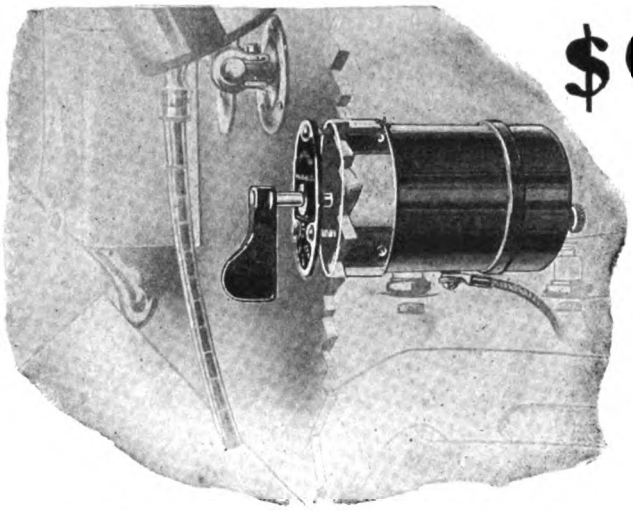
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Better Results from your FORD



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$9

Everybody knows that a well disciplined team of horses working together make much easier work of a heavy pull than a team of nervous, fretful horses, no two of which settle down to steady pulling at the same time.

The Coils on your Ford act much the same. Once out of adjustment their erratic timing causes irregular explosions and your motor loses power.

The Connecticut Master Vibrator for Ford cars is a masterpiece of coil construction which not only insures a hot fat spark for each explosion but which times the sparks for all four cylinders of your motor with absolute accuracy.

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300% in One Year!

That is the increase in the sales of the Rajah Giant Plug



This Plug was originally designed for racing purposes, but its widening popularity for general use on motor boats, tractors, trucks and pleasure cars has necessitated its addition to our regular line.

In construction, with the exception that it is much heavier in the porcelain and metal parts, it is the same as the

RAJAH "STANDARD" PLUG

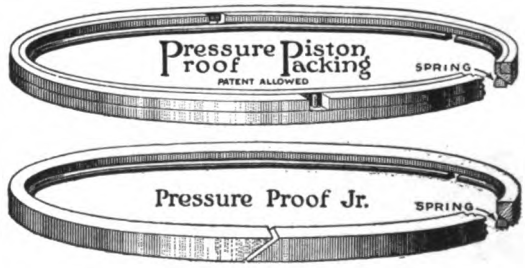
Extremely simple for cleaning: — only four parts—shell, porcelain, bushing and gasket. All standard threads.

Rajah Giant Plug $1.50
Rajah Standard Plug 1.25 } Postpaid—with Thumb-nut Terminal

Dealers: If you haven't carried Rajah Plugs in stock, did you ever stop to think how many sales you may have lost? Many thousands of car owners use no other plug. **Write us for particulars.**

RAJAH AUTO-SUPPLY CO.

BLOOMFIELD NEW JERSEY



(PATENT APPLIED FOR)

A NEW PRINCIPLE IN PISTON RINGS

One of the principal causes of leakage in piston rings is wear in the ring grooves, and poor fitting at the start. The pressure proof Ring and the Pressure Proof Junior Ring are the only piston rings on the market that automatically adjust themselves to the width of the ring groove, and maintain a tight joint at this point at all times.

Of what avail is a piston ring, however tight in the joints, if it soon wears loose in the groove, and allows pressure and oil to leak under. Pressure proof Piston Rings not only fit automatically, but they maintain a fit as long as they are in service.

Pressure Proof Piston Rings are guaranteed to restore power to worn cylinders that are not scored.

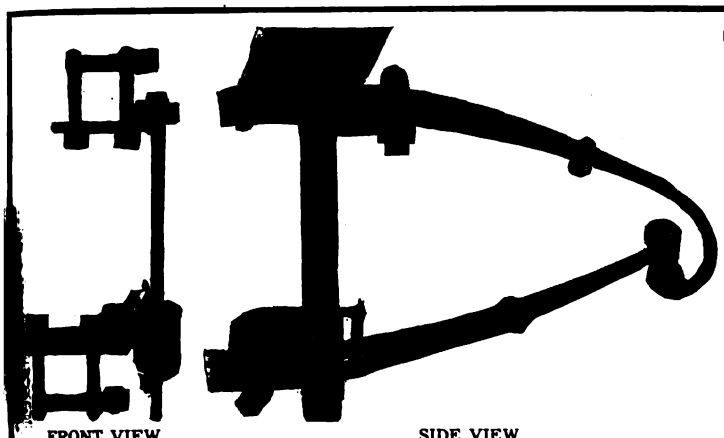
In use on automobiles, motor boats, Stationary engines, air compressors, etc. No danger of breaking or distorting in applying, as Pressure Proof Piston Rings are not stretched over piston in applying.

For full information, write

PRESSURE PROOF PISTON RING CO.

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FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

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MODEL "J" FOR FORDS
MODEL "M" FOR LARGER CARS

Get a Real Starter
The Compressed Air Rotary

Thurber Starter



Air Pump and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 RPM under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc Hundreds in use. **PRICES: Model M, Large Cars, $85.00—Model J, Medium Cars, $70.00—Model F, for Fords, $65.00.** F. O. B. Cars Our Works, Detroit.

NORTHERN ENGINEERING WORKS
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FORD STARTER $10.00

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HOUSEL'S IMPROVED FORD STARTER

we will sell 500 starters at $10.00 each, f. o. b. Buffalo. Terms: Cash with order. No C. O. D. orders accepted. All orders subject to our approval.

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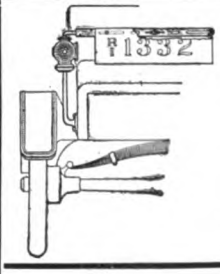
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FORD SPECIALTIES



No. 86 FORD COUPELET LAMP AND LICENSE BRACKET.

ALSO FITS OTHER CARS.

Specially designed for the FORD COUPELET and RUNABOUT.

Fastens by same bolts that hold present bracket.

Carries lamp and license plate well above the rear deck clear of mud and dust, permitting your danger light to be plainly seen by "The man behind."

"Safety First—Always."

Throws light directly across license plate. Made of malleable iron, black finish.

List Price $2.00 Each.



FORD LOCK TIRE HOLDER No. 88-9.

Protect Your Tires From Theft.

Carries casings flat, preventing them from sagging out of shape.

Consists of three properly designed light weight brackets, two of which are supplied with straps, the third with a pressed steel swing strap and an all brass automatic Yale Lock which securely locks casing, preventing theft.

Price, $2.50 Complete.



DASH VENTILATOR FOR FORD CARS. No. 240

Makes Driving A Comfort in the Hottest Weather.

Allows comfort to occupants of front seat, by carrying away excessive motor heat from the feet.

The only dash ventilator in the market for FORD CARS which can be used in rainy weather (just when ventilation is most needed, when car is all curtained in) without admitting rain into the car. Easily attached. Nothing to get out of order. Made of pressed steel. Two finishes. Copper Oxidized **$2.00** per pair, Gun Metal **$1.75** per pair, complete.

COMBINATION CRANK HOLDER AND NUMBER BRACKET FOR FORD CARS No. 80.

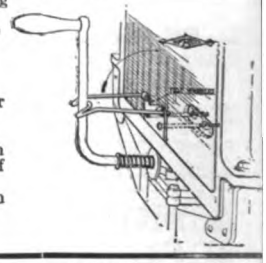


A practical device for holding crank handle in upright position, protecting it from road obstructions and mud. Much quicker and neater than the old way of holding by crank strap. Stops rattle and dangling of crank, thus saving wear. Hard Rubber Finish.

Easy to attach by same nuts that hold front spring clips. Positively locks back against radiator, allowing spinning of motor without danger of engaging with crank handle. **50c Complete.**

FORD CRANK HOLDER.

No. 85.



Holds crank handle in upright position clear of road obstruction.

Stops wear and rattle.

Positively snaps back against radiator, which permits spinning motor without danger of striking holder.

Better, Quicker and more Serviceable than crank straps.

Price, 25c.

"UFASCO" ADJUSTABLE OIL CAN HOLDER. No. 60.

You Don't Know What A Necessity It Is Until You Have Used Our No. 60.



You cannot afford to be without one.

None better. Positive Grip.

Adjustable to all sizes of 3⅜", 3¾", and 4½" oil cans. Holds can tight, preventing rattle. Fasten either with or without bracket.

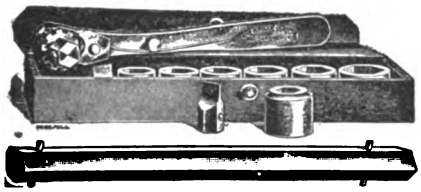
Saves time, oil and money by always being "where you can find it."

Has most flexible action and gripping quality of any holder on the market.

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Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U.S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
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1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.
Price, in leather case, - - - - $3.00

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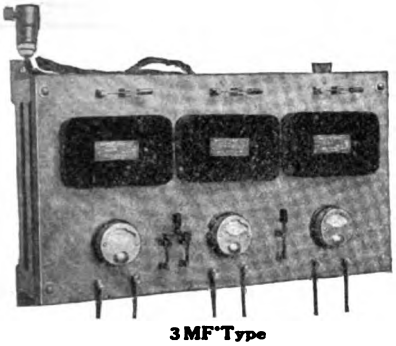
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THE ST. LOUIS BATTERY CHARGER

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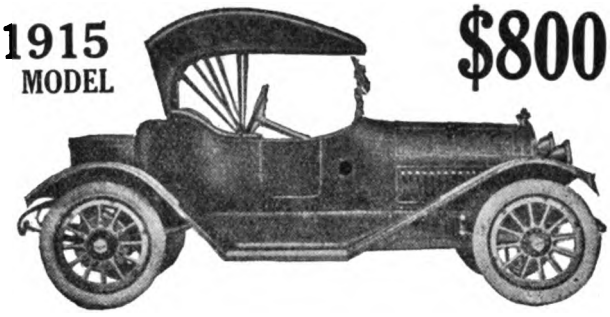
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$1500 Brand New Roadster

AT ALMOST HALF PRICE

1915 MODEL **$800**



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This is the first time this car ever sold under list price and we, therefore, cannot advertise the name. This car is widely known and is in use in practically every city.

The car is of distinguished appearance, and its power, construction features, refinements—many exclusive—cannot help but please the most critical buyer. There's nothing left to be desired—you get a wonderful hill climber and a good steady all 'round car **Built to Wear—Not Just to Sell.** Every car guaranteed.

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Motor 4-cylinder, 4¼-inch bore by 5¼ stroke; three-point suspension with unit power plant, ignition, magneto, dual system; Stromberg carburetor; transmission 3 speeds, center control, right and left hand drive, full floating rear; 34 x 4 tires; demountable rims, Goodyear no-rim-cut tires; 114-inch wheel-base and Fully Equipped.

The manufacturers are strong financially; are making cars every day—so there's no need to fear about getting parts at any time.

Place your order at once—the opportunity won't last long.

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The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

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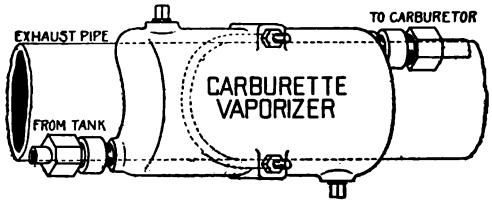
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In any and all kinds of weather on your GASOLINE in using our

CARBURETTE VAPORIZER

FOR FORD CARS



Start your engine and smell of the exhaust—you will notice a decided odor of gasoline. This means you are not getting the use of all the gasoline which goes into your motor.

This wasted gasoline amounts to fully 33⅓% and is due to the fact that your mixture is not properly vaporized in your carburetor.

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The Carburette Vaporizer is attached to the exhaust pipe with a simple clamp. Here the heat from the exhaus. is utilized to BOIL the GASOLINE. The hot gasoline enters the carburetor and on coming in contact with the air INSTANTLY VAPORIZES.

This is not a new principle but a tried fact. Boiling gasoline is constantly used by the big racers in the middle of summer.

By compelling this absolute vaporization your gasoline consumption will be from 25 to 50% less (our own comparative test shows 50%), not only this but you get

INCREASED POWER REDUCED CARBON
INSTANT ACCELERATION

The Carburette Vaporizer is a positive filter, now a recognized necessity in these days of low grade gasoline. We have provided drain cocks so that sediment and impurities boiled out may be drained off.

PRICE ONLY $2.50

And if not satisfied money refunded

Simple, not complicated, any owner can install in one-half hour. Order from your dealer or through us. Sent C. O. D.

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SERVICE WRENCHES

GUARANTEED QUALITY TOOLS

1620 TRIPLE SOCKET TOMAHAWK — TRADE MARK — (CYLINDER HEAD, REAR AXLE NUTS & HOUSING)

Most useful single wrench for Ford Cars. Cylinder Head Bolts, rear axle nuts and housing, water intake pipes and sundry other places. Sockets are shaped to allow full clearance.

38c. Each

It will fit any rod in practically any position without removing the engine from the car. The first and only wrench on the market today which will accomplish this purpose.

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FOR REVERSE and BRAKE PEDAL BANDS—FORD CAR 1564

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The peculiar shape of the handle is to allow for full working space.

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Sizes are ⅛ and ¼ in., to fit main bearings and engine base bolts and other parts. Most desirable tool for your Ford equipment.

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WALDEN-WORCESTER 1824 ¾ 9/16 DOUBLE SOCKET WRENCH

WALDEN-WORCESTER No. VG-3 VALVE FORD GRINDER

New design, all steel tool. Bar handle swivels on cone bearing. Pins are hardened steel and socket shaped to fit valve head—a real tool.

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5 ESSENTIAL TOOLS FOR EVERY FORD CAR

No. 5 Set $1.75

There are many nuts and bolts on the Ford Car which with ordinary wrenches are very inaccessible, causing much loss of time when making adjustments or repairs. These tools are designed and tested under practical service conditions and greatly simplify the work, saving much time and annoyance. The tools are built to meet hardest service conditions and are fully guaranteed. Every Ford owner and garage needs these tools.

Designed and Proven for Efficiency and Service

The idea has and seems to prevail in some quarters that because the Ford Car is an inexpensive car that any old tool will do.

The purchaser of accessories for the Ford car has a right to expect and receive value for every dollar spent. The name **Walden Worcester** on your wrenches is a guarantee of quality tools that have real tool value and will give you satisfactory service.

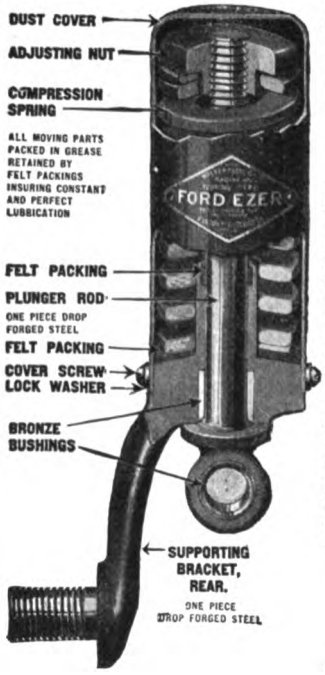
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64 CENTRAL STREET WORCESTER, MASS.

WE MANUFACTURE WRENCHES ONLY



Soak Up the Bumps with the FORDEZER

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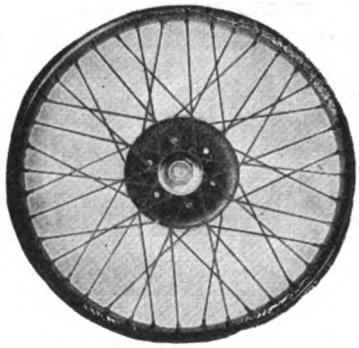
For improved riding qualities for which they are responsible are little short of wonderful. Their rapid action permits them to absorb—soak up—the vibration that makes long continued riding tiresome even over city pavements. On rough roads the improvement is even more noticeable. The springs are given a chance to act natural—the snappy recoil which is even worse than the downward bump, is entirely eliminated. The saving it effects in tire expense and car depreciation will more than repay their cost in a season.

Made To Fit All FORD Models

Either Touring or Roadster. They are easily applied. Their construction is the best of any Shock Absorber on the market—absolutely dust-proof; entire mechanism covered with a one-piece drawn shell cover, press fitted to the base. Once a year oiling is all that is required for average use. They will outsell and outwear any other Shock Absorber because all supporting parts are drop forged steel and all moving parts bushed with bronze bearings. The flat section, Vanadium Steel springs are guaranteed for life.

Price per set of four . . . $12.00

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UNIVERSAL WIRE WHEELS

Constructed of the very best material put together by the highest grade of workmanship.

Hubs are of special steel carefully designed as to weight and contour. They are machined to a perfect fit and may be quickly attached to any Ford hub without filing or cutting and the use of no tool except a wrench. Spokes are finest quality wire spokes—rims of heavy rolled stock, electrically welded and heat treated. Finish is black Japan thoroughly baked on—will not chip or rust.

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The Dewey Power Tire Pump

Save your tire trouble by getting a practical and efficient power pump. Nothing to break or wear out on the Dewey Pump. Every one tested before delivery. Furnished complete with 12 feet of hose, self-opening connections, dial pressure gauge and adapters for any thread spark plug.

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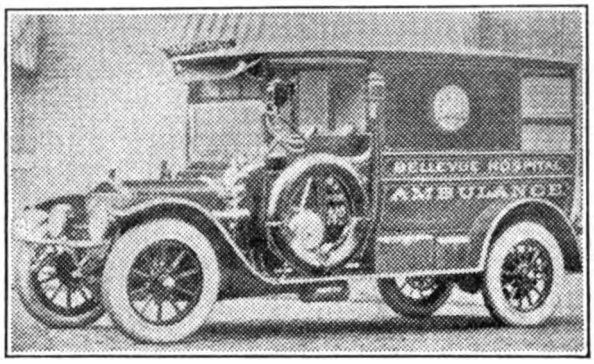
These Bumpers are made on honor, of good materials reinforced by a steel rod and filled with well seasoned concrete

SIMPLE AND EASY TO ATTACH

NO BORING OF THE FRAME OF THE CARS---SEE CUT OF ATTACHMENT BELOW

Concrete Bumper

Made in all sizes of round and square tubing, filled with concrete reinforced with steel rod running through center.



Concrete Bumper Applied to Bellevue Ambulance, N. Y. City

Concrete Bumper

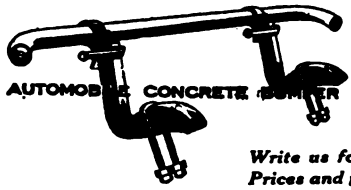
The choice of those who want the best protection for their Radiator and Lamps.

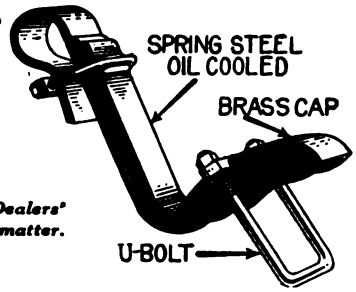
Prices: $10.00, $12.50, $15.00, $18.00, $22.00, $25.00.

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IRON LINED BRASS TUBING FILLED WITH CONCRETE RE-INFORCED BY STEEL ROD RUNNING THROUGH CONCRETE

How Concrete Bumper Derives Its Name





There Are Imitators but not Competitors
So get the *Real Concrete Bumper*

Write us for our Dealers' Prices and printed matter.

Canadian Factory: 331 Richmond St. London, Canada **CONCRETE BUMPER COMPANY** **214 West 50th St. New York, N. Y.**

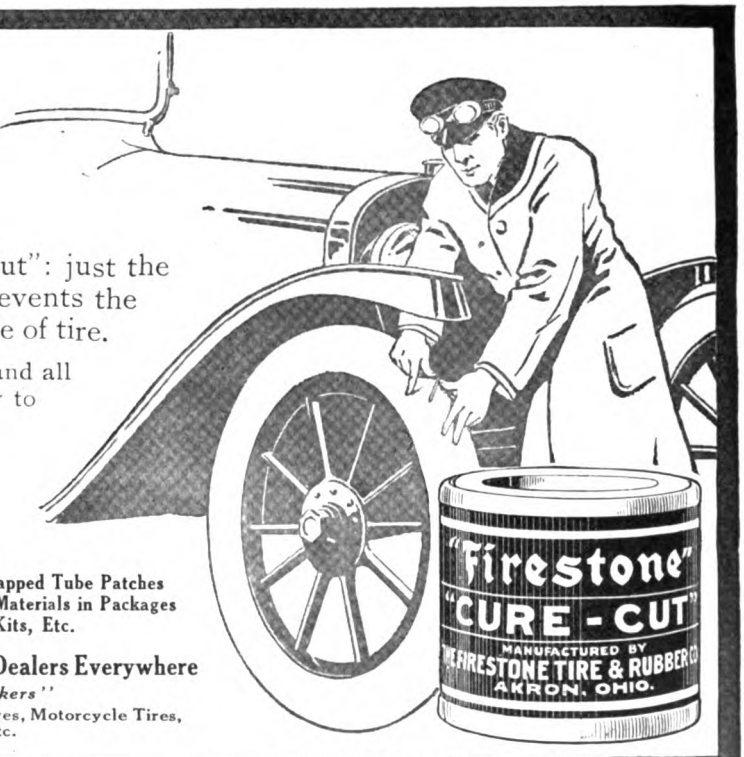
Firestone
Accessories

—include the invaluable Firestone "Cure-Cut": just the thing to nip tread troubles in the bud. Prevents the entrance of sand, water, etc., and prolongs life of tire.

There is a long list of Firestone Accessories—and all good dealers are glad to sell them. All are easy to use, sure to work, and mean satisfied trade.

Send for catalog with definite description of the line, which includes:—

Hook-on Boots	Air-Pressure Gauges	
Lace-on Boots	Valves and Valve Parts	
Blow-out Patches	Tire Tape	
Cementless Tube Patches	Tire Mica	Red Wrapped Tube Patches
"Cure-Cut" Cement	Pumps	Repair Materials in Packages
	Pure Gum Molded Tube Patches	Repair Kits, Etc.



Firestone Tire & Rubber Co., Akron, O.—Branches and Dealers Everywhere

"America's Largest Exclusive Tire and Rim Makers"

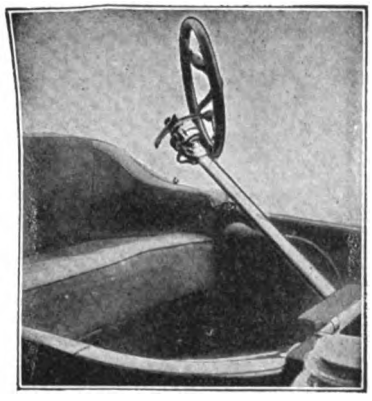
Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Motorcycle Tires, Fire Apparatus Tires, Rims, Tire Accessories, Etc.



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HALLADAY ADJUSTABLE STEERING WHEEL

The greatest convenience yet invented for the OWNER who drives his own Ford. Stout people MUST have it.

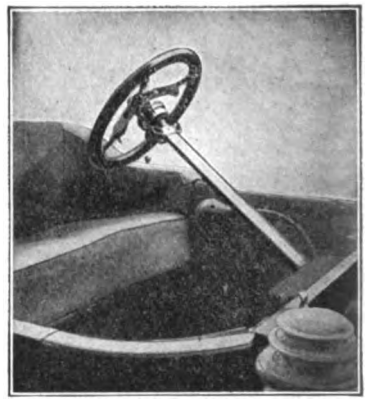


Patents Pending

Wheel lifts instantly, enabling driver to get out with perfect ease, even with two on the seat. Locks automatically. Beautiful Black Japan finish.

Attached by simply removing nut on end of steering column.

14-inch, Spider only . . .	**$3.00**
Same with Rim	**4.00**
16-inch Spider with Rim . .	**5.00**
Corrugated Rim, extra . . .	**1.00**



People using Fords get in and out of them many times daily. They appreciate the extra room and convenience this Adjustable Wheel gives.

Manufactured by L. P. HALLADAY CO. (Dept. D), Streator, Ill.

Write today for particulars on this and other fast-selling Ford Specialties.

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and Southwest, Gray-Heath Co., Chicago; For New England, Post & Lester Co., Hartford Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvania, Asch & Co., New York.

HYATT QUIET SERVICE

HY-FLEX-ROL

Hyatt Quiet Bearings are used in the majority of American made automobiles

Bearings required for motor car repairs may be obtained on short notice at any of the service branches indicated.

HYATT SERVICE STATIONS

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Minneapolis, Minn., 1400 Hennepin Ave.
Detroit, Mich.
Los Angeles, Cal.
New York, (Harrison, N. J.)

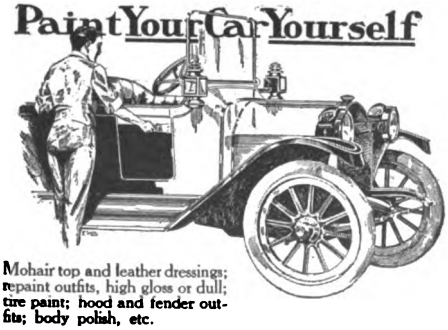
SERVICE AGENTS

High Wycombe, Broom & Wade, England

HYATT ROLLER BEARING CO.

DETROIT, NEWARK, N. J. CHICAGO

Paint Your Car Yourself



Mohair top and leather dressings; repaint outfits, high gloss or dull; tire paint; hood and fender outfits; body polish, etc.

ARSENAL VARNISH CO.
2501 Fourth Avenue, ROCK ISLAND, ILL.

Save $25 to $75. It's Easy

One man in Granite City, Ill., writes, after painting his car with the Arsenal System: "My car looks better than many which were painted in St. Louis at six times the cost." (Name on application.) **What he has done you can do. No experience required.**

"The Car Beautiful" Free to Motorists

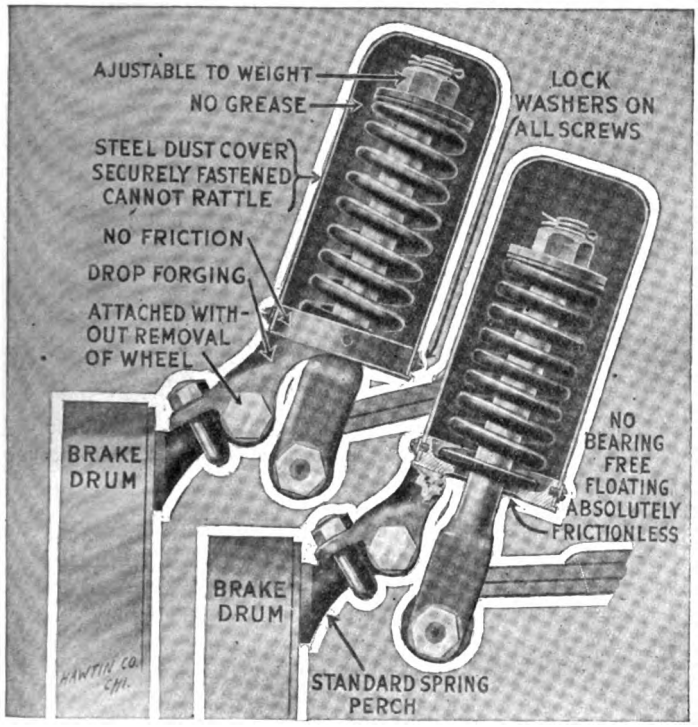
This 40 page book, the only one of its kind published, tells how to keep the car looking brand new at a small expense at home. It's FREE!

Black Enameled, Silver-Trimmed Lamps

Special Offer You can have black enameled, silver-trimmed lamps in half an hour with this combination. One $1 can Arsenal Gun Metal and one $1 bottle Arsenal Liquid Silver, both prepaid **$1.75**

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HALLADAY FRICTIONLESS SHOCK ABSORBERS



Backed by Maker's Guarantee

248,000 Sold in 1914

DROP-FORGED CASING and VANADIUM STEEL SPRINGS

Just what FORD OWNERS are looking for—a Shock Absorber that anybody can attach without special tools, in 20 minutes. Needs no machining or drilling; no adjustment, oiling or attention of any kind. Once attached it is on the job for life of car. The Halladay Shock Absorber has

NO FRICTION NOISE OR WEAR

because it is hung at such an angle that the free downward and outward thrust of the spring combine to pull in direct line with the axis of the shock absorber. The photograph explains this clearly. The Halladay is the only ***Frictionless*** shock absorber on the market. This feature is fully protected.

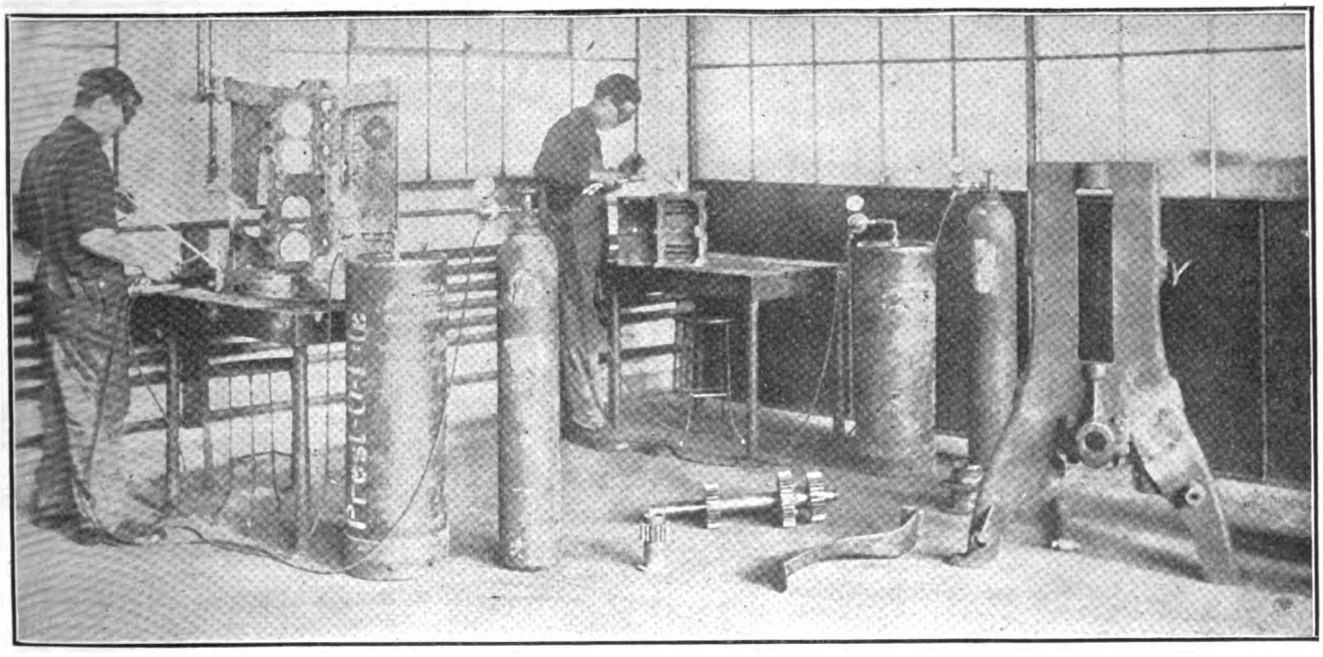
Our New 1915 Improved Model to sell at only - -	$12.00	A SET OF FOUR

WRITE FOR PARTICULARS

L. P. HALLADAY CO.

Dept. D **STREATOR, ILL.**

DISTRIBUTORS—For Pacific Coast, Hughson & Merton, Inc., San Francisco; For Middle West and Southwest, Gray-Heath Co., Chicago; For New England, Post and Lester Co., Hartford, Conn., and Boston, Mass.; For New York, New Jersey and Pennsylvania, Asch & Co., New York



2 Sets of Dyer Welding Apparatus in Operation Illustrating Its Unlimited Range

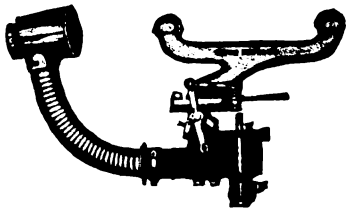
$35.00 OXY-ACETYLENE WELDING and CARBON REMOVING OUTFIT

COMPLETE WITH SUPPLIES. EVERYTHING NECESSARY EXCEPT TANKS.

Write us for particulars of Style D Outfit. 1500 SETS IN USE. If you now have a carbon remover we can quote you a lower price on the necessary additional apparatus to convert it into a welding outfit also.

The DYER APPARATUS CO., 155 BROOKLINE STREET CAMBRIDGE, MASS.

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ZENITH FORD Carburetor Adjusts Itself

Here is the carburetor with real reasons for its reputation—sound, common sense selling facts that compel the Ford owner to buy it if he would serve his own best interests.

Easy Starting
Economy
Simplicity
Flexibility

$20

Once installed, the ZENITH is always right. Not a screw, spring, valve or clapper to adjust. The compound spray nozzle gives an automatic priming charge, and then adapts itself to every possible condition at every impulse of the engine, without further attention.

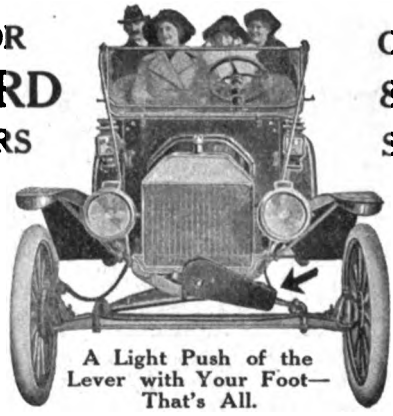
Retails at $20, with a generous profit to you. Write for proof of claims, trade terms and selling helps.

The Motor Parts Company
SOLE PRODUCERS
818 No. Broad Street
Philadelphia

Perfection Auto Starter

FOR **FORD** CARS

OVER **8500** SOLD



Operates From Seat

Engine Starts At Once

A Light Push of the Lever with Your Foot—That's All.

So simple a child can use it. No gas to explode; no batteries to charge; no springs to wind up and no up-keep expense. Neat and out of the way.

INSTALL IT YOURSELF

A Perfection Starter will make your auto pleasures complete. Catalog and Booklet, with full instructions for installation, sent free upon request. $15.00, anywhere in the United States

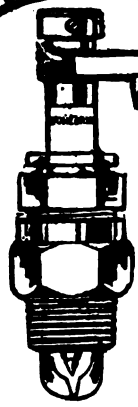
SEND $10.00 FOR SAMPLE
and get Agency Contract. *WRITE AT ONCE*

MANUFACTURED BY
PERFECTION AUTO STARTER CO.,
279 16th Street DENVER, COLO.

STONEBRIDGE

The Plug

THAT MAKES Both PROFIT and FRIENDS FOR YOU



The demand for this plug is headed your way Right Now. As fast as we explain it—we sell it. If you held one in your hand and looked it over carefully you'd understand why live dealers all over the country are stocking the **Stonebridge "Easy Clean" Spark Plug.** Its advantages are right where you can see them, for yourself.

1. **The only plug that can be cleaned without removal from the car.**
2. **Never needs adjusting.**
3. **Entire porcelain can be removed and replaced while plug proper stays in motor.**
4. **Has special safety connection on terminal.**
5. **You can test out plug without the use of any tool.**
6. **Spring terminal always assures positive contact — not sometimes, but always.**

DEALERS:
We pay your advertising bills—not in talk—but in Real Money!
WRITE US.

DEALERS: We have a proposition that is a wonder; it reaches right thru your front door and rings the cash register. It's a kind of co-operation you never heard about before. Write us now for particulars.

STONEBRIDGE SALES COMPANY
10 WALL STREET NEW YORK, N. Y.

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WANTED!

Responsible direct representatives in New England, New York, Pennsylvania, Maryland, Delaware and New Jersey.

Manufacturing facilities are complete. Sales territories for Browne and Browne-Branford Carburetors are being alloted.

Only high grade, responsible individuals or companies will be considered. Must be capable of handling all business of territory from Dealers, Garages and sub-agents.

Applications should be accompanied by full details, and in reply we will explain an unusual proposition.

HOLT-WELLES CO., Inc.
1790 BROADWAY NEW YORK CITY

WELDING

"The Weld that's Guaranteed"

ALL kinds of Castings—Machine and Auto parts welded—Worn and Weak parts Reinforced by the oxy-acetylene method of welding.

WE MAKE A SPECIALTY OF WELDING "ALUMINUM" PARTS OF ALL KINDS.

No Job Too Small or Too Large For Us to Handle.

WRITE FOR ESTIMATES.

Complete Oxy-Acetylene Welding and Cutting Plants Installed.

ENGINEERING WELDING WORKS
Welding Department
ENGINEERING SALES CORPORATION
520-24 W. Jackson Blvd., Chicago, Ill.

"The Cut that's Straight and Narrow."

CUTTING

BROWN SUB-BASE OILER
FOR FORD CARS



PAT. DEC. 8, 1914

The hit of the shows. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.

MARVELOUS REMARKABLE
Four to one in our favor



The Jensen Lever Pump inflates four tires with less effort than a compound hand pump inflates one tire, It is absolutely the easiest working pump on the market regardless of price. Send for one. Only about half the price of other lever pumps.

We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

Dealers, write for proposition.

W. H. HOWELL CO., - - Geneva, Illinois

Sell your trade a Spare Spring
Ready for Instant Use

Springs with the center bolt usually break in the middle—unless it's a Tuthill Titanic that has no center bolt and is guaranteed for life against center breakage.

And when a tire "blows" it's much easier to get another one than it is to get a spring, even if the motorist does not carry a spare tire.

When a spring breaks, however, the motorist is right up against it—perhaps miles away from a repair shop or a garage—so why not sell your trade a Spare Front Spring—and if it's an Unbreakable Titanic his troubles are over.

In addition, we can furnish promptly the Tuthill Titanic equipped with the famous DANN INSERT—the interleaf shock absorber.

Tuthill Titanic Unbreakable Spring

Guaranteed forever against center breakage

Write us today

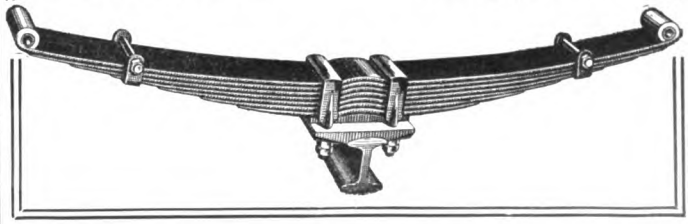
The Tuthill Titanic is the most satisfactory spring you can sell—it has no center bolt and is guaranteed forever against center breakage.

Most all jobbers carry a complete stock—or we can ship most orders in one day—special orders in 48 hours.

Write today for our special offer on "Best Sellers."

Tuthill "Titanics" can be easily adapted to any axle construction and quickly mounted **without any extra expense.**

TUTHILL SPRING CO.
758 Polk Street Chicago, U. S. A.



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MECCA "30" 1916 MODEL

With Electric Lights Self Starting Outfits Complete **$695**

AN EVENT IN THE HISTORY AND DEVELOPMENT OF MOTOR CARS

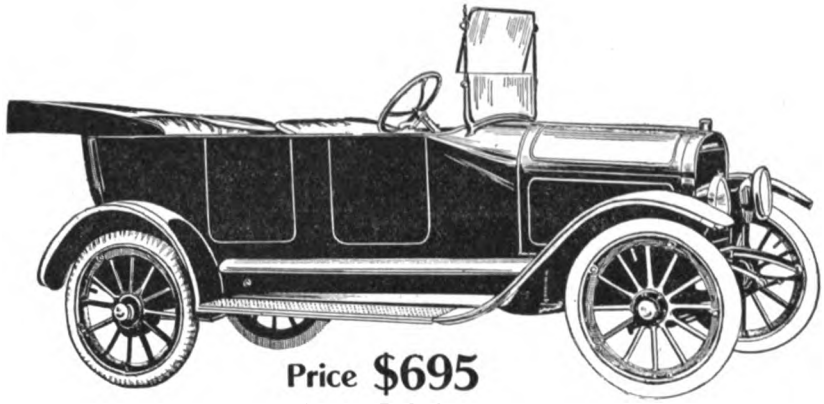
THE CAR FOR ALL CLASSES—FOR EVERY PURPOSE

LOW—RACY—TRIM—JAUNTY

CROWNING AMBITION OF EVERY MOTORIST

MECCA "30" FEATURES

French Stream Line
Genuine Leather Upholstering
Luxurious Finish
One Man Top
Clear Vision Wind Shields
Electric Lights
Silent Electric Starter
Crown Fenders
Left Hand Drive



Price $695

Fully Equipped—F. O. B. Detroit

MECCA "30" FEATURES

Speedometer
Light Weight
Maximum Unit Power
Perfect Balance Chassis
Low Center of Gravity
Safety First Brakes
Stewart Vacuum Gasoline System
Demountable Rims
Extra Rim and Tire Holder

The standard of comparison with cars of its sphere. Beauty, grace, power, speed, comfort and individuality. All embodied in this car of cars, and at an amazingly small figure. Cost of upkeep surprisingly low—economical on tires and fuel.

DEALERS WANTED IN EVERY STATE. Write for Special Proposition.

TIMES SQUARE AUTOMOBILE CO.

Southwest Cor. 56th Street & Broadway, NEW YORK — 1210 Michigan Avenue, CHICAGO

SAVE YOUR TIRES



Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

VULCANIZIT For inner tube punctures and blowouts,
KUTFILLER For filling cuts and other injuries,
SANBLIST A cure for sand-blisters, repairs blowouts,
NEWTRED For retreading worn tire sections,
PATCHIT Two colors, white and black, for repairing Hot-Water Bottles, Air-Cushions, Rubber Boots, Overshoes and kindred articles.
¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

MONEY BACK IF NOT AS REPRESENTED

Agents wanted everywhere, liberal terms.

Send immediately for descriptive circular giving full particulars of all our special products.

SELF-VULCANIZING RUBBER WORKS, MORRISTOWN, N. J.

PRES-TOE Ford Starter, the only guaranteed steel ball bearing starter on the market. Starts the motor every time. Out of sight. Conveniently located. We want Ford owners for agents. PRES-TOE Starters sell at sight, easy to install. Put the Ford in the $5,000 class. A prominent Buffalo Doctor has had three other starters and states that the PRES-TOE is the only satisfactory one yet.



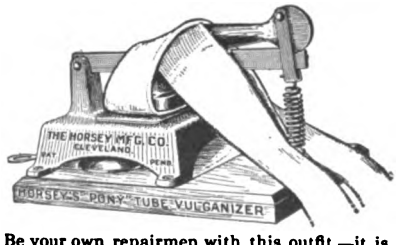
Now is the time to get started. Big inducements to agents.

WRITE TODAY FOR AGENTS SPECIAL.

W. ROBERTSON, Greenwood Place, Buffalo, N. Y.

HORSEY VULCANIZER

THE MOST PRACTICAL SMALL VULCANIZER FOR INNER TUBES



Will repair all punctures and 90% of blowouts.

Will vulcanize HORSEY No-Cement Patches, and any tube repair gum.

HORSEY PONY VULCANIZER with one box containing twelve assorted (large and small) HORSEY NO-CEMENT PATCHES, all complete.

Price $3.00

Be your own repairmen with this outfit,—it is a great money saver, and you should not be without it. **Satisfaction guaranteed.**

Write for Interesting Literature.

MANUFACTURED BY

THE HORSEY MANUFACTURING CO.

6104 EUCLID AVENUE — CLEVELAND, OHIO

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Oxy-Acetylene Welding pays Big Profits to Garage Owners

If you are not equipped to do Oxy-Acetylene repairs in your own shop, you're losing good, legitimate profits. With the welding process, you can save money for yourself by cutting repair costs. You avoid unpleasant delays, waiting for replacements. Immediate repairs make pleased patrons. Damaged parts are quickly and easily made good as new at small cost. Most of these repairs would be impossible with any other method. Even at the most moderate charges, the profits from this end of your business are too big to be neglected.

The daily use of the welding equipment requires that it be simple, efficient, portable and economical in operation. We can furnish, at low cost, a thoroughly high-grade welding apparatus for $60.00. The average user will also need gas cylinders, which are extra, and about $10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

If you use Acetylene for ANY purpose, you can secure added efficiency and wider scope of operations possible, by using.



PREST-O-LITE

Dissolved Acetylene

(Ready-made carbide gas)

Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

A Good Business Opportunity

Doing Oxy-Acetylene welding for others is a highly profitable business. The cost of equipment needed is slight. Immense and growing demand assures profitable operation right at the start.

Get Your Share of Welding Profits

Send your name and address immediately for highly instructive literature on Oxy-Acetylene Welding and Cutting. See what others have done—how you can add to your profits by adding the up-to-date methods in your shop.

The Prest-O-Lite Co., Inc., 820 Speedway Indianapolis, Ind.

The World's Largest Makers of Dissolved Acetylene

53 direct factory branches and charging plants in principal industrial centers

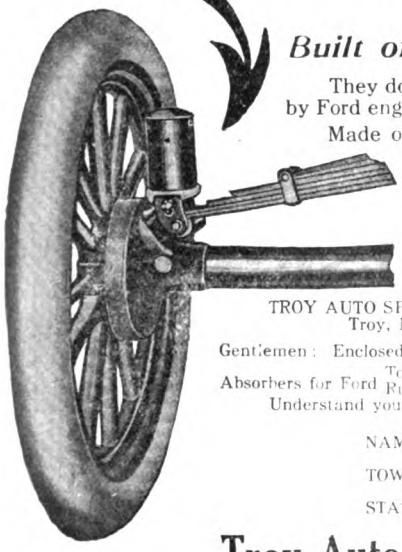
FORD OWNERS!

Why pay fancy prices for Shock Absorbers when you can get a set of

"TASCO" SHOCK ABSORBERS

For $6.00 Per Set of Four

Delivered to Your Door



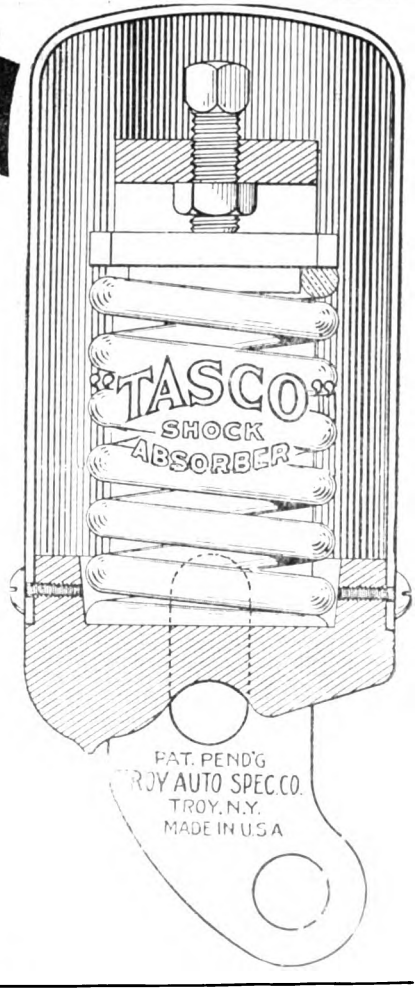
Built of Steel *Designed for Service*

They do not raise the car or change the suspension as designed by Ford engineers.

Made of the finest material, properly designed and have real springs—strong, lively and flexible. Springs are adjustable. Easily attached without taking off the wheels.

10 Days' Trial—Money Refunded

Transportation Prepaid



TROY AUTO SPECIALTY CO.,
Troy, N. Y.

Gentlemen: Enclosed find draft / M. O. for $ . . Send one complete set (4) "TASCO" Shock Absorbers for Ford Touring / Runabout Car, Transportation Charges Paid.

Understand you agree to refund my money in ten days if I am not satisfied.

NAME .....

TOWN .....

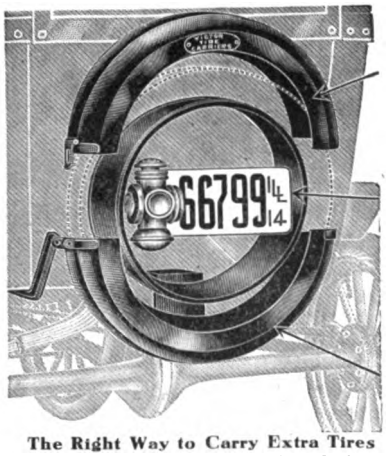
STATE .....

Troy Auto Specialty Co., Troy, N. Y.

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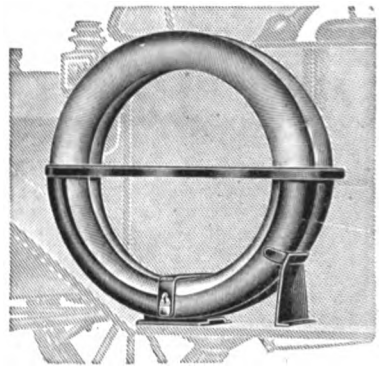
VICTOR, SIMPLEX AND DUPLEX TIRE CARRIERS

HANDSOMELY FINISHED IN BLACK ENAMEL



The Right Way to Carry Extra Tires





Duplex on Running Board of Ford Cars

A handy man with carpenter's brace and bit and a wrench can attach any of these carriers to the car in thirty minutes,

The **VICTOR** is made of sheet steel in three sections, formed to fit, completely enclose and protect the two tires, as shown.
The **DUPLEX** is an abbreviated portion of the lower half section of the **VICTOR** with bars across the top.
The **SIMPLEX** is for one tire only. **DUPLEX** and **SIMPLEX** are made in all sizes.

Made by THE INTERNATIONAL STAMPING CO., 1852 Austin Avenue, Chicago, Illinois

---

SEATS A SPECIALTY



THE HILL MANUFACTURING CO.
25-27 FULLER ST. BUFFALO, N. Y.

LEE *Tires*

PNEUMATIC NON-SKID PUNCTURE-PROOF

Lee Tire & Rubber Co., Conshohocken, Pa.

GASOLINE COUPON BOOKS

AUTO SUPPLIES COUPON BOOKS

INEXPENSIVE. F. O. B. DESTINATION. SAMPLES FREE.

WE HAVE SOLD MILLIONS OF OUR COUPON BOOKS!

J. P. FORBES, FORBES BLDG., COSHOCTON, O.

STOP!-THROWING MONEY AWAY ON TIRES



Don't Throw Away Your Worn Tires Like So Much Junk

It is unnecessary, highly extravagant, and altogether uncalled for. **Retread them at a LOW COST with "Pacific Fibre Treads" and cut down your tire expense $50 to $500 a year.** Our Free Booklet tells you how.

In 15 Minutes Old Tires Can be Made Good For

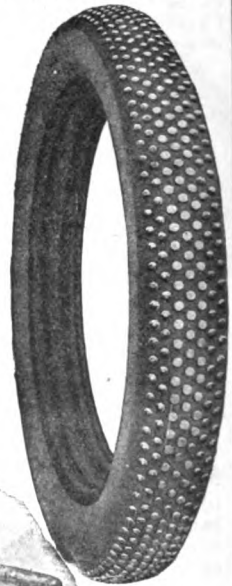
5,000 Miles More

Guaranteed Puncture Proof

Blow-out-Proof; Skid-Proof; Rut-cut-Proof; Rim-cut-Proof; Oil-Proof; Gasoline-Proof; Tear-Proof; Road-Proof; Trouble-Proof.

Special Discount

Offered to motorists in new territory on first shipment direct from factory.



"Pacific Treads"

Are Not Leather Treads

Leather Treads, processed, treated, or tanned as many times as you can imagine, will stretch and sag and being non-resilient can never resume their original shape again with the tire.

Pacific Treads on the other hand fit your tire like a glove and expand or contract evenly, smoothly and instantly—as little or as much as is required—never any more.

We Ship on Approval, Pay the Express and Take All the Risks

Pacific Treads will save every motorist who uses them time, worry, and expense. We will prove it to you at our own expense if you will fill out the coupon below. Mail it today.

Fill Out and Mail NOW

V. K. STURGES, Oakland, Calif.

Gentlemen:—Send me your book, **"5,000 Miles Without a Puncture,"** fully describing your new 1915 Model French Fibre Pacific Tread.

Name.....

Address.....

City and State.....

My Tire Sizes are.....



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Look for the name LEAK-PROOF stamped on the Ring



I want some LEAK-PROOF Piston Rings---have you them?

Salesman—Yes, sir—here they are.

Customer—But these are not LEAK-PROOF Piston Rings.

Salesman—Yes, sir—they are leak proof—they claim to stop the leaks.

Customer—But they're not the genuine LEAK-PROOF Piston Rings.

Salesman—That's what we bought them for—leak proof piston rings.

Customer—Then either you've been deceived or are trying to deceive me.

Salesman—What is the difference between those you want and these—aren't they all more or less alike?

Customer—Only in their claims—*not in results.*

Salesman—Are they made differently?

Customer—Yes, decidedly—the construction is absolutely different—it is the construction that makes the genuine LEAK-PROOF Rings efficient—that actually gives more power, maximum compression and minimum carbonization, that maintains perfect bearing on the cylinder walls and retains elasticity.

Salesman—What is it that does all this?

Customer—Two-piece—angle to angle, interlocking construction with the opening in each half of the ring sealed by the other half. If the ring is not a two-piece ring of this special, patented angle to angle, interlocking style of construction the ring is an inefficient imitation.

Salesman—Well—we haven't that kind of ring; can't I sell you the others?

Customer—No—when I buy rings to produce results I want sure results—I have used LEAK-PROOF Rings and gotten results—I don't want to experiment. Good-bye.

You—Mr. Motor Owner—follow his example. As a further aid and protection to you LEAK-PROOF is stamped in this specially designed and registered style of lettering—LEAK-PROOF on every genuine LEAK-PROOF Piston Ring—all others are imitations.

"Ask the User"

Made in All Sizes



Easily Adjusted



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Sold by all up-to-date supply houses, garages and repair shops

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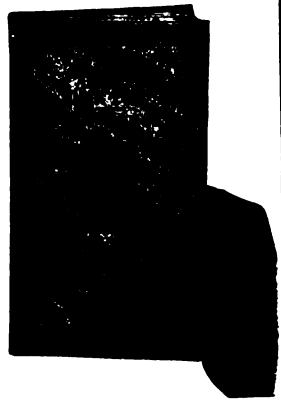
Canadian Factory—W. H. Banfield & Sons, No. 120 Adelaide Street West, Toronto

New York—1919-29 Broadway, at 64th St. **Pittsburgh**—902 Second National Bank Bldg. **Kansas City**—513 New Nelson Bldg. **Chicago**—Suite 718 Michigan Blvd. Bldg. **San Francisco**—164 Hansford Bldg. **Los Angeles**—224 Central Bldg. **Dallas**—509 Juanita Bldg. **St. Paul**—American Nat. Bank Bldg.

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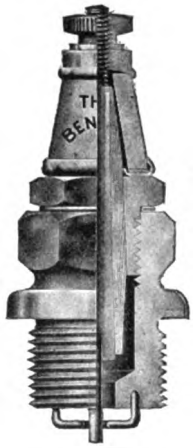
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When your engine balks on the road and the plugs act mysteriously, sometimes all right, sometimes all wrong, when you know carbon is **not** present, but some plug obstinately persists in missing—when a plug sparks if taken out into the open but fails to spark in the motor—do you know exactly how to go after and remedy the trouble? **You would** if you had read this booklet.

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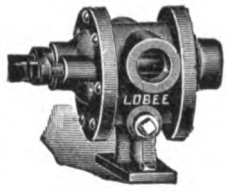
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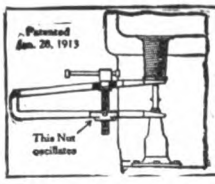
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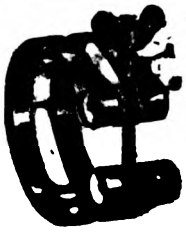


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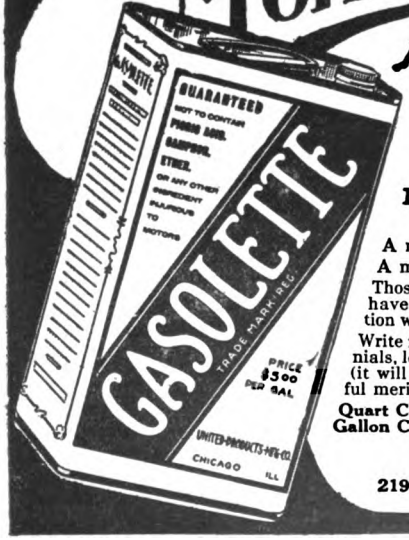
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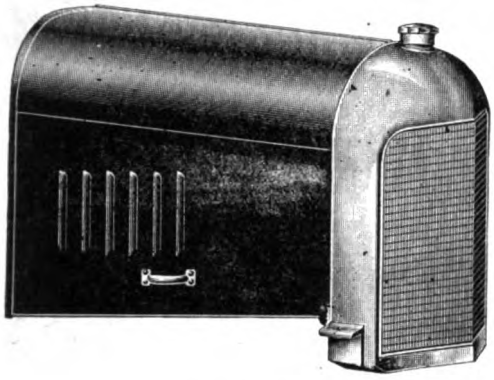
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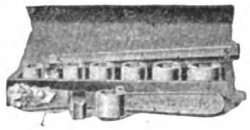
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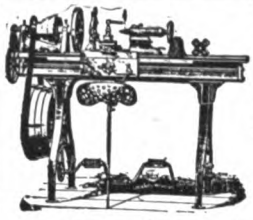
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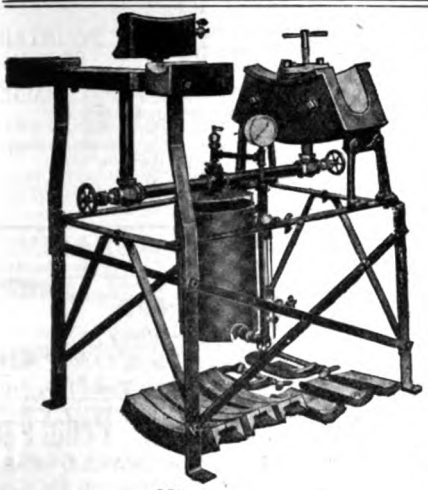


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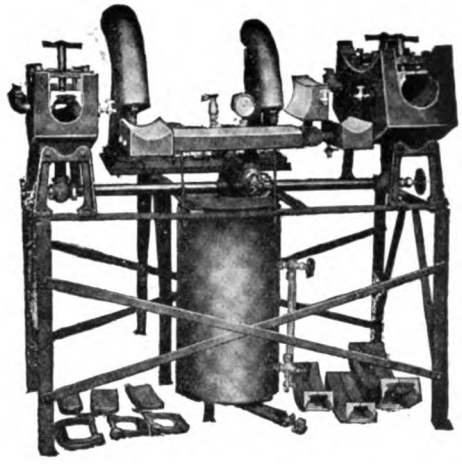
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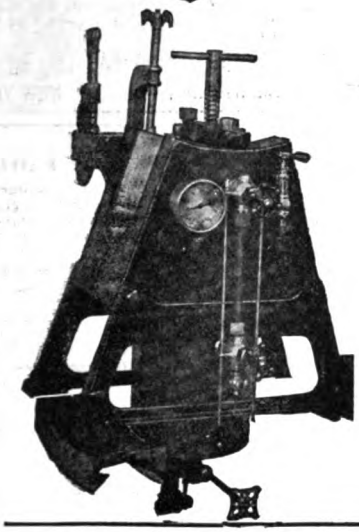
Your Vulcanizer is a wonder. I couldn't get along without it.—*H. Getman Chaumont, N.Y. 3-23-15.*

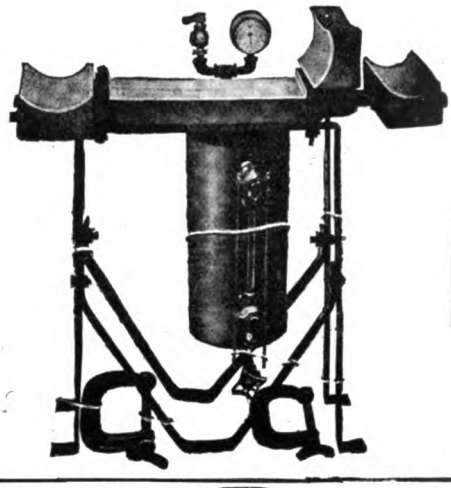
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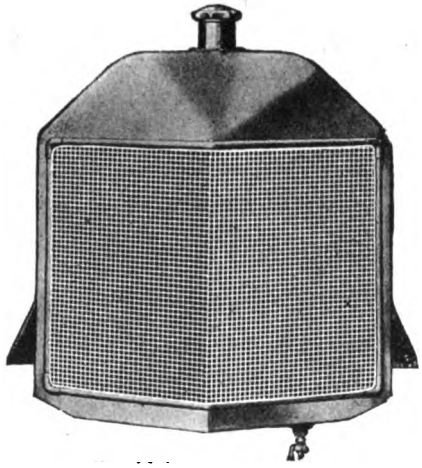
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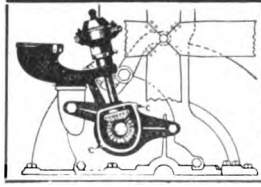
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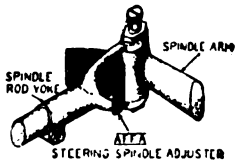
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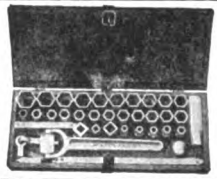
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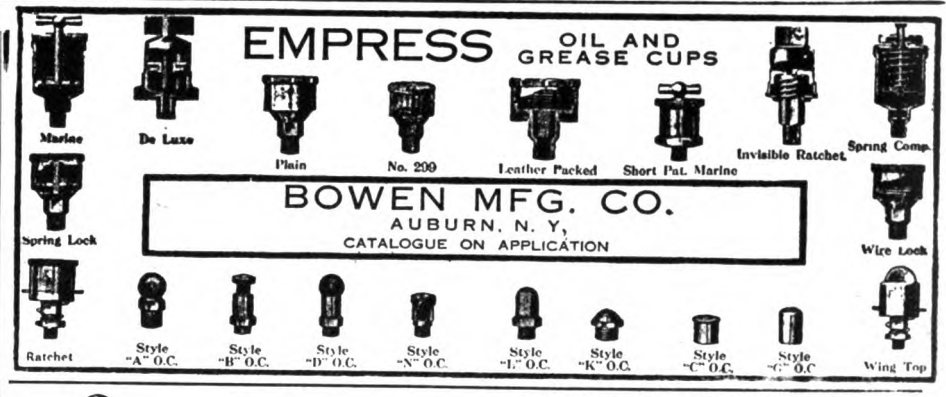


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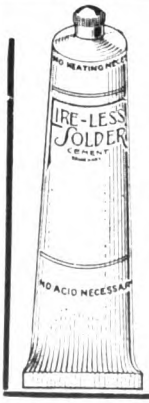
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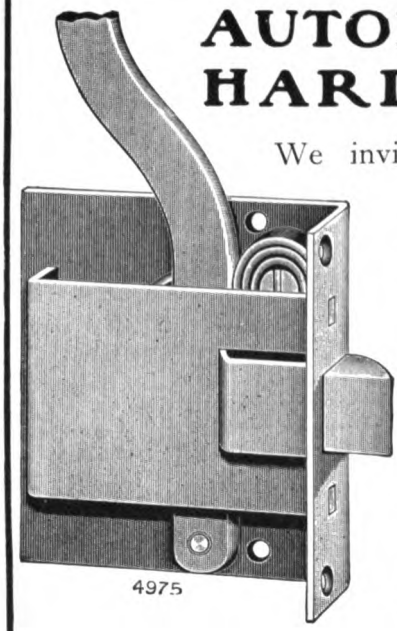
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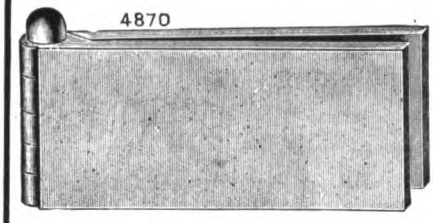
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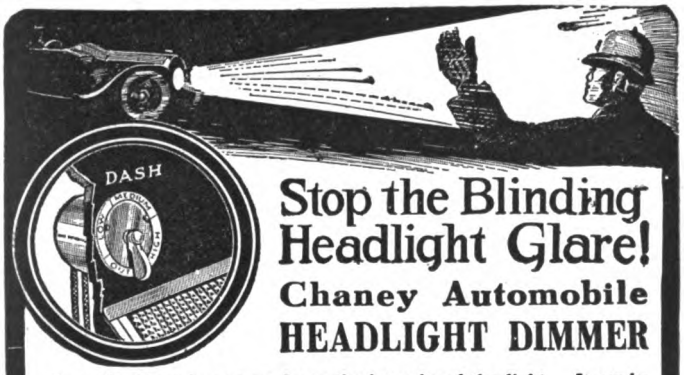
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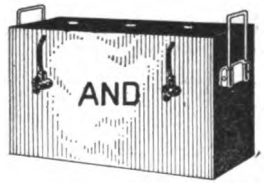
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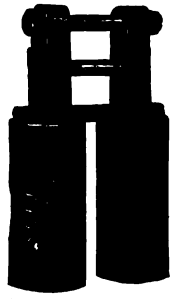
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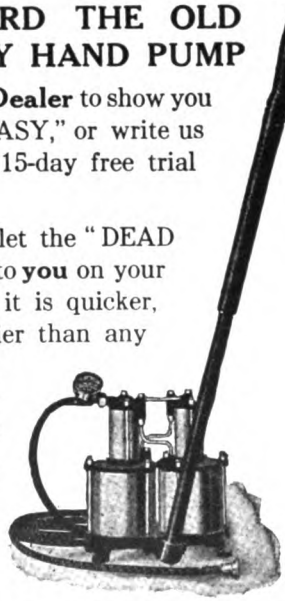
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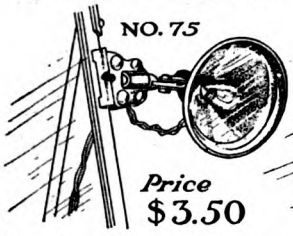
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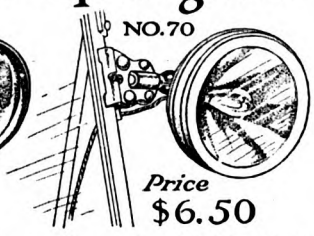


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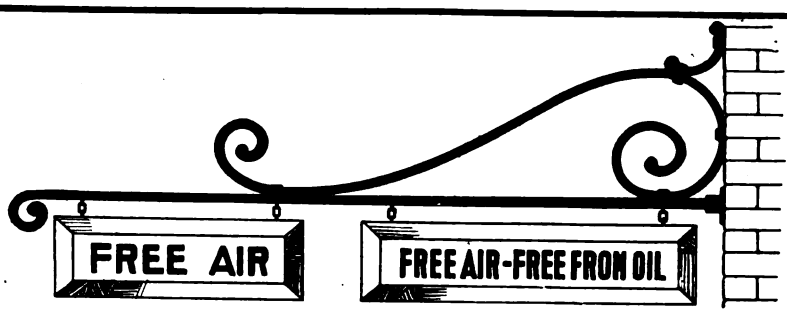
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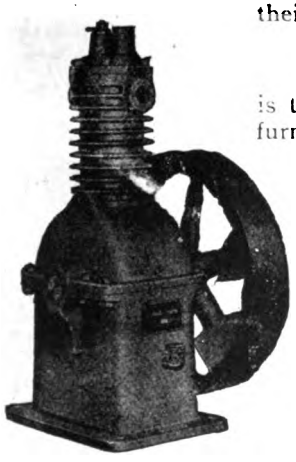
WHICH



OF THESE TWO SIGNS WILL BRING YOU THE MOST CUSTOMERS



THIS OR THIS

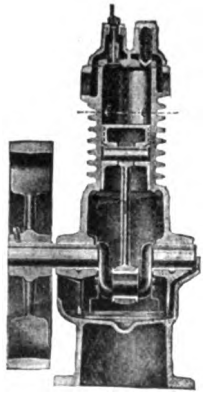


You don't hesitate—YOU KNOW—that by giving your customers AIR FREE FROM OIL you increase their tire mileage and decrease their tire expense, but do you know that the

CURTIS GARAGE AIR COMPRESSOR

is the only automatically lubricated garage air compressor that will furnish AIR FREE FROM OIL and won't flood the cylinders with oil.

The oil that will run most compressors 10 hours will run a CURTIS 100 hours. That is only one of many such good features. Each CURTIS is regularly equipped with a device that permits starting up with pressure in the tank with no more power than if the tank were empty. THEN THE COOLING SYSTEM—note the fan fly-wheel. Note the die cast bearings, the controlled splash oiling.



NOTE THE OILING FEATURE

Write us for full particulars of either stationary or portable outfits . . . .

CURTIS PNEUMATIC MCHY. CO., 1530 Kienlen, St. Louis, Mo.

CHICAGO—Marquette Building. **NEW YORK—30 Church Street.**

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PORTABLE ELECTRIC DRILLS
1/4" and up. All currents.

Portable Electric Tools

Motorshaft Combinations

Buffing - Drilling - Grinding

No Garage—Public or Private—is Complete Without One of these Tools

Pay for Themselves in 30 Days

Stow Manufacturing Company
400 State Street - - Binghamton, N. Y.

Oldest Portable Tool Manufacturers in America

Write for Full Particulars.



SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

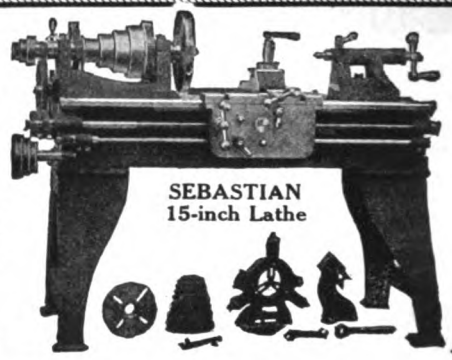
STANDARD FOR QUALITY—LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.
The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)

THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN
15-inch Lathe

THE LIGHT THAT'S RIGHT

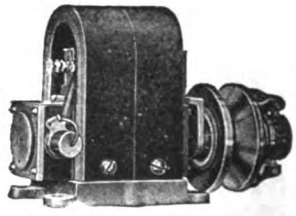
EUREKA LITE

The fact is with our Eureka, you can light almost any old car as light as day, but you can't afford to light a Ford in any other way.

LOW COST—HIGH EFFICIENCY

Used with or without storage battery

¶ Special attachments for Ford, Overland, Maxwell and other cars. ¶ Prices $24.00 and up, according to capacity required. ¶ Large Profit to dealers. ¶ *Write for particulars Today.*

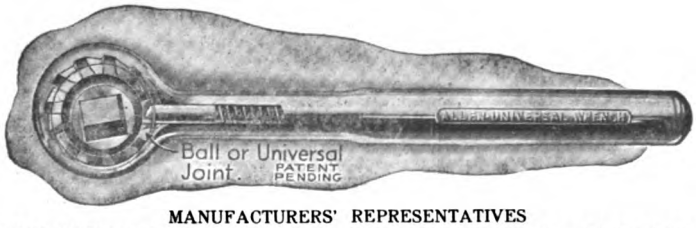


Ball Bearings Throughout

HENRICKS MAGNETO & ELECTRIC CO.,
Formerly HENRICKS NOVELTY COMPANY, 1499 St. Paul Street, Indianapolis, Ind.

ALLEN-UNIVERSAL WRENCH

"The Wrench With Universal Action"



A Drop Forged Wrench, Carefully Machined. All Parts Hardened. Fully Guaranteed. The "Universal Joint" principle makes this tool adaptable for use at any angle and in places where a straight wrench cannot be used.

Write for Circular D. R. 4.

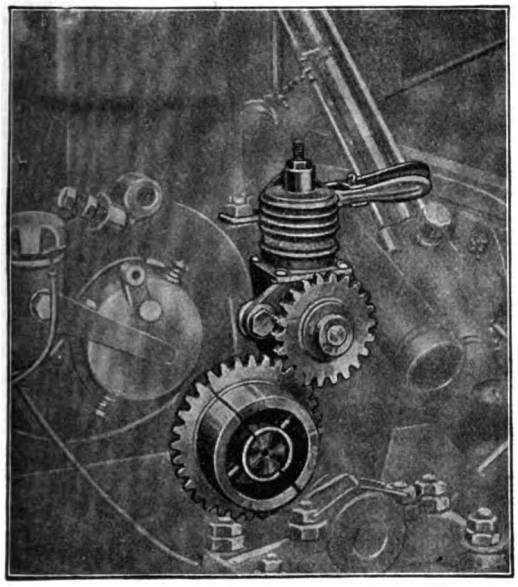


Price $8.00

MANUFACTURERS' REPRESENTATIVES
STEWART & CO., New York City N. A. PETRY CO., Inc., Philadelphia, Pa.
WEISS-BOSLEY SALES CO., St. Louis, Mo.
H. G. PARO, Chicago, Ill. M. A. BRYTE, San Francisco, Cal.

ALLEN WRENCH & TOOL CO., PROVIDENCE, R. I.

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ENGINE-DRIVEN MANZEL TIRE PUMP

FOR FORD CARS

A practical, accurately built, all metal engine-driven tire pump for Ford cars. Will inflate any Ford tire in less than two minutes, and can be installed by anyone. There are no holes to drill or machine work of any kind to be done in making the attachment.

PRICE, $7.50

Complete with steel gears, 12-ft. hose, and pressure gauge.
Everything ready for immediate attachment.

This Is a Money-Maker For You, Mr. Dealer

Every Ford owner will purchase an engine-driven tire pump at this low price, and you can guarantee the Manzel without the slightest hesitation. Tell your customers in the most unqualified terms that we stand behind the Manzel Ford Pump. Let him install it on his car and try it for 30 days. If at the end of that time he is not satisfied, take back the pump and we will make it good.



Two-Cylinder Pumps For the Larger Cars

Our 2-cylinder tire pump which has always sold for $28.00 and $30.00 is now sold for only $20.00, complete with fittings, and we can furnish fittings for over 150 different models of cars.

Write Today for Our Liberal Terms on Both Models

MANZEL BROTHERS COMPANY, 321-323 Babcock St., BUFFALO, N. Y.

MILLER'S High Pressure Air Pump

Made in Four Styles

MILLER'S HIGH PRESSURE AIR PUMP is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to 300 lbs. pressure.

PUMP ONLY, PRICE, SINGLE, $35.00



ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers; adjustable sectional vulcanizers; inner tube vulcanizers; inside vulcanizers; retreading vulcanizers; adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.

Miller's Rubber Instruction Book
Price Prepaid, $1.00 Net

MILLER'S REPAIR MATERIALS

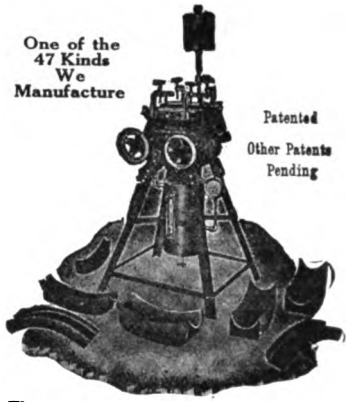
Common Tread Stock, per lb.	$0.50
Standard Tread Stock, per lb.	.70
High Grade Tread Stock, per lb.	.85
Cement Stock for Casings	1.25
Cement Stock for Tubes	1.75
Inside Tube Patching Rubber, cured one side, per lb.	1.50
No-Cement Patches, per dozen packages	2.50
No-Cement Patching Rubber, sheet form, per lb.	2.00
Fabric Sea Island Cotton, 17½ ounces, one or two sides	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides	.06
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, Net	2.00
*Miller's Three in One Repair Stock	1.20

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 10 lb. lots or over, 10 and 5 per cent. On 20 pound orders, 25 and 5 per cent for cash.

MILLER'S IMPROVED ADJUSTABLE SECTIONAL VULCANIZERS

One of the 47 Kinds We Manufacture



Patented
Other Patents Pending

That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Models.....$42.00

MILLER'S SPRING SPREADER



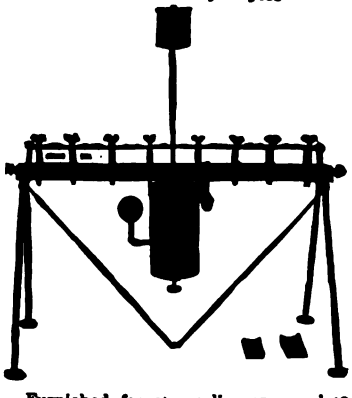
Quickly adjusted to any width of spring and when adjusted all that is necessary to open up a space between the leaves for insertion of oil is to tilt cam lever.

Many a good automobile has been condemned as a hard rider, simply for the want of oil between the spring leaves. It is a fact, that if the springs are not oiled occasionally that they will rust and stiffen, nearly equal to a solid bar of iron.

Price $1.00

Miller's Inner Tube Vulcanizers

Made in Twenty Styles

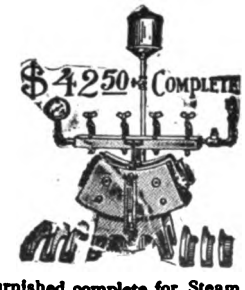


Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

MILLER'S SECTIONAL VULCANIZER

with Tube Attachment



Furnished complete for Steam Line } Gas or Gasoline Burner.

Write for our 52 Page catalog which lists Vulcanizers of All Sizes and Styles, and Equipment for Tire Shops. Write for prices on Miller's Heavy Wrapped and "Cog" Tread Tires and Heavy Red Tubes. Address Dept. D.

CHAS. E. MILLER
Anderson Rubber Works
ANDERSON, IND., U. S. A.

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National Rubber Tire Filler

THE ONLY GENUINE ALL RUBBER TIRE FILLER



It is made of the best grade of rubber, cut in small particles molded to a pattern, properly vulcanized by a special process, laid inside the tire and put on with the same pressure as required by air. No chemicals, oils, glucose, or gelatine to damage your tires; nothing but high-grade Rubber. No limit to its life and wearing qualities. Can be changed from one tire to another as often as is necessary. A perfect substitute for air. Rides just as easy after 30,000 miles as when new. From both a business and pleasure standpoint it is the greatest economical factor ever produced.

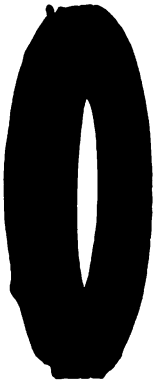
WRITE AT ONCE FOR FULL PARTICULARS AND SAMPLE

National Rubber Filler Company
208 College Street **Midlothian, Texas**

The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

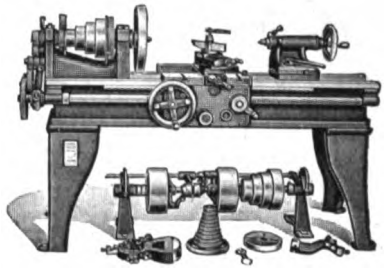
we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,

"Worn Out Tires Made New."

Please mention the size of your tires.

TRIPLE TREAD MFG. CO.
1542 MICHIGAN AVENUE **CHICAGO**
Factories: San Francisco, Chicago, Winnipeg



The Lathe for Your Shop

YOU should pick the lathe you install in your garage or repair shop with care; know it represents full value for the price you pay; be certain that it is designed right; that it is constructed of approved materials; and last, but by no means least, be sure that the dealer who sells you your lathe is reliable and will do as he agrees.

We claim that our line of Expert Lathes meets all of the above requirements. In addition, we claim that ours are sold under a stronger and more comprehensive guarantee of satisfaction than any other lathes on the market. And our prices are low—$63.00 and up. If you plan to install a lathe in your shop you should get our Machinery Catalog. Write for it today—It's free. Ask for Catalog No. 57A211.

Sears, Roebuck and Co., Chicago

The unique "Porcupine" drive on the

CARLETON GENERATOR

(7 volts, 49 c. p. direct current) solves the lighting problem.

Gives a steady light with or without storage batteries.



Special attaching brackets for Ford, Saxon and Metz cars, but applicable to any car, cycle, boat or miniature stationary plant.

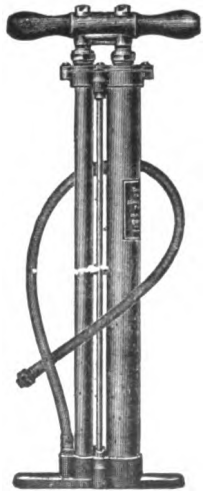
Highest quality and moderate price. Also Automatic Cut-out, Storage Batteries, Governors and Ammeters.

Descriptive Bulletin explains.

Local demonstrating agents wanted where there are no dealers.

The Carleton Company

180 Summer, Boston



THE CARVER

{COMPOUND
{DOUBLE-ACTING

PUMP

When a Carver Pump is once Tried we don't hear---

Why the price? We have others.

All pumps are alike, etc.

Because---

In principle it's different. It's made different. It pumps different. It lasts different

The result is different, and worth more than $6.00.

The Osborne & Stephenson Mfg. Co.
M and C Streets, **PLAINVILLE, CONN.**

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MARATHON TIRES

Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

SPEED MARATHON ENDURANCE

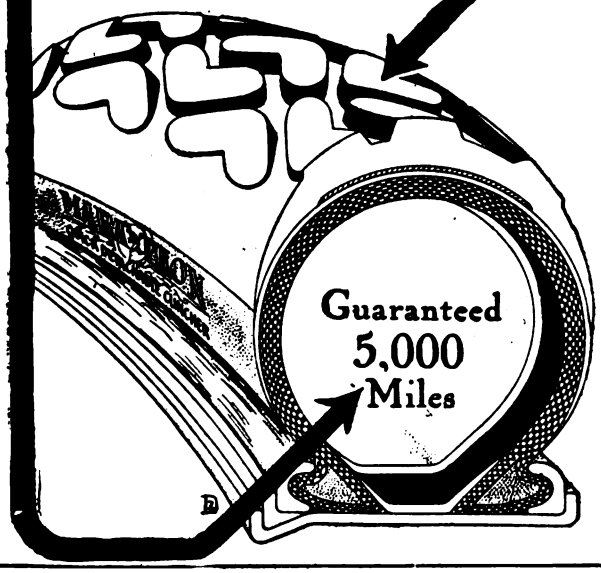
TIRES

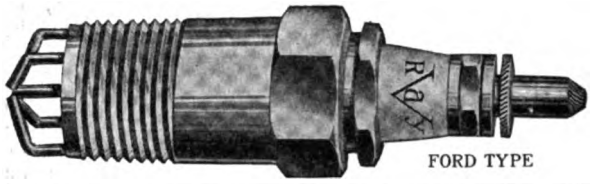
Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS,
OHIO



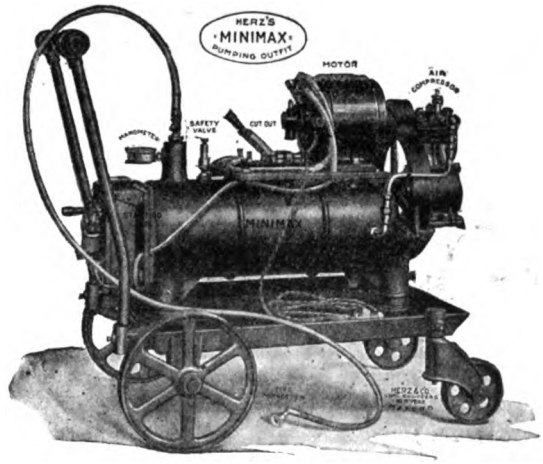




Ask us for attractive literature and 12"x19" enlargement (wall hanger) of above size chart.

The V-Ray Co. Marshalltown, Ia.

The Best Thing in Your Garage!



The Famous "Minimax" of Europe.

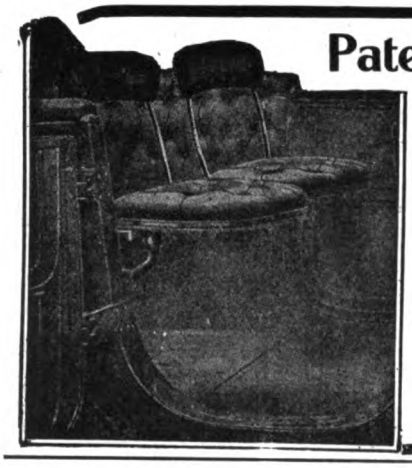
Herz Garage Pump

Inexpensive in both first price and cost of operation. Highly efficient—holds enough air, at 200 pounds compression, to inflate four tires after the power has been cut off. No losses by leakage. Has double-cylinder air compressor and splash lubrication. Very convenient—can be wheeled anywhere and attached to any lamp socket. Occupies very little space—height, 30 in.; length 35 in.; weight, 280 lbs. Made for any kind of current WRITE FOR PARTICULARS.

HERZ & CO., 245 W. 55th St. (nr. Broadway), New York

Mfrs. of the world-renowned Herz-Plug, Herz-Timer and Herz-Distributor

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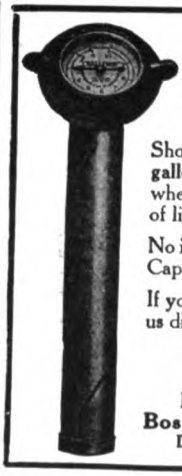
Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

Hodge & Graves Co.
AMESBURY, MASS.



The "CHALLENGE"

A PERFECT Combination Gasoline Gage and Filler Cap
For FORD CARS

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

Dealers

If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.

Quality Counts

BOSTON AUTO GAGE CO.
Boston Massachusetts
DETROIT OFFICE: 1231 Woodward Avenue



Perfect Valves— Always

Here is the tool you need to keep valves in perfect order. Regrinds and reseats in one-quarter the time needed by hand—and is 100% accurate. The

FOSNACHT VALVE RESEATER

is simple in operation—no expert is required. No emery—no dirt—no tearing down of motor. Pays its cost in a week. Brings its owner repair work his competitor is now getting. Look into this matter NOW.

Our **free book** shows how the **Fosnacht Valve Reseater** will quickly bring you greater profits. **Write for it today**—while you think of it. Address

H. G. Paro

Suite 763, Michigan Boulevard Building
CHICAGO, ILL.

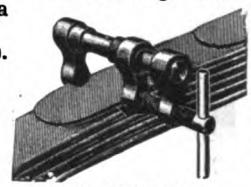
KNOWLSON'S SPRING LEAF SPREADER



Highest Grade Drop Forgings. Nickel Plated and Polished.

Gives 100% Easier Riding and STOPS THE SQUEAK

A practical, durable tool for spreading spring leaves for lubricating. Nothing better as a temporary **Repair Clamp.**

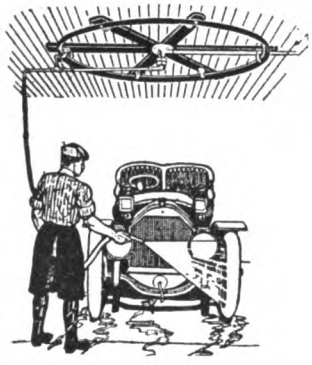


One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

Adjustable to any size auto spring.
Sent prepaid anywhere, $1.50.

GUARANTEED

SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., Ann Arbor, Mich.



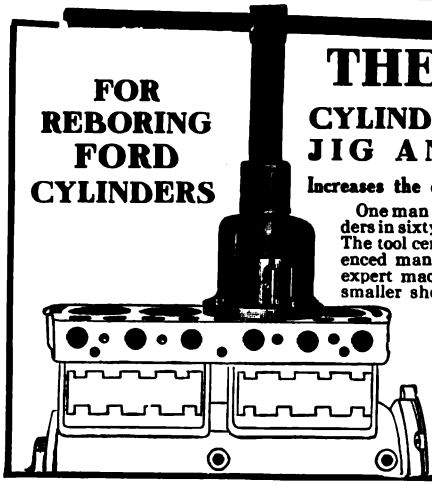
KEEP YOUR CAR CLEAN WITH A "PERFECT" VEHICLE WASHER

SAVES LABOR, WATER and HOSE

Send for Catalogue

PERFECT MANUFACTURING COMPANY
ALBANY, N. Y.

FOR REBORING FORD CYLINDERS

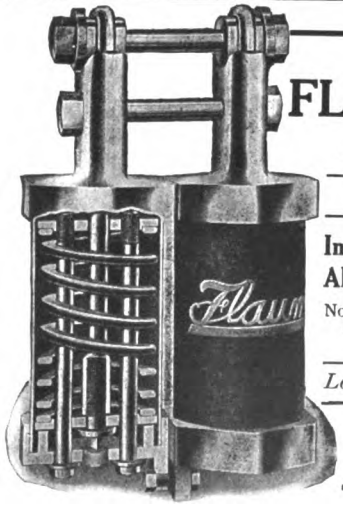


THE DAVIS CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.



THE FLAUM SHOCK ABSORBER

Simple and Effective

Instantaneously Adjustable to All Road and Load Conditions

No wearing parts or friction surfaces; consequently, no oiling or packing in grease is necessary.

Lasts the Lifetime of the Car

Flaum Shock Absorber Corp.
Motor Mart Bldg., 1876 B'way, N.Y.C.

WELDING AUTOMOBILE PARTS

Cracked or Broken



Cylinders, Crank Shafts,
Crank Cases, Housings, Frames,
Axles, any metals of any shapes or thicknesses, including

ALUMINUM PARTS

All work absolutely GUARANTEED

¶ Write for estimates.

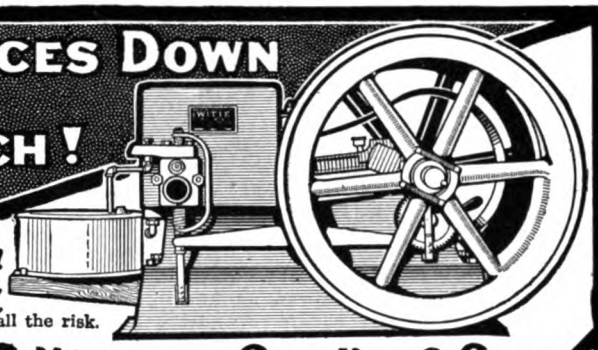
¶ Complete Oxy-Acetylene Welding and Cutting Plants installed.

OXWELD ACETYLENE COMPANY
646 Frelinghuysen Avenue, Newark, N. J. - 37th Street and Jasper Place, Chicago, Ill.

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ENGINE PRICES DOWN ANOTHER NOTCH!



Look at these Prices!

2 H-P, $34.95; 4 H-P, $69.75;
6 H-P, $97.75; 8 H-P, $139.65; 12 H-P, $197.00.
Other sizes up to 22 H-P, proportionally low.

Direct from Factory to User!

Why pay two prices for any good engine, or take chances on a poor, or an unknown engine, when the "WITTE" costs so little, and saves you all the risk.

WITTE ENGINES, Kerosene, Gasoline & Gas

LET ME send you a "WITTE" engine to earn its own cost while you pay for it. It's cheaper than doing without one. I have proved that to thousands who are now WITTE users.
Ed. H. Witte.

Stationary, Portable and Saw-rig Styles.

Liberal 5-Year Guaranty CASH OR EASY TERMS.

GET your engine from an engine specialist. All my life I have done nothing but make engines. **The success of my customers and nothing else, makes my success.** I've simply got to sell better engines. I can't lose money on an engine and make back the loss on something else. My factory is the only one, that started in the engine business 28 years ago, which has come through successfully under the same management with which it started. Only WITTE engine-quality has made that possible.

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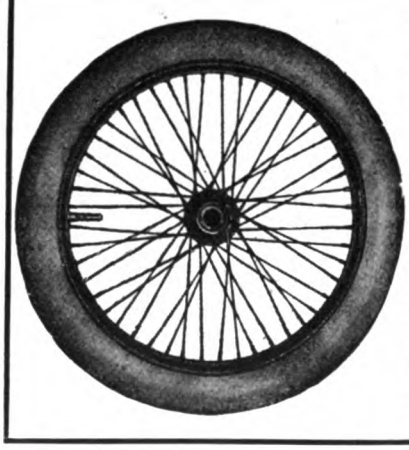
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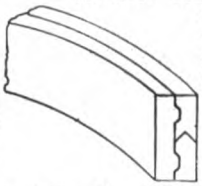
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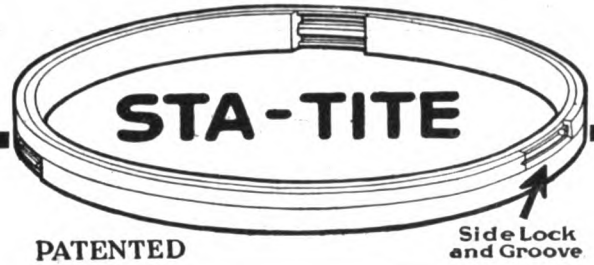
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Efficiency Ed.



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Complete protection from all road and rut wear.
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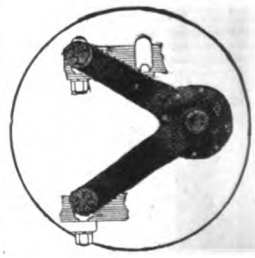
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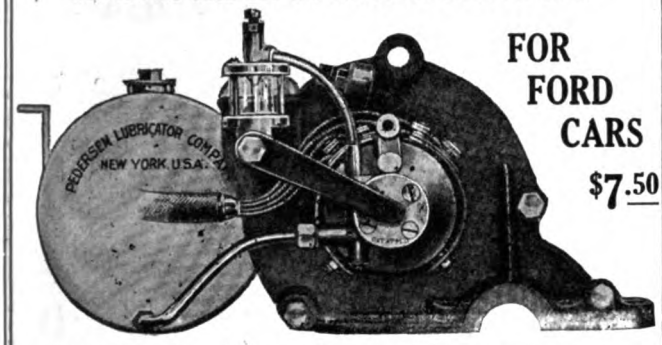
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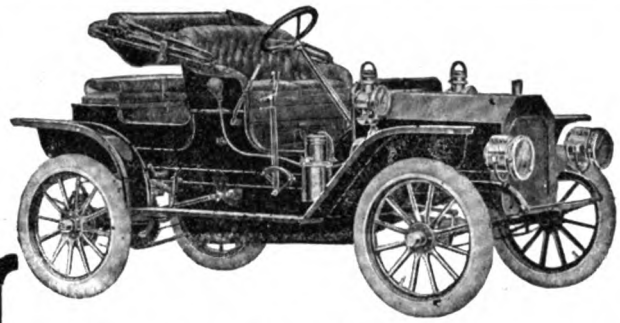
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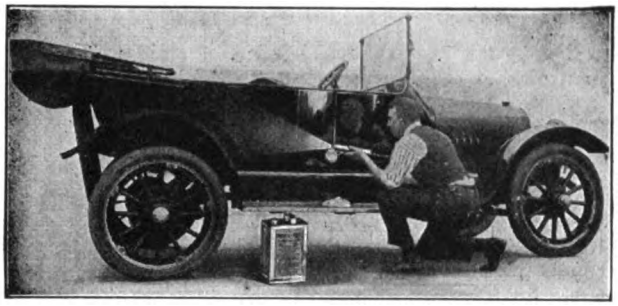
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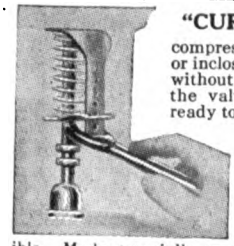
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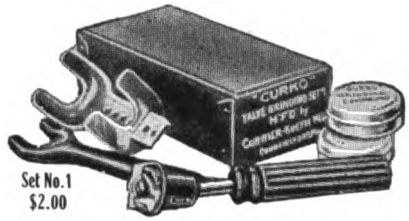
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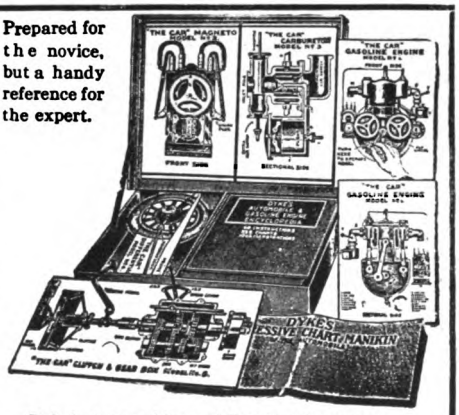
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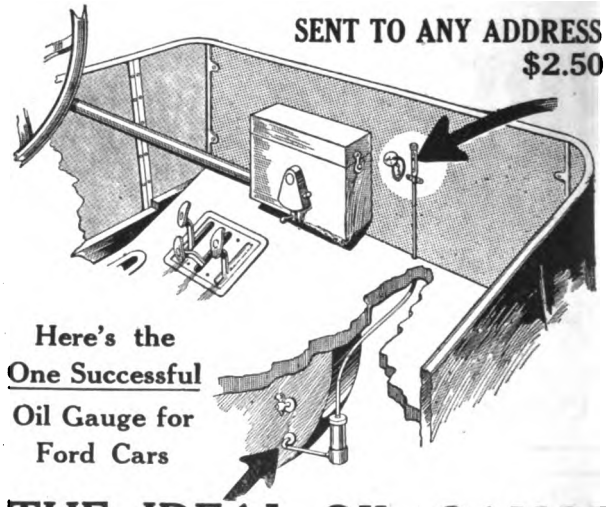
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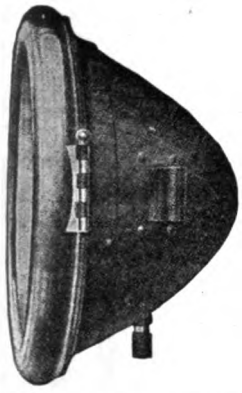
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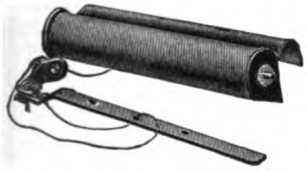


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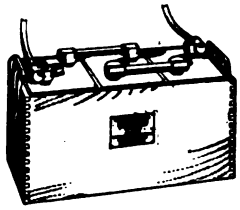
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Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

The engraving shown gives the correct appearance of this clock.

This offer is good for either old or new subscribers.

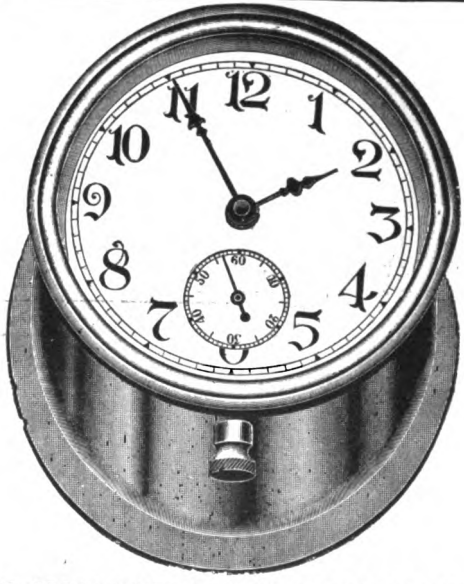
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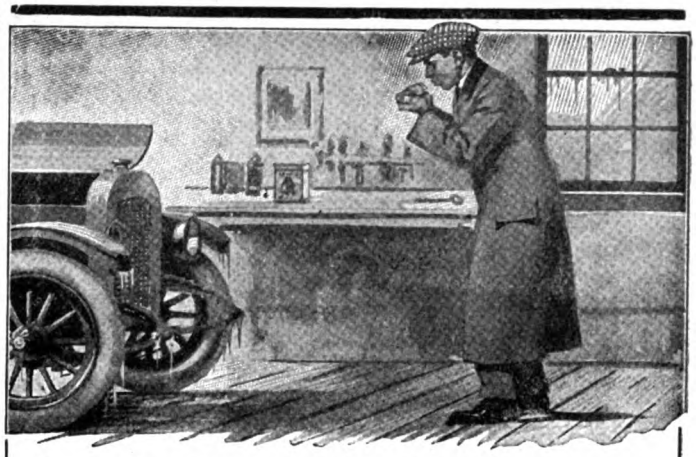
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We can refer to hundreds of satisfied customers. Write today for detailed information, advising numbers of cylinders and bore diameters, for our guidance in making quotations.

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Take advantage of our special spring prices by buying now. A Stewart Heater gives you warm water for washing all the year round. In winter it prevents freezing of your radiator, saves repair bills, does away with the stiff-fingered inconvenience of making adjustments in a cold garage.

There is a Stewart Heater for every size and type of private garage—from $21 up. Your garage needs one. If you are handy at all, you can install it yourself. We provide special arrangements for water heating where there is no town supply. Our catalog gives complete information. A line brings it.

"STEWART"
TRADE MARK

GARAGE HEATER

FULLER & WARREN COMPANY
Madison Street Troy, New York

CITRUS
CUBA

Wonderfully rich land, good water, good title. Outdoor life the year 'round. A ten acre grape fruit grove will pay you $2,500 per annum for life. Eastern Cuba is to be the great winter playground of the American. The land is so fertile and accessible that fortunes are to be made in fruits and vegetables. Great country to relieve and cure rheumatism, nervous and respiratory diseases.

Present price of land $50 per acre. No frost and no irrigation or fertilization required. The young man's opportunity and the old man's paradise.

The grape fruit raised here surpasses in flavor and quality anything grown in Florida or Southern California.

The most delightful place in the world for a winter home, and very accessible. Boats sail from New York to all the principal ports, and at very reasonable rates.

For literature and further details address the

CITRUS DEVELOPMENT CO.
101 Tremont St., Boston, Mass.



LEAKS?

Your customers will never kick about oil, gasoline or water leaks if you use a packing that is made **especially** for such joints—ENDURA.

Your reputation for careful, lasting work will grow, if you use a packing that can't be affected by oil, gasoline or water—ENDURA.

Just send a postal for a valuable free chart, "How to Pack the Car," and free ENDURA samples that will prove themselves before your eyes.



Endura Manufacturing Co.
6305 Eastwick Avenue
Philadelphia, Pa.

Mail This Coupon

Send me free chart, "How to Pack the Car," and free Endura samples.

Name .....
Address .....
City .....
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GET THEM NOW!

The Old Way



More power, better acceleration, greater mileage per gallon and less carbon trouble—you can have all these by adding

SU-DIG SERIES PLUGS

to the plugs you now have. Get them now, of your dealer or from us, and have the benefit of them all this season.

Interesting booklet free.

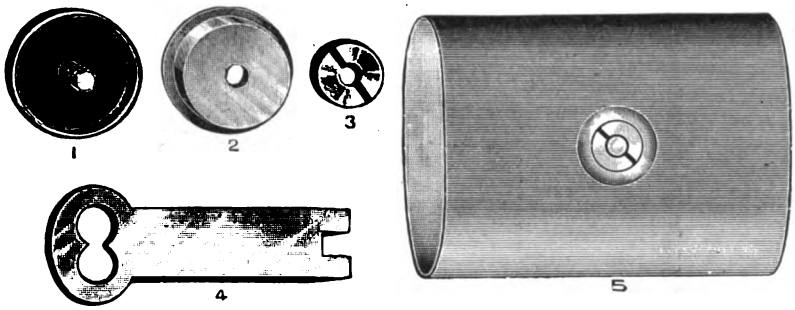
Dealers—SU-DIG Plugs mean extra sales and profits Write us today.

Superior Motor Specialty Co., 40 N. 4th St., Philadelphia

The SU-DIG Way



One Minute Answer to Flat Tires



¶ An inexperienced person can make a permanent repair on an inner tube in ONE MINUTE.
¶ Plug will repair any hole smaller than itself.
¶ Unlike any other inner tube repair—they can be used over and over again.
¶ Cheapest and best repair that can be made on an inner tube.
¶ GUARANTEED not to Chafe nor Cut the TUBE or FABRIC.
¶ Automatically vulcanize themselves to the inner tube and cannot leak.
¶ The saving in expense for repairing punctures in inner tubes by the use of Spitler Puncture Plugs is a conservative economy that will appeal to all motorists.
¶ PRICE of 1-inch size, $1.00 for set of 4 Plugs and one wrench mounted on heavy cardboard and each set put up in a neat box.

SPITLER PUNCTURE PLUGS ECLIPSE ALL OTHER INNER TUBE REPAIRS. LIVE AGENTS WANTED. WRITE TODAY.

B. W. SPITLER, - - - - 52 Clayburne St., Dorchester, Mass.



Gouin's Anti-Rattler For Auto Doors

Car Owners Have Long Been Looking for this Device———

Can be applied by anyone in a few minutes, and instantly puts a tension on your door so that rattling is absolutely impossible. They act the same way on the hoods and keep them from rattling. Simply rivet under hood ledge and radiator ledge.

The Biggest Seller in the Automobile Field

PRICE 25 CENTS EACH
Or a Set of Four for $1.00

Money back if not as represented.

Dealers and Jobbers—Write for our liberal quotations. State and County distributors wanted, some good territory open, but it will not last long, so write at once. Secure this fast selling article at once.

Address all communications to

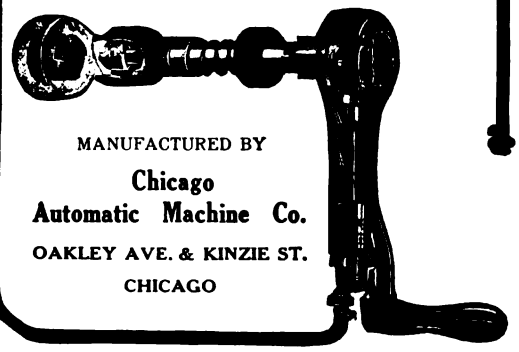
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14 Roosevelt Ave., Poughkeepsie, N. Y.

DE LAUNTY TIRE PUMP AND CRANK--Combined

Pump is inside of Crank.

Can be put on in one hour—no machine work.

Sent on 30 Days' Trial

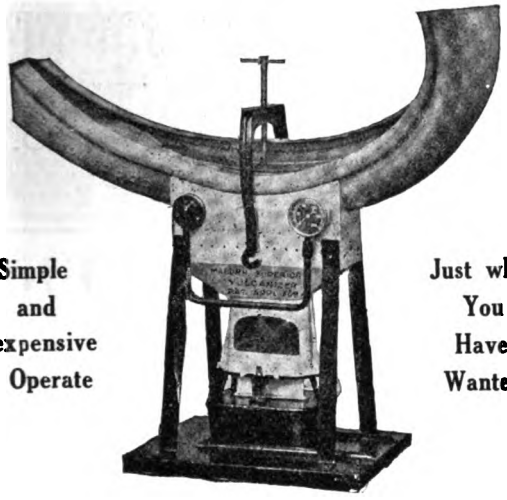


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Chicago Automatic Machine Co.
OAKLEY AVE. & KINZIE ST.
CHICAGO

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Economy Is Wealth

Do Your Own Vulcanizing with a SUPERIOR VULCANIZER



Simple and Inexpensive to Operate

Just what You Have Wanted

Write for Catalogue

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16 FULTON AVENUE - ROCHESTER, N. Y.

HARRIS

TRADE MARK REG. U.S. PAT. OFF.

OILS AND GREASES

DOES SHE SMOKE?

Well, she ought not to. No matter whether she is old or young, your car can be properly lubricated. Smoke means that your lubricant is being wasted—that carbon is depositing on piston heads and valves.

You will find, by using pure HARRIS OILS, that the smoke nuisance can be eliminated. That is one of the reasons why so many dealers recommend them.

Sold in Barrels, Half-Barrels, 10 Gallon, 5 Gallon and 1 Gallon Cans.



"A Little Goes A Long Way and Every Drop Counts."

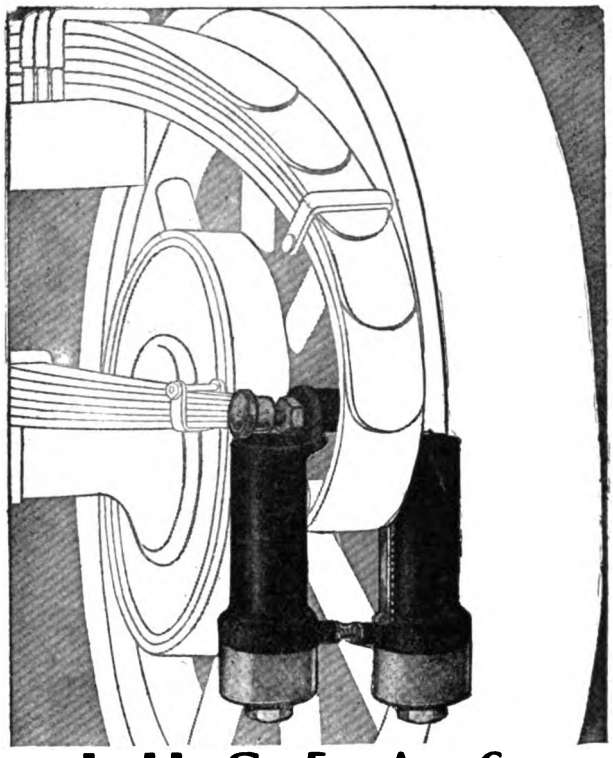
A. W. HARRIS OIL CO.,

326 S. Water St., Providence, R. I.

Branch: 143 No. Wabash Ave., Chicago, Ill.

SAGER PRODUCT

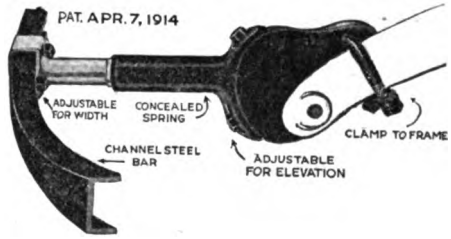
Endorsed by 20 Manufacturers and Over 250,000 Motorists.
Ten Years of Manufacturing.



J. H. S. For Any Car

Highest Standard of Quality. Minimum of Cost. Indispensable for Comfort and Economy of Upkeep. Make Every Road a Boulevard

Free Trial Offer. A Guarantee Worth While.



SAGER BUMPERS

Recognized as **best** and **oldest** in the trade. **Channel—Triangle—Square and Round Bars. List Price $5.00 and Upwards.**

Big discounts to the trade. Write also for a Bumper Rack.

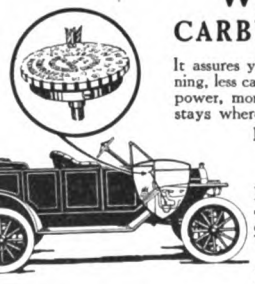
We have the best proposition on Ford Absorbers, Ford Bumpers, Ford Auxiliary Radius Rods and Ford Truss Rods.

J. H. SAGER CO., 291 South Avenue, Rochester, N. Y.

FORDS

RUN 31 MILES PER GALLON WITH THE

WHITTELSEY CARBURETOR ADJUSTER



It assures you easier starting, better running, less carbon, less overheating, more power, more mileage, easy to handle—stays where set.

1.00

Makes a man master of his carburetor.

GUARANTEED

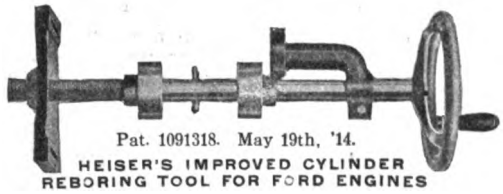
$500 Dollars in Prizes

For longest mileage run on one gallon of gasoline in a Ford car with the aid of the Whittelsey Carburetor Adjuster. Write for particulars.

WHITTELSEY COMPANY
Dept. 2 11 Broadway, New York

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REPAIRMEN! MAKE MONEY REBORING CYLINDERS



Pat. 1091318. May 19th, '14.
HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

This tool accomplishes results the same as grinders costing several hundred dollars and a few jobs enables the machine to pay for itself, besides giving the customer service which it would be impossible to give otherwise.

It requires an expenditure of $6.00, and 90 minutes energy to make the cylinders and pistons as tight, true and new as the day they left the Ford Factory. Reboring and fitting oversize pistons is the most important repair that can be given a worn motor, and this is the most important tool you can buy for your shop, for the low price of the tool together with the low price of the pistons makes it an attractive proposition for the repairman who wants to make his shop popular.

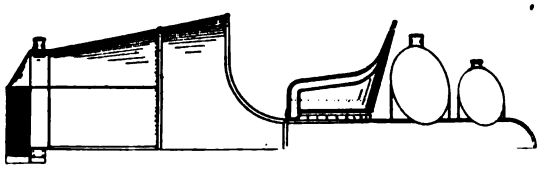
Do it now: The first job of reboring means $ $ $ $ $ to you, if it is done in your shop.

Write for Full Particulars and Proposition

We furnish the oversize pistons, $1.50 each, net.

HEISER SPECIAL TOOL CO. - - - Kingston, Missouri

CHANGE YOUR FORD CAR INTO A SPEEDSTER



You can make this change yourself. Install one of our V-shaped radiators, tapered hood, roadster seats, oil and gasoline tanks. We furnish trunk tool-box in place of small oil tank if desired.

You can buy any part of this outfit at the following prices:

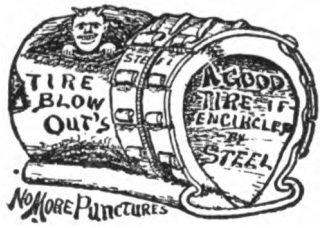
V-shaped radiator, brass	$25.00	Wood brackets for gas tank	$ 1.50
Taper hood, regular length, with handles	8.50	Round straps for gas tank	1.50
Cowl, rolled edge	5.00	Oil tank, 7½x11x27, or tool box	3.00
Wood dash to fit	3.00	Brackets for oil tank	1.25
Body with wood frame, metal covered	14.00	Round straps for oil tank	1.00
Oval gas tank, 10x16x30	4.75	Long starting crank	1.00
		Upholstered seats, leather	25.00
		Total	$96.50
Nickel Plating radiator, extra			$2.00

AUTO PARTS CO. 737-739 Jackson Boulevard CHICAGO

Hang on to your old tires. They will last as long as you live if covered with steel.

The Kimball Steel Protector makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever.

Special inducements to those in new territory.





KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

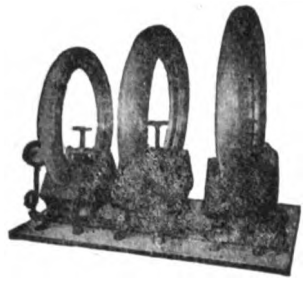
!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS, SMOOTH FORGED OR FINISHED COMPLETE, READY TO ASSEMBLE : : : : :
SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY

(PLANT AT CUDAHY) MILWAUKEE, WIS.

O'NEIL VULCANIZERS

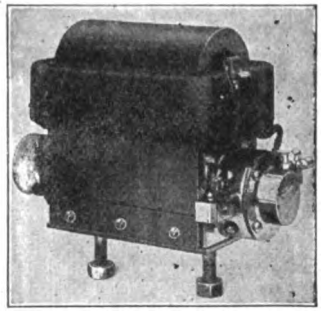


Have stood the test for over seven years, and are used and recommended by Tire Manufacturers and the majority of Tire Repair concerns. We make everything that is used in Tire Repair Shops.

Send for our catalogue.

O'NEIL TIRE & RUBBER CO.

AKRON, OHIO



VOLTA ELECTRIC LIGHTING SYSTEM

can be put on any make of car

Best and simplest generator on the market

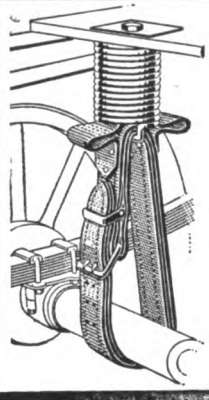
Special Outfits for FORD Cars

County and State Agents Wanted

IRWIN D. GROAK ENGINEERING CO.

Engineers, Designers, Builders

MONADNOCK BLOCK CHICAGO, ILL.



HOOVER SHOCK ABSORBERS

Prevent rebounds and save springs and tires. Simple to attach. ABSOLUTELY GUARANTEED.

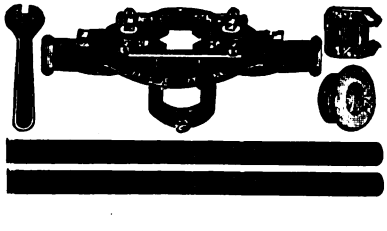
Price:	WHY PAY MORE?	
No. 20	Cars 1000–1500 pounds	$5.00
" 21	" 1500–2500 "	7.00
" 22	" 2500–3500 "	8.00
" 23	" 3500–5000 "	9.00
" 24	Ford-Rear Springs–all models	7.00
" 25	" Front " " "	7.00

If dealer cannot supply you, we will send direct, charges prepaid, on receipt of price.

THE W. H. HOOVER CO., NEW BERLIN, OHIO

Manufacturers of a complete line of Top Straps, Rebound Straps, Bow Rests, Joint Covers, Tire Rim Removers, etc.

Write us for Catalog.



GENUINE ARMSTRONG STOCK and DIES

For Cutting A. L. A. M. THREADS

No. 1 STOCK & DIES, ¼ to ⅝ in.
No. 2 STOCK & DIES, ⅝ to 1 in.
AND TAPS TO MATCH

Good Tools for Repairmen. These Dies are Adjustable.

MANUFACTURED BY

THE ARMSTRONG MFG. CO.

335 Knowlton St. BRIDGEPORT, CONN.

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AUTO LAMPS REPAIRED

Do not throw away your old, broken Auto Lamps. We can repair them for you and make them as good as new. Estimates of cost promptly furnished.

METAL SPINNING OF ALL KINDS

Parts made for Auto Lamps or other brass or aluminum work, where round parts are needed. No order too small, or we shall be glad to figure on contract work for the trade.

Send samples, blue prints or specifications for estimates.

EXPERIMENTAL WORK A SPECIALTY.

Prompt Service, Expert Workmen, Reasonable Prices.

COLLINS & HATCH COMPANY

150½ ELM STREET AMESBURY, MASS.

DEALERS GARAGE ACCESSORY
JOBBERS OWNERS HOUSES

Increase Your Profits—Sell

BADGER SEAT COVERS

We make them for the leading cars manufactured.

Five High Grade Materials to choose from, including Cravenettes, Mohairs, Serges, and Two-colored Washables.

Our "Special Dealers Proposition" will appeal to you.

Write for Samples, Confidential Prices, Etc.

WISCONSIN AUTO TOP COMPANY

DEPT. 10 RACINE, WISCONSIN

NOW ACKNOWLEDGED AS A FORD NECESSITY



The Comfort Safety Steering Device

Ford drivers will agree that the Steering mechanism on a Ford is incomplete.

With the aid of THE COMFORT DEVICE, drivers can overcome the difficulty of steering a Ford and can be relieved of the strain and tension invariably experienced in driving over rough and sandy roads.

The possibility of wheels "doubling under" is reduced to a minimum. It saves tires by preventing the "side lash" of wheels.

Get ALL the pleasure of driving. **PRICE $5.50 DELIVERED.**

Agents Wanted in Unassigned Territory.

Special Introductory Price:—We offer a special discount to Ford drivers in territories where our Steering Device has not been introduced.

WRITE FOR CIRCULARS AND PRICES.

THE COMFORT MOTOR MACHINE CO., Denver, Colo.



BRAENDER

Tires and Tubes

Are Famous For Their QUALITY

We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2.60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

Braender Rubber & Tire Co.

Factory: Rutherford, N. J.

NEW YORK, 250 West 54th Street

Agents in principal cities

Established Agents Solicited.

Something New

Just a little tool but a big convenience. Saves its price in one week in any garage. The

Handy Valve Lifter

will remove all the valves of an automobile or motorcycle in thirty seconds. High grade, polished spring steel.

Write for prices and discounts.

THE FULTON CO.

723-725 National Ave.

Milwaukee, Wis.



TOWNSEND GREASE GUN





A Good gun should be
Quickly, easily and completely filled.
Quickly, easily and completely emptied.
—A pound a minute.
Not a speck should get on your hands.
The Townsend is such a gun—**the only one.**

S. P. TOWNSEND & CO.,

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"AMERICAN" REPAIR STOCKS ACCESSORIES AND CEMENTS

MATERIAL REDUCTION IN PRICES FOR 1915.

The "AMERICAN" lines are unquestionably the highest grade products of their kind on the market.

Will gladly furnish you with working samples, including our wonder "5 Minute Cure Vulcanizing Cement." Manufacturers of "American Indian" Red Inner Tube and American Gray Tube.

ADDRESS ALL INQUIRIES TO FACTORY.

THE AMERICAN TIRE & RUBBER CO.

AKRON, OHIO

"Eklips"

A strictly first class spark plug that is well finished in every detail and will give every customer complete satisfaction.

Soot-proof and oil-proof features. Both porcelain and mica types. **Made to fit all motors.**

Write for prices and folder—"A Spark Plug of Many Merits."

THE FULTON COMPANY

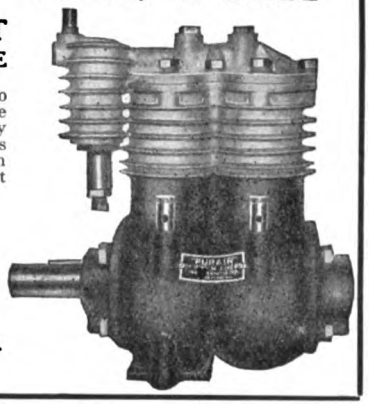
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"PURAIR" TIRE PUMP

SAVES ITS COST
IN A VERY SHORT TIME



May be installed by anyone, as no machine work or special tools are required. In most cases it is only necessary to remove two cap screws and put them back again with bracket in place, and clamp split gear to its shaft.

Effective and Compact

Every Pump Guaranteed

Made with either one or two cylinders.

Write for Prices and Full Description

HERT MANUFACTURING CO.
INDIANAPOLIS, IND.

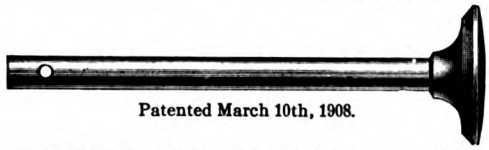


"STAR" LATHES

9 in., 11 in., 13 in. SWING.
Suitable for fine accurate work in the garage, repair shop, tool-room and machine shop.
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THE SENECA FALLS MFG. CO.
A-4 **429 Water Street, SENECA FALLS, N. Y.**

Ford Valves



Patented March 10th, 1908.

VALVES finished to blue prints or samples.
VALVE BLANKS for any size valve for repair work.
We manufacture exclusively valves with

Carbon or Nickel Steel Stems and Cast Iron Heads

fused by an up-to-date process that fuses the head and stem together the entire length of contact—can't be beat—every valve guaranteed. **Write for prices on finished valves or price list of blanks.**

MICHIGAN ENGINE VALVE CO., Detroit, Mich.

H-M HEADLIGHT RAY CONTROLLER

"SHADES THE LAMP BUT DOES NOT DIM IT"
COMPLIES WITH THE LAW



Patent Pending

SIMPLE EFFICIENT INEXPENSIVE

The specially prepared glass shades the lamp, and allows a strong, searching beam to be thrown upon the roadway.

Sent Prepaid, on Receipt of Money

When ordering, state diameter of glass, flat or bent, and make and model of machine.

Send for Circular DR.

Liberal Discounts to the Trade

Price per pair:

Flat	$1.50
FORD SPECIAL SIZE	1.50
Bent	3.00

H-M MFG. CO.
189 PUBLIC ST., PROVIDENCE, R. I.



SMOOTH-ON

TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS

No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - **$1.00**

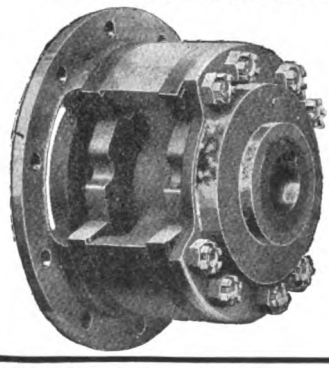
SMOOTH-ON MFG. CO.,
Jersey City, N. J.

CHICAGO, 221 N. Jefferson St. SAN FRANCISCO, 36 Sacramento St.

Prominent Engineers Recognize the

GEARLESS DIFFERENTIAL

As Correcting the Weaknesses of the Differential Gear



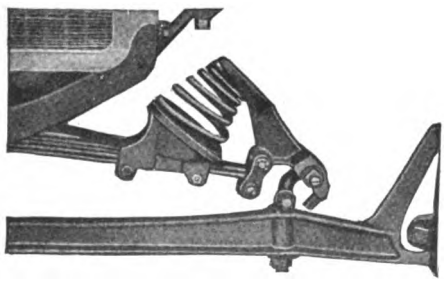
That is the reason the largest Automobile makers are now testing for 1916 adoption, and two axle manufacturers are furnishing as standard equipment.

It is now offered to **Ford Owners** on a permanent guarantee—(we will replace any broken part at any future time).

Ford Dealers and Repairmen:— *Write Us Today.*

Complete literature on request.

Gearless Differential Co.
Detroit, U. S. A.



HASSLER

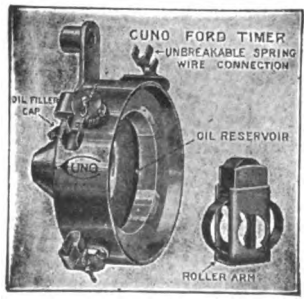
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The One You Will Eventually Buy.

Two years' successful use. The Exclusive Patented Stop Prevents Rebound. The Spiral Spring has a range of three inches and Does Not Carry the Direct Load of the Car.

Sold On Merit, Quality and Comparison
$20.00 Per Set of Four
Attractive Proposition to Dealers

ROBERT H. HASSLER, Inc., West Tenth & Canal Sts., Indianapolis, Ind.



PRICE $1.50

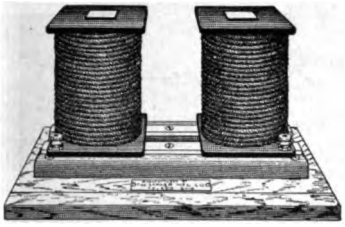
MISSING in your FORD Will be STOPPED BY A Cuno Ford Timer

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

Attractive Jobbers' and Dealers' Proposition.

CUNO ENGINEERING CORPORATION, 80 So. Vine Avenue MERIDEN, CONN.

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THE QUALITY MAGNET CHARGER

A Real Charger—Not a Toy Weight Twenty Pounds

The most efficient magnet charger on the market. Has special Ford attachment, by which Ford magnets can be recharged by simply removing the top housing. Wound for 6,110 and 220 volts. **Price $15.00.**

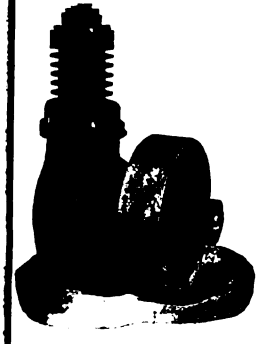
SYPHER MANUFACTURING CO. - Toledo, Ohio

Private Portable Garages
FOR CAR OWNERS



The Convenience, Rent and Car upkeep soon pays it. My New Illustrated Catalogue describes the finest and most complete line of real LOW PRICED GARAGES ever offered. A copy will be mailed you Free. Address

GARAGE FACTORY, Beaver Springs, Pa.



GARDNER "GEE GEE"

The 1915 Garage Pump

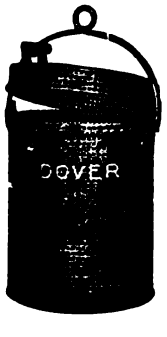
Few parts, can't get out of order. Large capacity, perfect splash lubrication, noiseless operation.

Low Price, Gardner Quality

The best seller for the supply dealer ever put upon the market.

Write At Once For Circular AC-11

THE GARDNER GOVERNOR COMPANY,
Station R, QUINCY, ILL.



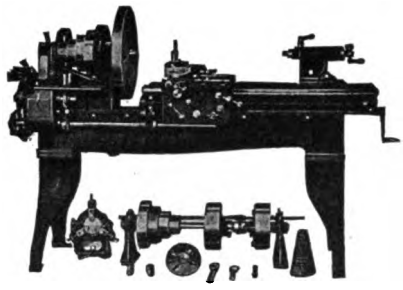
NEW
DOVER GARAGE SOAP ECONOMIZER

Reduces Soap Consumption Over One-Half
Saves All Waste
Prevents Theft

SEND FOR 1914 CATALOGUE

(2)
DOVER STAMPING & MFG. CO., Cambridge, Mass.

THE UNIVERSAL GARAGE LATHE
IS OUR 14-24" SLIDING EXTENSION GAP LATHE



Saves investing in a large expensive lathe. Swings 14½" over top bed, and 24" through gap. The 7½ ft. machine takes 8 ft. between centers.

Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

Taper attachment, milling attachment, and other accessories if wanted.

Machine is strong, rigid and accurate, has 2⅛" spindle with 1⅛" hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

JUST THE THING FOR GARAGES AND REPAIR SHOPS

Send for New Literature and Prices.

Barnes Drill Co., Inc. 1907 818 Chestnut St. Rockford, Ill., U. S. A.
Builders of the All Geared Drill

You Can Secure Prompt Delivery of the famous

Engine Driven KELLOGG TIRE PUMP

Garage Pumps and Other Specialties from the Following Distributors:

R. W. Norris & Sons, Baltimore, Md.
W. J. Connell Co., Boston, Mass.
Kellogg Mfg. Co., Chicago, Ill.
Ohio Rubber Co., Cincinnati, Ohio.
Penn. Rubber & Supply Co., Cleveland, Ohio.
Ferris-Dunlap Auto Supply Co., Dallas, Texas.
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Reinhard Brothers Co., Minneapolis, Minn.
Interstate Electric Co. New Orleans, La.
Motor Car Equip. Co., New York City
Powell Supply Co., Omaha, Neb.
J. H. McCullough & Son, Phila., Pa.
Dyke Motor Sup. Co., Pittsburgh, Pa.
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Phœnix Auto Supply Co., St. Louis, Mo.
Am. Supply Co., Tampa, Fla.
C. Rubel & Co., Washington, D. C.

Catalog on Request. **KELLOGG MFG. CO., 265 Circle St., Rochester, N. Y.**

Why the TRINITY BELL is to be the *ultimate* type of Warning Signal

A BELL COMMANDS ATTENTION AS NO OTHER SIGNAL CAN



Bred in the nature of every pedestrian and driver, is the recognition of the two universal danger signals—the bell and the red lantern. Years before motor cars were known, these two signals were standardized—and accepted.

Street cars, fire engines, patrol wagons, ambulances, locomotives, street railway service wagons—vehicles that give the alternative, "move or get injured," are without exception equipped with bells.

Made in 3 models: Model A, for smaller cars, complete, $6. Model B, for medium cars, complete, $10. Model C, for limousines, heavy touring cars and trucks, complete, $12. All prices include entire equipment for installation. Special model for motor boats, $12.

The TRINITY answers all requirements of law, and is absolutely guaranteed. Dealers and Owners: We absolutely guarantee that the Trinity bell is not an infringement on any other similar device.

Dealers and Jobbers—The TRINITY BELL is a big seller at a good profit. Write for particulars now.

The Trinity Bell Electric Mfg. Co., 5108 Calumet Ave., Chicago
BRANCH OFFICES: Trinity Bell Sales Co., 11 N. Cascade Ave., Colorado Springs, Colo.; 2028 Farnam Ave., Omaha, Neb.; 519 Downing Bldg., Erie, Pa.

How a Quick Repair Sells a New Tire



Thousands of dealers have learned this simple way to increase their business. It is done through small sales that win customers for you.

Help a motorist out when he has small tire troubles and he will come to you when he has *big* tire troubles. He will buy your tires when he needs new ones.

Goodyear Self-Cure Inner Tube Patches need no cement in applying. They are made of uncured gum that has extraordinary adhesive qualities. They stretch with the tube and *will not* tear loose and leak.

They are wonderfully simple to apply and win all motorists who need an emergency patch.

Learn more about the Goodyear line of 22 Tire Savers. Learn of the added advantages of handling a line that stays sold through super-quality. Address Desk 154

GOODYEAR AKRON, OHIO

THE GOODYEAR TIRE & RUBBER CO., AKRON, OHIO
Makers of Goodyear Automobile Tires (2363)

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Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.

DINSHAH ENGINE TESTER

Locates Motor Trouble at Once

Shows exactly what is wrong in electrical system, spark plugs or gas plant. Booklet, etc., upon request.

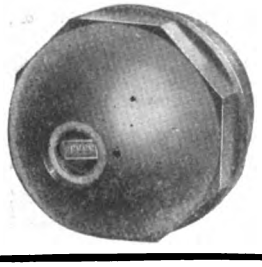


Dealers: Write for our offer.

DINSHAH SALES CO., 735 Seventh Ave., New York

You can earn EXTRA DOLLARS

Accessory and Tire salesmen and dealers can add to their income by selling the TRANSIMETER Hub Odometer; especially easy to sell to truck owners because it fills a need and saves money.



TRANSIMETER

is far ahead of other hub odometers.

Dreadnaught Type—Guaranteed

Indestructible	Price, $20.00
Applied Type (fits any truck)	" 16.50
Ford Type	" 15.00

Write today for our special commission offer.

AMERICAN TAXIMETER CO.
7th Ave. at 49th St. New York City

Polish Your Car With

MARVEL-MIST

Fifty Polishes for Fifty Cents

Cleans
Polishes
Protects

—

Pints
75c



Removes
Road-Tar
and Oil

—

Quarts
$1.00

Half-Gallons, $1.75 **Gallons, $3.00**

Prices Include Combination Sprayer and Polishing Cloth.

Be Economical. A pint of Marvel-Mist is equal to half-gallon of ordinary polish.

Spray Lightly with Marvel-Mist, rub off with cheesecloth and you have a wonderfully lustrous mirror-like surface.

Beware of Imitations. Like everything good, Marvel-Mist is being copied.

It's Guaranteed. Money back if you want it.

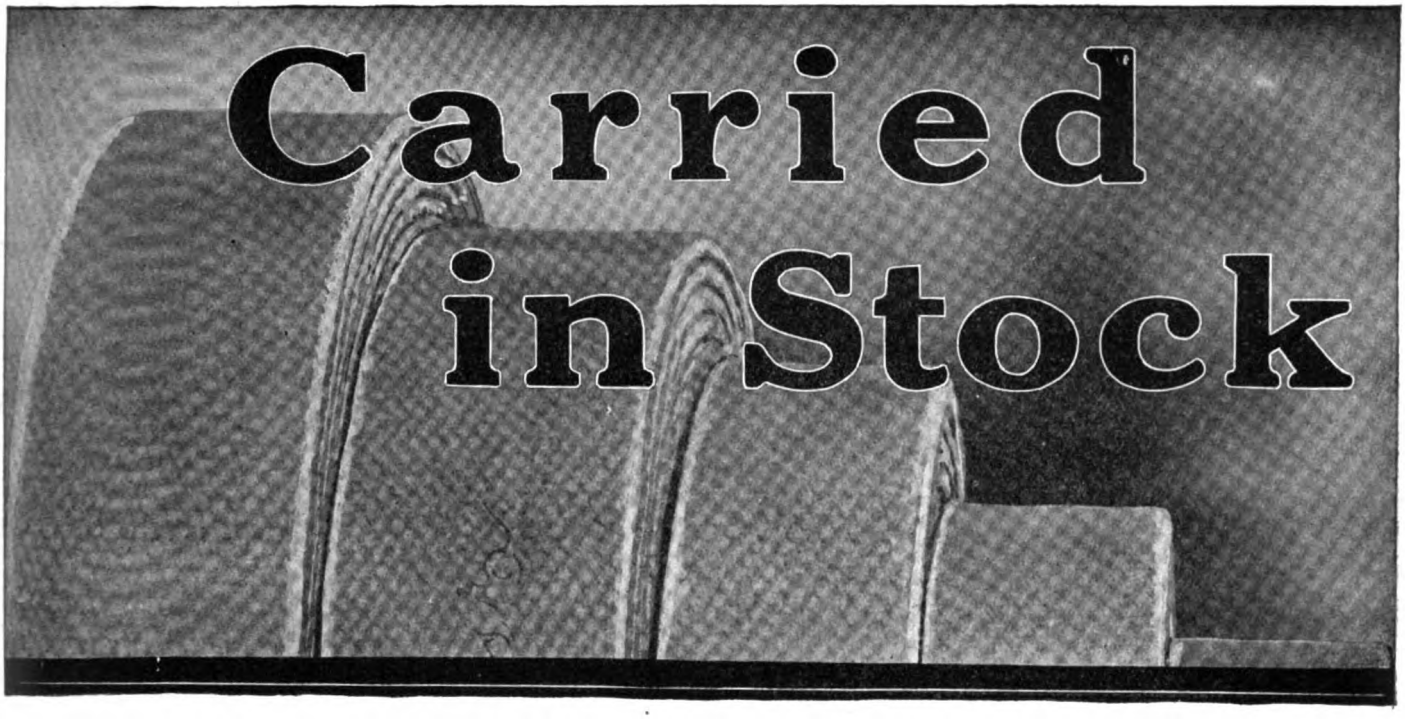
Dealers Wanted Everywhere for Marvel-Mist

Positively the Best Polish on the Market

Send for descriptive circular. Tells all about Marvel-Mist.

MARVEL-MIST MANUFACTURING CO.
56 Greenpoint Avenue Brooklyn, N. Y.

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MORE dissatisfaction results from doing business on a consignment basis than in any other way—disappointing to the manufacturer—disgusting to the dealer and disquieting to the user if he should find that either the manufacturer who made the goods or the dealer who sold them did not think enough of the quality of the goods to stand squarely on their feet and do business on a business basis.

RAYBESTOS is not—and never has been handled on consignment—not a foot of it.

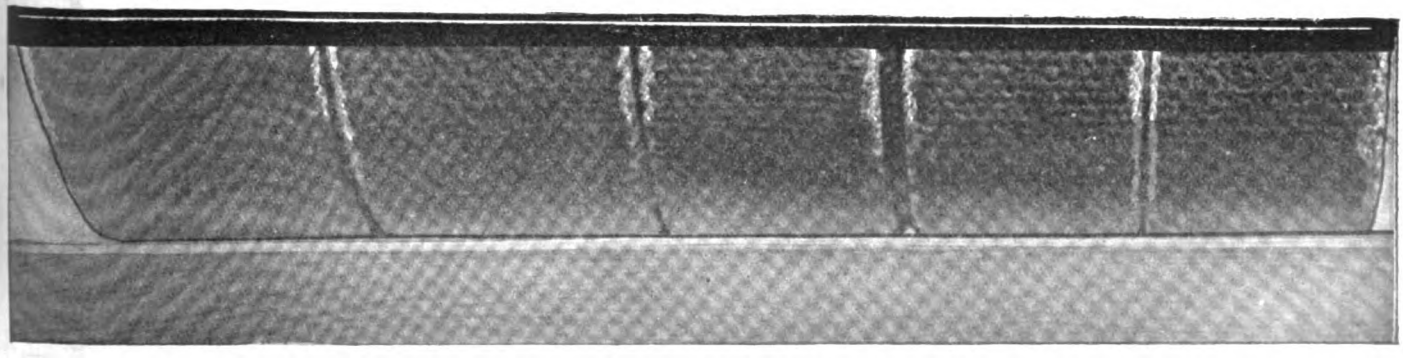
The RAYBESTOS system of marketing through distributors—which are in effect direct factory branches—is infinitely more satisfactory, far more economical and in emergency more convenient to all concerned than any consignment arrangement could be.

TRADE MARK Raybestos REG. U.S. PAT. OFF.

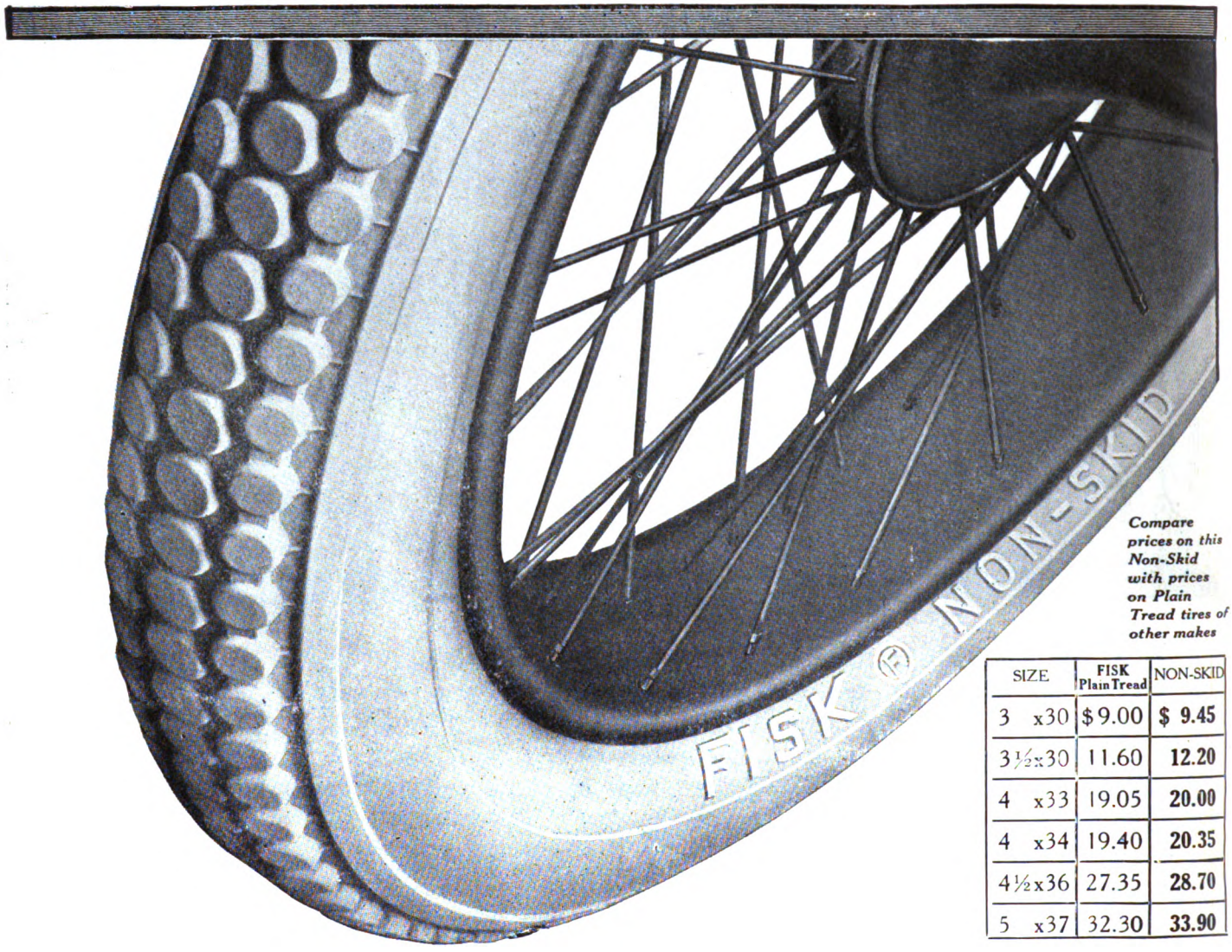
RAYBESTOS in all sizes is carried in stock by some one hundred odd reputable concerns located in the various centers throughout the United States and Canada, and each and every one of these distributors carries a stock of RAYBESTOS adequate to meet trade demands. Each and every one of them can and will quote prices equally as favorable as the home office itself. They are prepared at all times to supply the trade with any size, in any quantity, however large or small, and no dealer, garage man or repair man is so far removed from one of these distributors that he cannot send his order by telephone, telegraph or mail and have it filled over night.

THE ROYAL EQUIPMENT COMPANY

1354 Bostwick Avenue Bridgeport, Connecticut



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Compare prices on this Non-Skid with prices on Plain Tread tires of other makes

SIZE	FISK Plain Tread	NON-SKID
3 x30	$9.00	$ 9.45
3½x30	11.60	12.20
4 x33	19.05	20.00
4 x34	19.40	20.35
4½x36	27.35	28.70
5 x37	32.30	33.90

A Comparison of Fisk Low Prices

THE Fisk Non-Skid, with Fisk Service, at the **Fisk Low Prices,** represents the utmost in tire value. The prices for the Non-Skid are less than charged a few months ago for the Fisk Smooth Tread and **less** than now asked for many smooth tread tires of other standard makes.

Fisk Non-Skid Designed Right

The Fisk Non-Skid is designed **right.** It possesses the mileage, durability and easy riding qualities of the Fisk Plain Tread and in addition a remarkably effective development of traction and non-skid resistance—the kind that prevents serious accidents in an emergency.

FISK
NON-SKID
TIRES
WITH FISK SERVICE

Greatly increased production and distribution make possible these Fisk Low Prices. We hold to the high Quality that has always characterized Fisk Tires and made them the choice of wise and discriminating motorists everywhere.

Fisk Service is Unique

The Service we render tire users is tangible and greatly appreciated. We do all we can to make your investment satisfactory to you, to increase your motoring pleasure to the point where the presence of tires is lost sight of. A thousand trained employees are located in Fisk Branches in all the principal cities to **serve you** with all the helpfulness that the word **serve** implies.



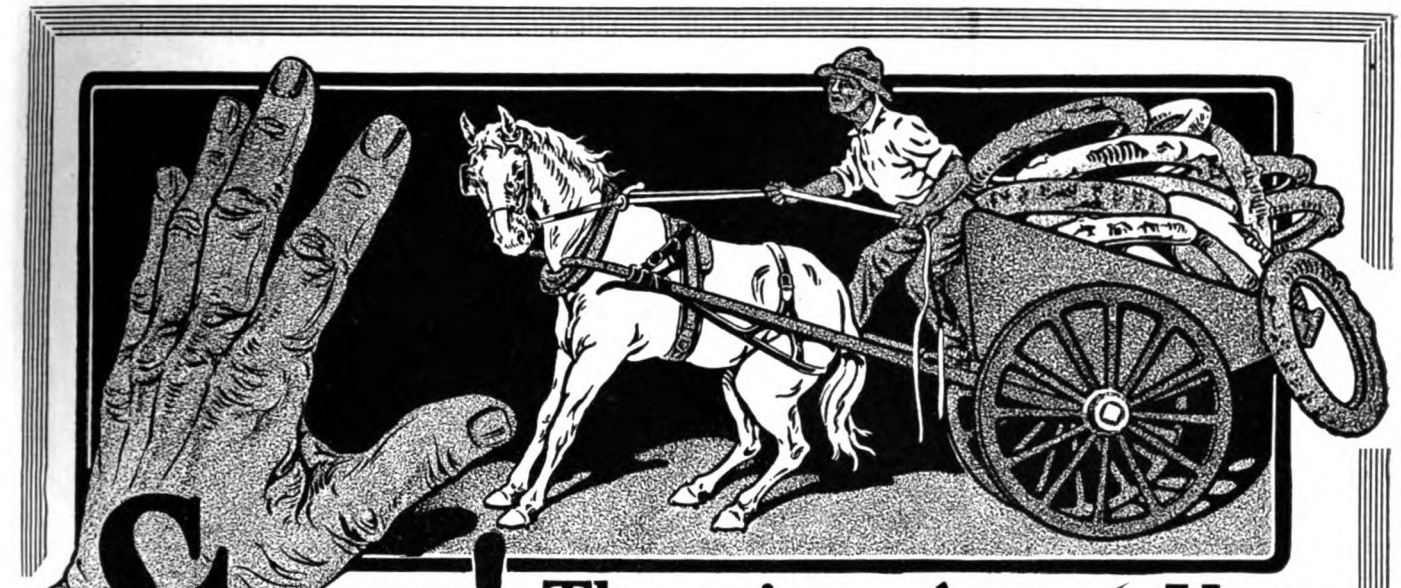
Trade Mark Reg. U. S. Pat. Off.
Time to Re-tire? (Buy Fisk)

THE FISK RUBBER COMPANY

Factory and Home Office **Chicopee Falls, Mass.**

You Can Buy Fisk Tires From All Dealers—Fisk Branches in ALL Principal Cities

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Stop! Throwing Away Your Worn Tires

It's just as unnecessary—just as extravagant—to throw away your tires when they become tread worn or rut worn as it is to throw away your shoes when the first sole gets thin, for you can get 5,000 miles more service out of them by doing what European motorists have done for the past three years. This will result in a saving of from $50 to $200 a year for you.

Don't Let the Junk Man Profit at Your Expense

That picture of the junk wagon—with its heap of cast-off tires—illustrates in a striking manner what becomes of the average rubber tire after 3,000 to 5,000 miles of service—uncertain service, with the nerve-racking dread of tire trouble.

This waste in tires is distinctly an American extravagance.

What European Motorists Are Doing

The foremost European engineers have for years been studying the problem of getting more miles for less dollars. With their usual painstaking, scientific thoroughness, they experimented with tire protectors and steel-studded Treads. The result—for over three years European motorists have been "half-soling" their tires with steel-studded Treads just as we "half-sole" our shoes when the original sole gets thin.

These European motorists are getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American motorists are getting from 3,000 to 5,000, and—what is just as important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim cuts.

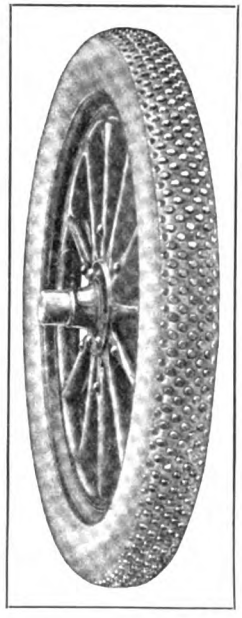
We Brought Mr. Bullerman to America

When we learned that foreign engineers had perfected a steel-studded Tread that would make a tire run at least 10,000 miles, we set about finding out how they did it.

Then we brought to this country probably the foremost European tire engineer, Mr. August Bullerman, who designed **Durable Treads** along the line of that foreign study and experiment, improved them by new basic patents and made them even superior to the Treads universally used by European motorists. Their success was immediate. In eight months 20,000 American motorists took advantage of this opportunity to cut down their tire expense and eliminate their tire trouble.

Last year the sale of Durable Treads increased 917% in the United States alone. Over 40% of these sales were unsolicited—made through the recommendation of Durable Tread users.

Where is there an automobile acccessory which has received such universal, country-wide endorsement?



How Does This Affect You?

The almost unbelievable waste in tires by the American motorist is not only national—it is vitally personal. It affects you—**your pocket-book.** Just consider what it would **mean to you** to get 10,000, 12,000 or 15,000 miles out of your rubber casings and at the same time drive your car without the constant dread of tire trouble.

In round numbers, it would mean a saving in tire miles sufficient to pay your yearly gas and oil bills by the elimination of punctures, blowouts, rim cuts and skidding—a gratification which cannot be estimated in dollars and cents.

Guaranteed 5,000 Miles Without Puncture

Durable Treads are sold under a **signed guarantee for 5,000 miles of wear without a puncture.** This guarantee is an iron-clad agreement—as good as a government bond—and holds good whether your tires are new or old, tread-worn, rut-worn or rim-cut.

Think of it—to be able to **FORGET** tires! Not once will you have to get out of that car to fix a puncture, and this **tire vacation** is guaranteed to you.

No More Skidding

Durable Treads are as sure-footed as a burro, and they're supremely convenient. Look at them—they're simply bound to be safe. The sharp-edged steel rivets make skidding almost impossible.

In London and in Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of steel-studded Treads for public safety. Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and, what is more important—**you receive perfect non-skid service while your tires are protected instead of injured.**

Ask Yourself This Question

Do you intend to continue allowing the junk man to profit at your expense, by carrying away in tire miles enough to pay your yearly gas and oil bills, or will you turn to your advantage the experience of European motorists?

It is the same question of economy you decide when you "half-sole" your shoes instead of throwing them away when the first sole gets thin. Rubber tires cost several times as much as shoes and are certainly worthy of the same economy.

Special Discount Offered

To motorists in territories where Durable Treads have not yet been introduced we offer a special introductory discount equal to the full dealer's profit.

Will you let us give a demonstration at our own expense and risk?

Will you let us make you an offer so fair and square that you do not stand to lose one red cent, either before or after you buy? The time for action is NOW, before the tires on your car run another week in a "barefooted" condition—before you get your next puncture or blow-out.

Cut out the coupon below. If you haven't a pen or pencil handy you can fill it out afterward, but cut it out now before you turn the page and forget. It will be the means of adding at least 5,000 miles to the life of the tires on your car.

The Colorado Tire & Leather Co.

65 Tread Bldg., Denver, Colo. Dept. F5, Box 228, Chicago, Ill.
Suite 56, 162 West 34th Street, New York, N. Y.

Cut Out and Mail Now---To-Day

THE COLORADO TIRE & LEATHER CO.
65 Tread Bldg., Denver, Colo. Dept. F5, Box 228, Chicago, Ill.
Suite 56, 162 West 34th Street, New York, N. Y.

Gentlemen:—Please send your free catalog, sample and written guarantee for 5,000 miles without puncture. This request carries no obligation.

Name .....

Address .....

City ..... State .....

My Tire Sizes are .....

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BETHLEHEM FIVE POINT SPARK PLUGS

For SERVICE and PROFITS

You can sell cheap plugs, but what is the use? You get nothing out of it. Your customers do not get value.

Why not push and sell the Plugs that have real quality behind them and that pay you a liberal profit for handling them—

BETHLEHEM FIVE POINT SPARK PLUGS

Guaranteed for the Life of the Car

ILLUSTRATED IS "TYPE A" BETHLEHEM FOR FORD CARS

Ford Spark Plug trouble is notorious. It is due to the cheap equipment Plugs which are supplied. Why replace these with other similar Plugs when—

Here is a Plug that is specially designed to give SERVICE in the Ford engine—that it does give service is assured by the strongest guarantee ever put on an accessory.

At the same time it pays you a liberal profit.

All types of Bethlehem's—$1.25 each—and worth it.

Illustrated Booklet Free—

Type A



Designed for the FORD car

THE SILVEX COMPANY

171 Madison Avenue, NEW YORK

FACTORY: South Bethlehem, Pa

PACIFIC COAST BRANCH: Oakland, California
W N DAVIDSON Manager

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SOME 1914 BOSCH VICTORIES

VANDERBILT CUP RACE
MERCEDES—DE PALMA—75.4 M. P. H.

GRAND PRIZE CUP RACE
MERCER—PULLEN—77.2 M. P. H.

500 MILE SWEEPSTAKES RACE
DELAGE—THOMAS—82.4 M. P. H.

CORONA (CAL.) ROAD RACE
MERCER—PULLEN—87.8 M. P. H.

FRENCH GRAND PRIZE RACE
MERCEDES—LAUTENSCHLAGER—65.5 M.P.H.

ELGIN NATIONAL TROPHY RACE
MERCEDES—DE PALMA—73.5 M. P. H.

LOSANGELES-PHOENIX Desert RACE
STUTZ—OLDFIELD—30.2 M. P. H.

EL PASO—PHOENIX Desert RACE
POPE-HARTFORD—MILLER—36.5 M. P. H.

ENGLISH TOURIST TROPHY RACE
SUNBEAM—GUINESS—56.4 M. P. H.

ELGIN C. A. C. TROPHY RACE
MERCEDES—DE PALMA—73.9 M. P. H.

TARGA FLORIO (ITALY) RACE
SCAT—CEIRANO—36.8 M. P. H.

SIOUX CITY SPEEDWAY RACE
DUESENBURG—RICKENBACHER—78 6 M.P.H.

TACOMA MONTAMARATHON RACE
STUTZ—COOPER—73.4 M. P. H.

THE BOSCH MAGNETO

has proved its claim—the best ignition system. A broad claim perhaps, but built upon deeds and facts that prove their case beyond a doubt.

For the future, the Bosch Magneto promises to hold its position of supremacy, for every 1915 race of prominence run, has been a Bosch victory and the lengthy Roll of Honor of 1914 and those of previous years promise to be exceeded.

There are no greater nor could there be more impressive proofs of Bosch superiority, than the list of victories given here—not only because they prove Bosch Magneto Ignition more speedy, not only because they prove Bosch Magneto Ignition more capable for easy starts and quick "getaways," for strength and intensity of spark, but because they prove Bosch absolutely reliable. A broad claim, but the facts are there to prove it, for no test could be more severe than the long grilling grind at the terrific, high speeds evidenced in contests as prominent as these.

When Bosch Magneto Ignition is selected, the price paid in dollars and cents may mean a trifle more to the car maker, but the priceless requirement absolute reliability at all times is there and with it go efficiency, speed, comfort and confidence.

TACOMA POTLATCH RACE
HUGHES—MAXWELL—74.2 M. P. H.

TACOMA INTERCITY RACE
FRANTZ—PARSONS—73.6 M. P. H.

100-MILE Circular TRACK RECORD
DUESENBERG-ALLEY—1.31.30

1914 CHAMPION CAR OF U. S. A.
MERCEDES—BOSCH MAGNETO OF COURSE

1914 CHAMPION DRIVER OF U. S. A.
DE PALMA—HE USED BOSCH OF COURSE

SOME 1915 BOSCH VICTORIES

VANDERBILT CUP RACE
PEUGEOT—RESTA—67 2 M. P. H.

GRAND PRIZE RACE
PEUGEOT—RESTA—56.7 M. P. H.

SAN DIEGO ROAD RACE
STUTZ—COOPER—65.3 M. P H.

TUCSON DESERT ROAD RACE
STUTZ—CLARKE—64 M. P. H.

VENICE (CAL.) ROAD RACE
MAXWELL—OLDFIELD—66 5 M. P. H.

TUCSON DESERT ROAD RACE
MAXWELL—OLDFIELD—66 M. P. H.

OKLAHOMA 200-MILE SWEEPSTAKES
PEUGEOT—BURMAN—67 9 M. P. H.

25-MILE Circular TRACK RECORD
PEUGEOT—BURMAN—20.28.4-5

Every Prominent Racing Driver Uses the Bosch Magneto
Every Worth While Victory Has Been a Bosch Victory
Because Bosch Magneto Ignition Gives the Kind of Service Expected

BE SATISFIED **SPECIFY BOSCH**

Write for the "Greatest of All Testimonials," if you want to be convinced.

BOSCH MAGNETO COMPANY **202 West 46th Street** **NEW YORK**

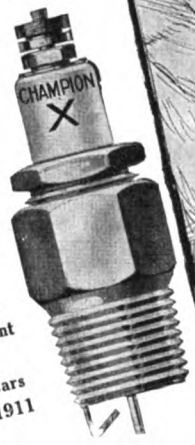
Service and Distributing Stations in Every State

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Champion

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"

Champion
"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"
X
Special
1/2 inch
Price
75c
Factory Equipment on Ford Cars since 1911



Champion
"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"
Conical
7/8-18
Long
Price
$1.00
Specially Designed to develop Maximum power in Buick Motors. Has extension base, conical porcelain Buick Terminal



Champion
"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"
Two-Piece
Heavy
Stone
All Sizes
Price
$1.25
For High Powered automobiles, trucks and Stationary Engines



Why The Porcelain Doesn't Break

See that **asbestos-cushioned** copper bushing (A in illustration)?

That's where the porcelain insulators in Champion Spark Plugs take the hammerlike blows of the explosions in the cylinders.

We **cushion** the blow by **packing** the little copper bushing with **asbestos.**

That saves the porcelain—also the compression.

This distinctive Champion feature saves Motor Car Owners many a dollar and much annoyance.

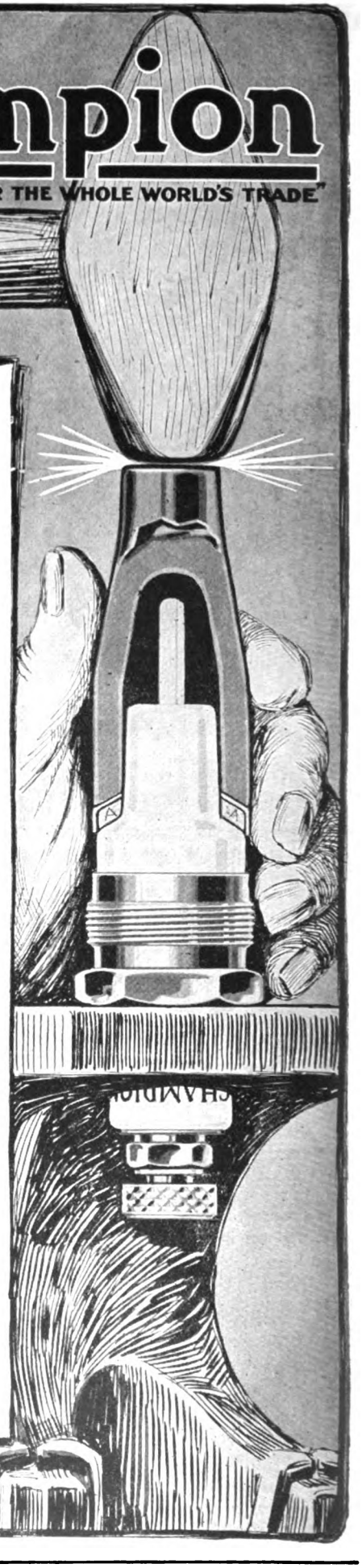
This is just one of the reasons why 75% of all American Made Motor Cars are equipped when new with Champion Spark Plugs.

This is just one of the reasons why Dealers so unanimously recommend Champions to Driver-Owners.

Their loyalty to Quality which has led them to recommend Champions so consistently, has entitled Dealers to a share in our profits.

Any Dealer whose strong-box does not contain our 1915 Profit Sharing Agreement should ask his Jobber's Salesman or write to us about it at once.

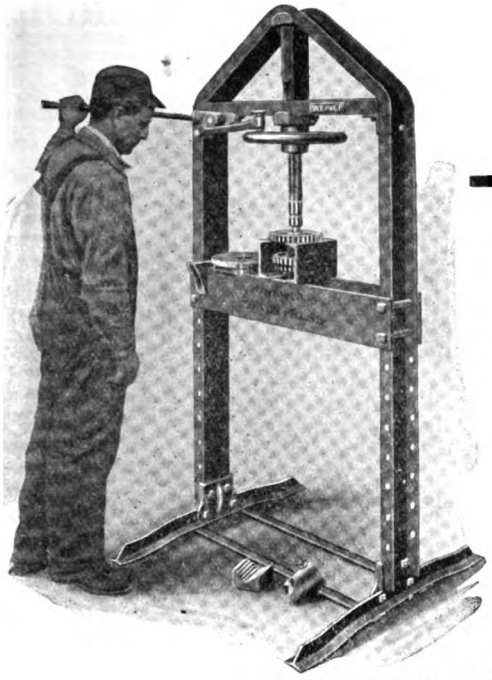
Champion Spark Plug Co.
2003 Upton Ave., Toledo, Ohio



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$48.00 Will Earn $100.00

in three months if invested in a



WEAVER Garage Press

HUNDREDS of these Presses in Garage service have more than paid for themselves in thirty days—so why should YOU continue to throw money away by depriving yourself of this money-making equipment?

Every time you use a sledge to straighten an axle or shaft,—to force a gear or ball race or hub, you lose money in labor and time, to say nothing of the parts which you injure and are compelled to replace.

LEVERAGE 1500 to 1

The lever construction on this Press provides a leverage of over 1500 to 1, so that one man can develop a pressure of 20-tons with very little effort.



DESIGNED FOR GARAGE WORK

Crank shafts and similar bulky pieces can be very readily handled with this Press by reason of the divided bolster, as shown herewith. The bolster may also be adjusted to the extreme bottom of the frame, giving a capacity of 48 inches between it and the screw.

The frame of the Press is 32 inches in width, allowing it to receive the largest automobile wheels for pressing out hubs, bearings, etc.



VISE-BLOCK ATTACHMENT

A "vise-block" is provided which operates between the screw and bolster for the purpose of holding axles, shafts, etc., against a twisting strain.

CONSTRUCTION

The frame is one piece of heavy channel steel; the hand wheel is 15 inches in diameter and the weight of the wheel and screw is carried upon ball bearings. The hand lever has a leverage of over 1500 to 1. The thrust of the screws is directed against heavy Bronze Thrust Bearings. The screw is 2 inches in diameter with 3-pitch Acme thread, and has a range of movement of 12 inches. **The Screw Does Not Revolve.**

The bolster which carries the plate can be set at any desired height with extreme adjustment of 48 inches. The width between frame uprights is 32 inches, height 74 inches, floor space 36x36 inches, weight 425 pounds.

Net Price, Complete with Equipment $48.00

WEAVER Auto Ambulance

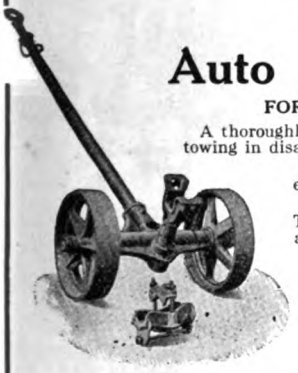
FOR CRIPPLED CARS

A thoroughly substantial and practical device for towing in disabled cars.

Strong, compact, comparatively light, enables one man to do the work of three.

Roller Bearing Cast Steel Wheels; Telescoping steel tongue; 1¼ inch steel axle; full range of adjustment.

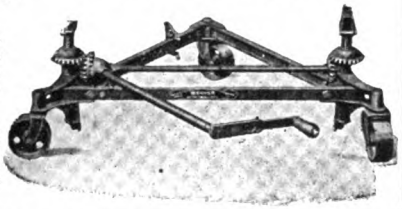
LIST PRICE, $30.00



WEAVER Auto Twin-Jacks

The one piece of equipment which enables one man to manipulate a car upon the floor in any desired manner.

Ball and roller bearing casters and lifting mechanism will handle extremely heavy loads with ease.



EXTRA HEAVY (Capacity 8000 lbs.)
PER SET (Two)..... $36.00 Singly..... $20.00

REGULAR TYPE (Capacity 4000 lbs.)
PER SET (Two)..... $20.00 Singly..... $12.00

WEAVER MANUFACTURING CO.

2175-79 SOUTH NINTH STREET, SPRINGFIELD, ILLINOIS

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New York Uni-Coil Ignition System for Ford Cars

PRICE $15.00



It gives all the advantages of the best high tension magneto service. The spark is delivered in perfect time to each of the four cylinders. No failure is possible at any speed. Greater power, speed and flexibility is attained by its use.

Operated by the Ford Flywheel Magneto or Battery

It increases the efficiency and perfects the timing of the Ford Magneto to a degree that puts it in a class with the best big-car magnetos. The **vital factors** in **magneto efficiency** are all embodied in its construction—a magneto contact breaker, with but one pair of adjustable contacts—an advanced type of high tension distributor that uses but one of the standard Ford coil units.

The New York Uni-Coil gives the Ford the ignition efficiency of the high-priced cars. It permits unlimited spark advance and assures perfect accuracy in timing at all speeds. It greatly simplifies the Ford ignition apparatus, eliminating the timer and practically all the present wiring. It is readily installed on the car, all necessary fittings and connections being supplied. This equipment includes an **elevating gear bracket which is permanently oil-tight.**

The complete Uni-Coil Ignition System costs $15.00 at retail. Dealers' margin is right—selling terms on request.

NEW YORK COIL COMPANY

338-340 Pearl Street **New York**

WESTERN BRANCH: 1461 Michigan Ave., Chicago, Ill.

MAKE $250.00 A MONTH

REPAIRING AUTOMOBILE TIRES



Sounds like a lot of money—IT IS—A WHOLE LOT of MONEY to be earning CLEAR every month—yet it's what hundreds of men we have established in the Automobile Tire Repair Business are making. You let down the DRAWBRIDGE for SUCCESS to enter into your career by getting into business for yourself. The business for you is one where the investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase.

A HAYWOOD TIRE REPAIR EQUIPMENT

answers to all of these requirements of Old Dame Fortune—the certainty of success in this business is as sure as anything in this world can be—Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

HERE IS YOUR OPPORTUNITY!

Be first to enter this new, big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I have made as high as $18 in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as a side line in connection with auto business—garage, or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

THIS MAN IS MAKING MONEY

Repair Tires at Home!

Young men and boys! repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business. **Auto owners**—repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow, investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.

The New Money-Making Business—Start Now.

HAYWOOD TIRE & EQUIPMENT COMPANY

528 North Capitol Avenue
INDIANAPOLIS, INDIANA

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TUTHILL'S TITANIC
SAFETY-FIRST
Patented Feb 15. 1910
Guaranteed Forever Against Center Breakage

The Spring with NO CENTER BOLT

The Spring with NO CENTER BOLT

KISSELKAR
Every Inch a Car

After exhaustive tests KisselKars are now equipped with

Tuthill Titanic Springs

thus adding an increased factor of safety

Now standard equipment

The Kissel Motor Car Company in line with their well known policy of not overlooking any detail of construction that will improve their product have, after a series of the most severe tests, adopted the Tuthill No-Center-Bolt Titanic Spring as standard equipment.

This insures to KisselKar owners a greater factor of safety at the center of their springs—the point which is necessarily the weakest in all springs of the old style center bolt construction.

Fitted to any car

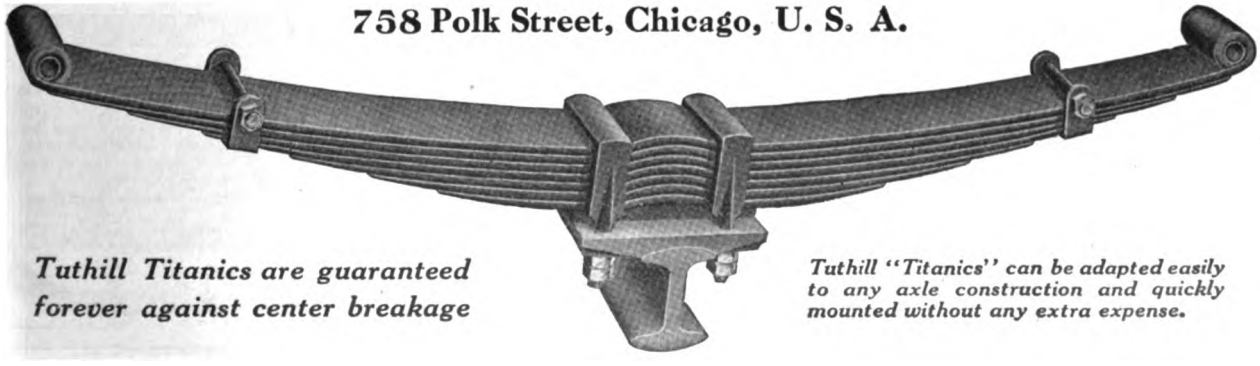
Insist on Tuthill Titanics for *your* new car.

Or if your car is not equipped with Tuthill Titanics and you break a spring, don't take any more chances—insist that your dealer or garage man replace your broken spring with a Tuthill Titanic—it costs no more than the ordinary kind and will last as long as your car.

Service Department: Whether you are an automobile owner or a manufacturer, the knowledge we have gained through thirty-five years in the spring business is at your disposal. If you are having trouble of any kind with your spring suspension write us in regard to same today—we will give you valuable and expert advice.

TUTHILL SPRING COMPANY

758 Polk Street, Chicago, U. S. A.

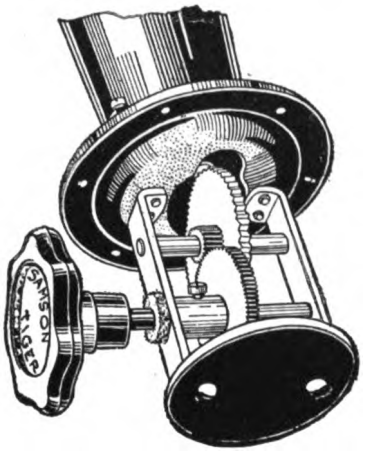


Tuthill Titanics are guaranteed forever against center breakage

Tuthill "Titanics" can be adapted easily to any axle construction and quickly mounted without any extra expense.

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Samson-Tiger



LOOK at this illustration and see for yourself why it is impossible for the Samson-Tiger to stick or refuse to operate. The shaft-drive is the keynote to the satisfaction that this new type of hand-operated horn is giving to its thousands of users. The "push-type" horn, with its lever or plunger, has proven to be too complicated; its many parts have spelled high maintenance cost and trouble for the dealer. Not so with the Samson-Tiger. There is no plunger or lever to stick; there are no springs, dogs, ratchets or other complicated parts to give trouble, and it is equipped with a tone adjuster not found on other horns. *The Samson-Tiger is the only shaft-driven hand horn on the market.* Give it a chance to increase your sales.

Shaft-Driven Hand Horn. List Price $5.00

If your jobber can't supply you write for Dealer's discount and Sample Horn at our expense. ∴ ∴

AMERICAN ELECTRIC CO., STATE and 64th STS. CHICAGO

Manufacturer of Samson Automobile Horns, (motor, vibrator and hand actuated), American Carphone, American Sonoscope, Samson Marine Timer, etc.

A $600,000 business, developed in eight months

with our Conover Cowl-windshield for FORD cars, shows conclusive evidence of merit. Sold by all the best dealers, the country over. Used on 1912, 1913, 1914 and early 1915 model T. Thousands of Ford owners are using them and praising them. The demand is country wide. Wonderfully improves Fords. Worth all they cost for looks alone. When riding in HOT weather, you don't have to be cooked, you open the bottom ventilating section and are cool and comfortable. When it storms, you open the rain vision upper section and look under. It makes driving SAFE and convenient, and at the same time gives protection from the elements. It is an all year proposition. Our UNIVERSAL shield for the NEW 1915 cowl-dash FORD has all the above advantages. It is the final touch of elegance and refinement that brings the new Ford right up to date. No better shields made at any price.



F. O. B. Adrian, Mich., $15.00

Carried in stock, prompt shipments.

Capacity 300 per day.

CONOVER COWL-WINDSHIELD

Bolts on without fitting

UNIVERSAL WINDSHIELD

takes place of plain old fashion folding shield that comes with the new 1915 Cowl Dash Ford.

Complete with Brackets
F. O. B. Adrian, $10.00



PAGE WOVEN WIRE FENCE CO.

Windshield Department **ADRIAN, MICH.**

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YOUR CAR, SIR



Represents your personal judgment—whether as its owner, or as the dealer who sells it, or as the maker who builds it.

Its capacity for pleasure-giving **service** depends upon the **service capacity** of the units which, combined, make up the car. The **service quality** of these units, then, concerns you vitally.

The magneto, the lighting generator, the starting motor, for instance—your engine runs right only as your magneto runs right—your lights are dependable only as your generator is dependable—your car starts properly only as your starting motor does its duty.

As owner—or as dealer—or as builder—run over in your mind the names of the magnetos, generators and starting motors that you **know** stand for **maximum service capacity.** Then—

Ask the makers of these accessories what bearings they use. The answer, almost without exception, will be

"NORMA" BALL BEARINGS

Accessory manufacturers who build their reputation into their magnetos, generators and motors—use "NORMA" Bearings.

Car manufacturers seeking to give maximum service capacity to their cars—use "NORMA"-equipped electrical accessories.

Dealers discover that the cars with the greatest demand among discriminating buyers—carry "NORMA"-equipped accessories.

Owners find that the cars that give them the most satisfactory service—have "NORMA"-equipped accessories.

In fact "NORMA"-equipped electrical accessories have come to be one of the features which distinguish the car of maximum service capacity.

As accessory manufacturer, then, why not put **your** apparatus in the "standard" class by using "NORMA" Ball Bearings?

As car builder, why not add to the popularity of **your** car, make its sale easier, by standardizing on "NORMA"-equipped magnetos, generators and motors?

As car dealer, why not insist upon "NORMA"-equipped accessories in the line of cars **you** handle?

As car owner, why not demand "NORMA"-equipped accessories as the electrical equipment of the car **you** buy?

We will send on request a list of electrical automobile accessories using "NORMA" Bearings. You will recognize the names as those of the leaders.



THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

"NORMA"

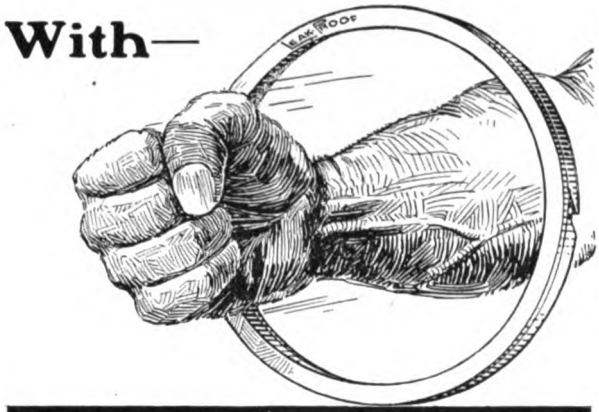
Ball, Roller, Thrust and Combination Bearings



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Put a Punch in Your Motor

With—



LEAK-PROOF
PISTON RINGS

MADE BY McQUAY-NORRIS MFG. CO., ST. LOUIS, U. S. A.

THEY secure perfect compression of each fuel charge and the utilization of the whole force of the succeeding power impulse. They also prevent impairment of valve action by carbon caused by surplus lubricating oil getting up past worn or imperfect piston rings into the combustion chamber of the cylinder.

The patented two-piece, angle-to-angle interlocking construction is the exclusive LEAK-PROOF design —absolutely essential to true LEAK-PROOF service. It is the only mechanical principle by which exact fit, equal and enduring tension of a piston ring can be obtained. Look for this feature--identify the LEAK-PROOF Ring – insist on it when you order.

Sold by all up-to-date supply houses, garages and repair shops.

McQUAY-NORRIS MFG. CO., Dept. R, ST. LOUIS, U. S. A.

Canadian Factory:
W. H. BANFIELD & SONS, 120 Adelaide St., West, TORONTO

BRANCH OFFICES:
NEW YORK—1919-29 Broadway at 64th Street
PITTSBURGH—902 Second National Bank Building
KANSAS CITY—513 New Nelson Building
CHICAGO—Suite 718 Michigan Boulevard Building
SAN FRANCISCO—64 Hansford Building
LOS ANGELES—224 Central Building
DALLAS—509 Juanita Building
ST. PAUL—American National Bank Building

Ask the User

In use on over 300,000 motors



FREE BOOK "To Have and to Hold Power"
Send for it to-day



The Staude Glare Stopper attaches to any make of wind shield. The pure amber glass protects the eyes of the driver from all bright and glaring light.

THE STAUDE GLARE STOPPER

The Staude Glare Stopper is the practical solution of the headlight trouble, solved from the right end.

Don't allow your customers to dim their headlights. Every motorist needs all the light he can get. The Staude Glare Stopper protects the eyes of the driver from all bright and glaring lights.

The Staude Glare Stopper fits snug and looks trim.

The Staude is not an experiment. It has been tested out in the Twin Cities for over a year. It has no competition. If you stock it at once it will mean quick turnovers and large profits for you.

The heavily nickeled clamp attaches to any car on the top or side of the wind shield, for either a right or a left hand drive, and is kept perpendicular regardless of the angle of the wind shield. The specially prepared clear amber lens glass, 6¼ inches in diameter, is ground and polished to order.

Send us $2.50, the retail price for one. If you are not convinced, after seeing and using it, that you can't get along without a Staude Glare Stopper, return it and we will refund your money. If you like it and order more, we will quote you dealer and jobber prices in quantities and give a refund on the one you already have.

The Staude is the sensation of the times.

Write us today.

E. G. Staude Manufacturing Co.
Automobile Accessory Department B
St. Paul, Minn.

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What's the Answer to the Blow-out Question?



But they can't save you from the expense and risk of blow-outs if they are not on your car

A BLOW-OUT is more than a nerve racking noise—more than the ruination of a tire—more than losing control of the car—it is a positive danger! It comes from the inside, from a bruised, weakened, brittle and lifeless fabric—the backbone of the tire.

The Miller Method prevents blow-outs by eliminating their cause—by retaining the natural vegetable wax and oil in the cotton fabric. By not deadening the life of the fabric during manufacture. Oil carbonizes at 240 degrees. The old method of tire building requires 287 degrees to vulcanize a tire. The Miller exclusive process vulcanizes perfectly at a low degree of heat. It makes a rugged unit of both fabric and rubber—without destroying the natural wax and oil of the fabric or burning the native toughness out of the rubber.

The result is a tire that gives you practical immunity from stone-bruises, and the blow-outs that follow.

Perhaps it does not interest you what is put into a tire. It's what you get out that counts. But *you can only* get out of a tire what has been built into it.

In every Miller Tire there is

—additional care used in compounding rubber:
—an extra price paid to procure exactly the right cotton fabric and rubber:
—added time spent to secure the very best workmanship:
—the "Miller Method" of vulcanizing that keeps the life in the rubber and retains the natural wax and oil in the cotton:
—a greater number of inspections to make sure that each part of every tire is perfect:

Together, these items make a big sum total that insures the purchaser of a Miller tire additional mileage, safety and freedom from irksome roadside repairs.

Go to the nearest Miller dealer. When he equips your car with Miller tires—you can put the blow-out question out of your mind.

Miller **Geared-to-the-road** Tires gear your car to the road through mud, sand or slush. **With Miller tires on your car you're in control. Its tread is an integral part of the tire and retains its safety features until the entire tire is worn out.** The greater mileage you get from them, will make your choice of Miller Tires an economy, as well as a permanent safeguard.

MILLER TUBES answer the tube question.

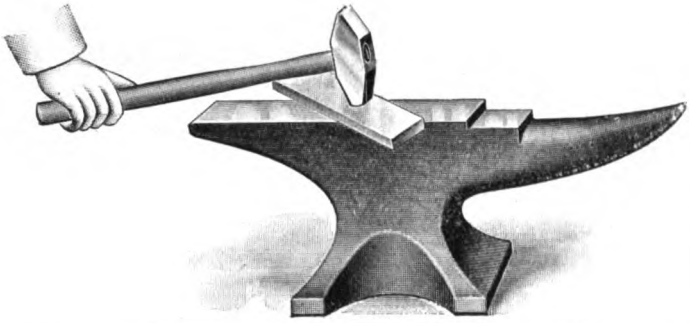
ALL THE LIFE IN THE FABRIC IS RETAINED IN MILLER TIRES

Write for Booklet
"What's the Blowout Question"

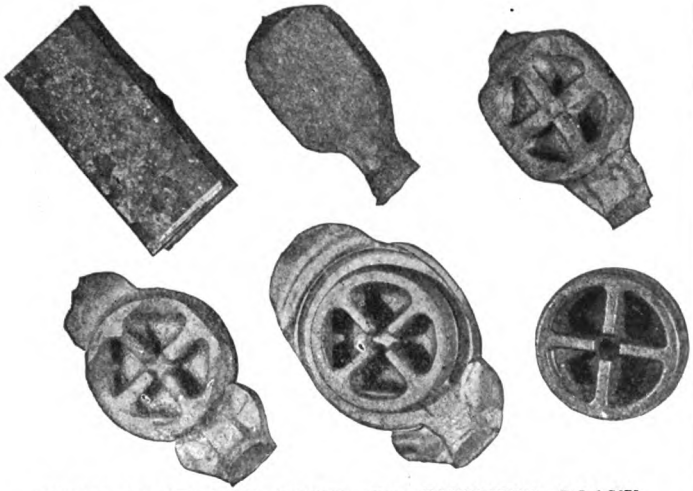
The Miller Rubber Company, Akron, U. S. A.

Distributors in the Principal Cities

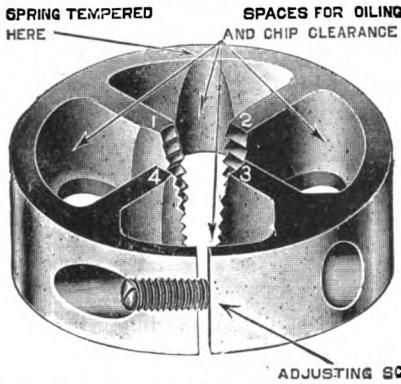
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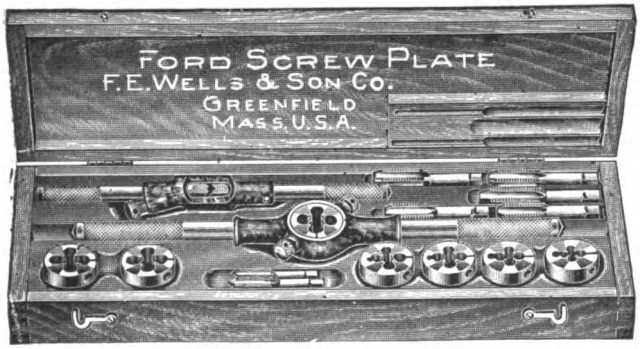
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

WALDEN-WORCESTER-WRENCHES

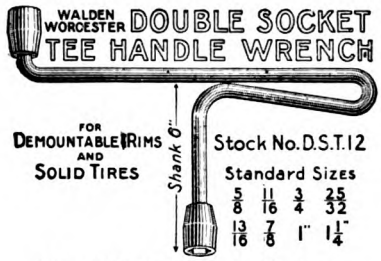
STANDARD TOOLS FOR DEMOUNTABLE RIMS AND SOLID TIRES PLEASURE AND COMMERCIAL CARS



PRICE EACH 65 CENTS.

The popular tool for use on demountable rims. The only all steel brace on the market. Pressed steel swivel handles. Buffed nickel finish. A real high class tool. Guaranteed in every respect.

SOCKETS are machine turned and broached to size and applied to the rod by our own special process and guaranteed not to twist or shear off.



⅝ to ⅞" Price Each 65 Cents.
1 and 1¼" Price Each 75 Cents.
Handle 12 inches. Shank 6 inches.

Both sockets are same size. Socket on end of handle designed to give full (12 inches) leverage to release or tighten nuts. The other socket makes the tool a perfect Tee Handle Wrench. For quick work left hand on shank, right hand on socket end of handle and it is easy to spin the nut off.

Operators who have used this tool prefer it to the brace, just as rapid and more efficient.

When ordering please use our stock number and also give short diameter of nut or bolt head.

If your dealer or jobber does not carry these tools, advise name and we will ship, charges prepaid, on receipt of price.

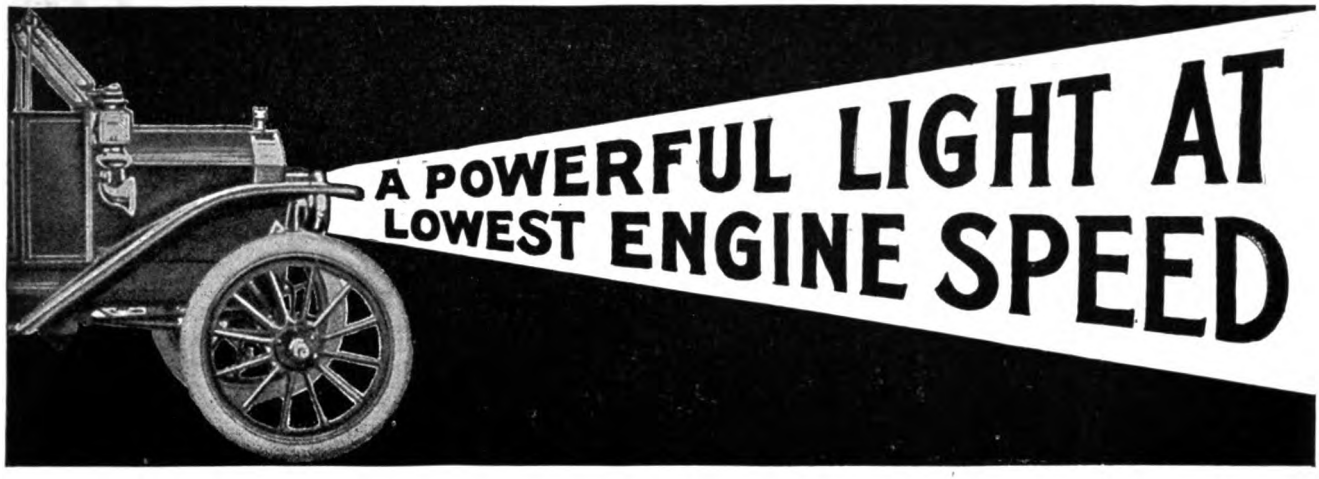
SEND FOR CATALOG AND TRADE PRICES

WALDEN MFG. COMPANY

64 CENTRAL STREET, WORCESTER, MASS.

We Manufacture Wrenches Only

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The New York Automatic Head Light Controller For Ford Cars

PRICE, $5.00

PATENT APPLIED FOR

Uses the regular Ford magneto, no batteries, charging devices, or complications. Every Ford owner will be vitally interested to learn that we have perfected a device that is applied by anyone in ten minutes, which will cause the regular electric light equipment on Ford cars (that have been installed by the owner or by the Ford Company) to deliver a powerful penetrating light at all speeds, *including the lowest speed at which a Ford car can be run.*

The Controller is *entirely automatic* in *operation* and at the same time wonderfully simple in construction. In addition to furnishing a strong light at all times, it prevents the burning out of the lamps at excessive engine speed. All the labor necessary is the removing and replacing of a single bolt together with the simple connecting of three wires.

No belts, gears, or moveable connections to the engine are employed.

It is the first and only solution to the electric head light problem on Ford cars. A trial of ten minutes will demonstrate its value. You need one—Why delay? Remit $5.00 now with the understanding that purchase price will be refunded within thirty days if you are not convinced that you have received the largest $5.00 worth in your experience.

Our booklet tells a complete story. Gladly sent upon request.

Address Lighting Department.

New York Coil Company

338 Pearl Street
New York, N. Y.

Western Branch
1461 Michigan Avenue
Chicago, Ill.

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NEW TRADE APCO MARK FORD SPECIALTIES

THE APCO SPARK PLUG



When everything has been said about spark plugs, the fact remains that there is very little difference between any of the high grade plugs except the amount of money spent on exploiting them. The new **Apco** plug is high grade in every particular and while the price is low, we absolutely guarantee it to be as good as any dollar plug on the market and will replace any that do not give the service you have a right to expect. The bushing and body are blued steel. The electrode is very large and is fitted with hexagon nut to hold wire. Points are bent for Ford use and will not accumulate oil. Plug is extra long and removing from engine is a very simple job. The porcelain which is the most important part of any spark plug is the best money can buy and is extra large to insure against breaking. The time when a dollar is the lowest price for a good plug is gone and when you start using **Apco** plugs you will know it.

PRICE 40 Cents

The APCO Detachable FAN BELT



The best fan belt for Ford cars is not expensive but the installation is a troublesome job. The **Apco** waterproofed Oak-Tanned belt has always been the best that money could buy and with the addition of the detachable feature as shown in the illustration it should be the only belt that you could consider when next you need one. To install simply push one end under lower pulley than over upper pulley, and hook fasteners together **without** clinching hooks. This takes but a jiffy and you had better buy one and put it in your tool box.

PRICE 50 Cents

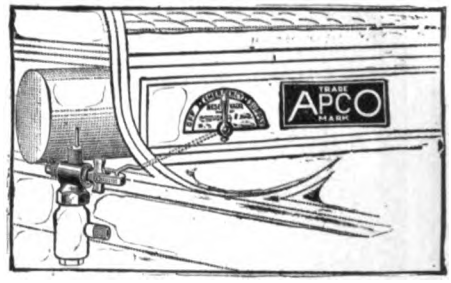
THE APCO HOOD ANTI-RATTLER



This is one of the lowest priced accessories we have ever marketed but it is one of the most necessary and desirable. It consists of a long spring with two special hooks that clamp to the hood where hood rests on hood blocks. The spring passes under the outlet water connection and does not interfere with anything under the hood. In practice the spring is pulling both sides of the hood together, which prevents rattle, and when necessary to raise the hood the spring holds it in position either half-way or all the way up. The price is low and the article is one that you need.

PRICE 10 Cents

THE APCO EMERGENCY GASOLINE VALVE



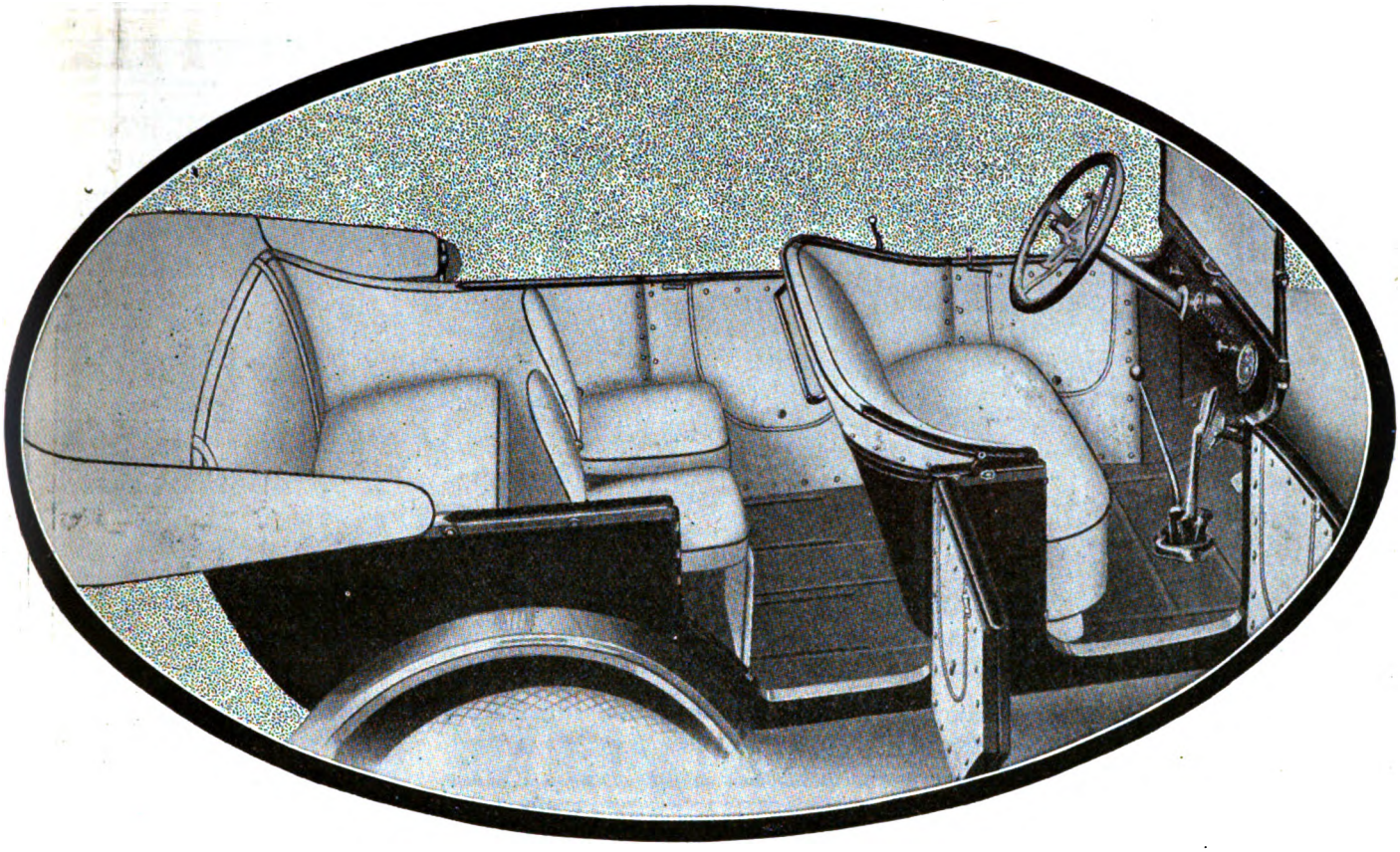
The Apco Emergency Gasoline Valve for Ford cars is the only one on the market with a universal joint in the shut-off lever and a dial to fasten the heel board which shows position of lever. With this device, your car is equipped with a reserve tank holding a gallon of gasoline, enough for twenty miles running. The most experienced drivers often run out of gasoline on the road and if it happens once it means more to you than the cost of an Apco valve. Equip your car today and forever rid yourself of that feeling of uncertainty of your gasoline supply. It can be put on your car in ten minutes, and being made throughout of brass, it will outlast the car to which it is applied.

PRICE $1.00

AUTO PARTS COMPANY, The Largest Manufacturers of Ford Specialties in the World Providence, R. I.



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Give Your Car This Luxurious Look

With every efficient mechanical accessory included as regular equipment on the car, the eyes of the automobile world are turned toward greater luxury.

Luxury—with all the added beauty, comfort and pride of ownership that go with it—is the aim of every motorist.

Campbell Detachable Upholstery gives you this luxury in a way no other single accessory can. It transforms the interior of your car into a drawing-room. It is the last word in refinement.

Campbell Detachable Upholstery goes on over your regular upholstery, and is held in place by special snap fastenings, so that it can be instantly removed for cleaning.

It can be obtained for all standard makes and models of cars in a wide range of fabrics and shades at surprisingly moderate prices. Every set is custom tailored to a permanent glove-fit. Its durability is greater than that of cheap leather coverings. See that you get it on your new car, or better still, put it on your old car and make it look like new.



Write for this Catalog

Every dealer, every car owner should get a copy of our new catalog describing and illustrating many other accessories, all sold under the Campbell guarantee. We have an especially attractive proposition for progressive dealers.

Write today for samples and prices

of Campbell Detachable Upholstery. Whether you are a manufacturer, a dealer or owner, you owe it to yourself to investigate this accessory. Write today to

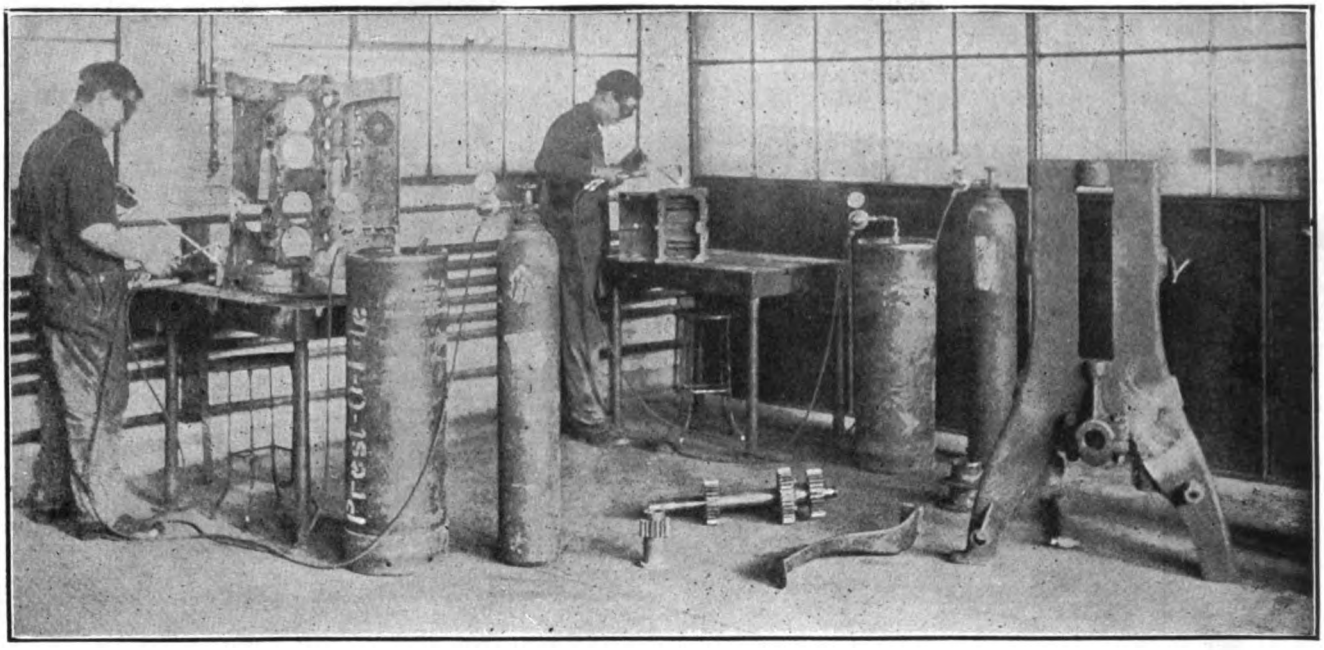
The Perkins-Campbell Co., 628 Broadway, Cincinnati, Ohio

NEW YORK OFFICE: 89 Chambers Street

The name Campbell on the fastenings guarantees the genuineness of Campbell Detachable Upholstery. Look for it.

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES

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2 Sets of Dyer Welding Apparatus in Operation Illustrating Its Unlimited Range

$35.00 OXY-ACETYLENE WELDING and CARBON REMOVING OUTFIT

COMPLETE WITH SUPPLIES. EVERYTHING NECESSARY EXCEPT TANKS.

Write us for particulars of Style D Outfit. 1500 SETS IN USE. If you now have a carbon remover we can quote you a lower price on the necessary additional apparatus to convert it into a welding outfit also.

The DYER APPARATUS CO., 155 BROOKLINE STREET **CAMBRIDGE, MASS.**

Removes Rims Instantly

AN INSTANTANEOUS TOOL for the immediate removal and replacement of tires in an *upright position. Fits the Tool Box.*

TWO MODELS

Straight Side Tool operates all sizes of Kelsey and Stanweld Split Rims.

Clincher Tool for Kelsey Split Rims, 4 inches and smaller.

Friestedt Rim Contracter $2.00



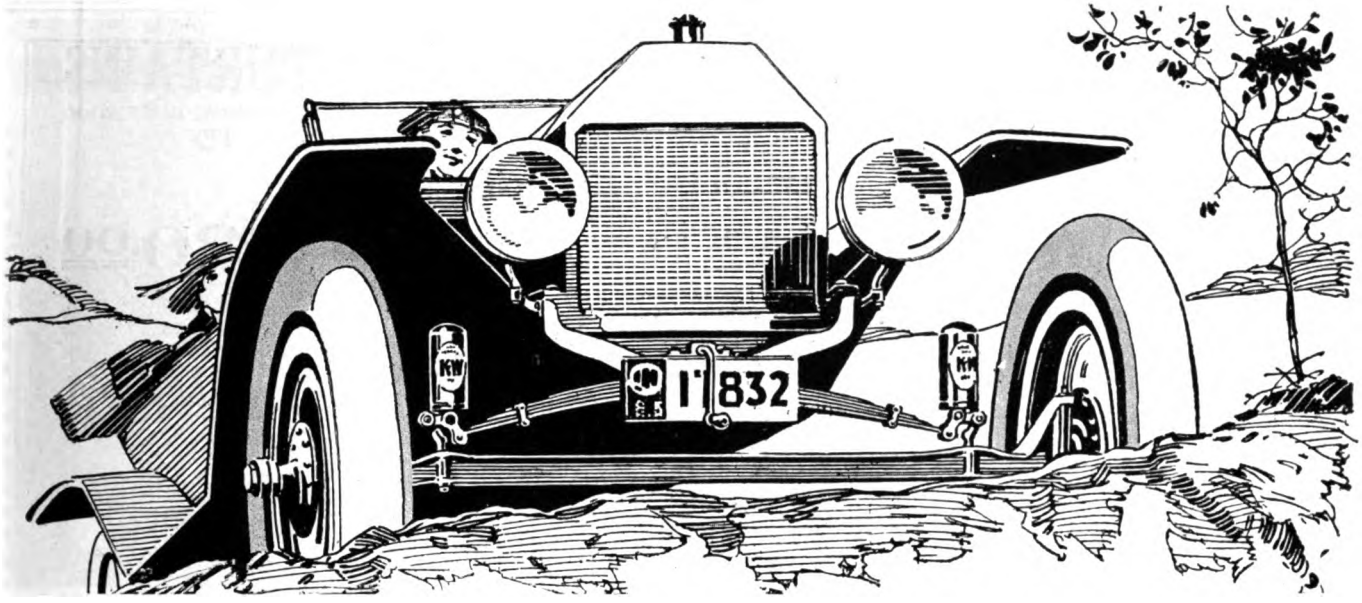
Guaranteed to make good every claim. Order direct or through your dealer. Indicate which tool is required and give tire size.

Dealers: Write today for attractive proposition. 75 per cent of the cars have these rims.

FRIESTEDT RIM CONTRACTER COMPANY
2931-2939 W. LAKE STREET CHICAGO, U. S. A.

"IT OPENS THE RIM LOCK"

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There are Two Kinds of Comfort—Body and Mind—You Get Both With

TRADE K-W MARK REG U.S. PAT OFF

Road Smoothers

QUICKLY APPLIED TO YOUR FORD CAR

They give you the body comfort that comes *only* from motoring "relaxed" in a smooth riding car—regardless of the road's roughness. They give you mind comfort—that freedom from the tiring effort of steering around bumps and ruts so common to the average road. You are relieved of the nerve-racking tension of "picking the road." You get the same comfort as your passengers, plus the pleasure of "no road worry" driving.

K-W Road Smoothers give you this enviable comfort because their design combines three vital factors.

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost ***twice the length of spring action*** or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.



K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all of these vital factors *only* in K-W Road Smoothers

K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

$15 SET OF FOUR ONE FOR EACH WHEEL

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your car's usefulness, and bring you home with that "satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet "That Satisf.ed Feeling"

TRADE THE K-W IGNITION Co MARK

2817 Chester Ave. CLEVELAND, OHIO. U.S.A.

Makers of 125,000 K-W Master Vibrators

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ONE-MAN-TOP EQUIPPED WITH JIFFY SLIDING CURTAINS

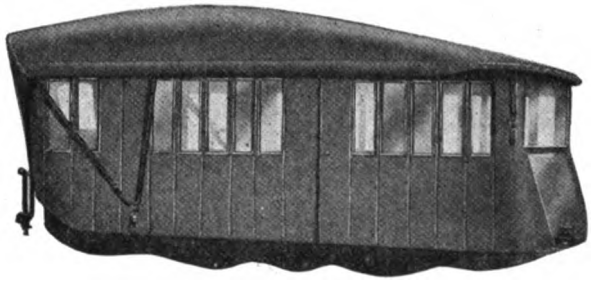
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$35.00 OVERLAND FORD $30.00

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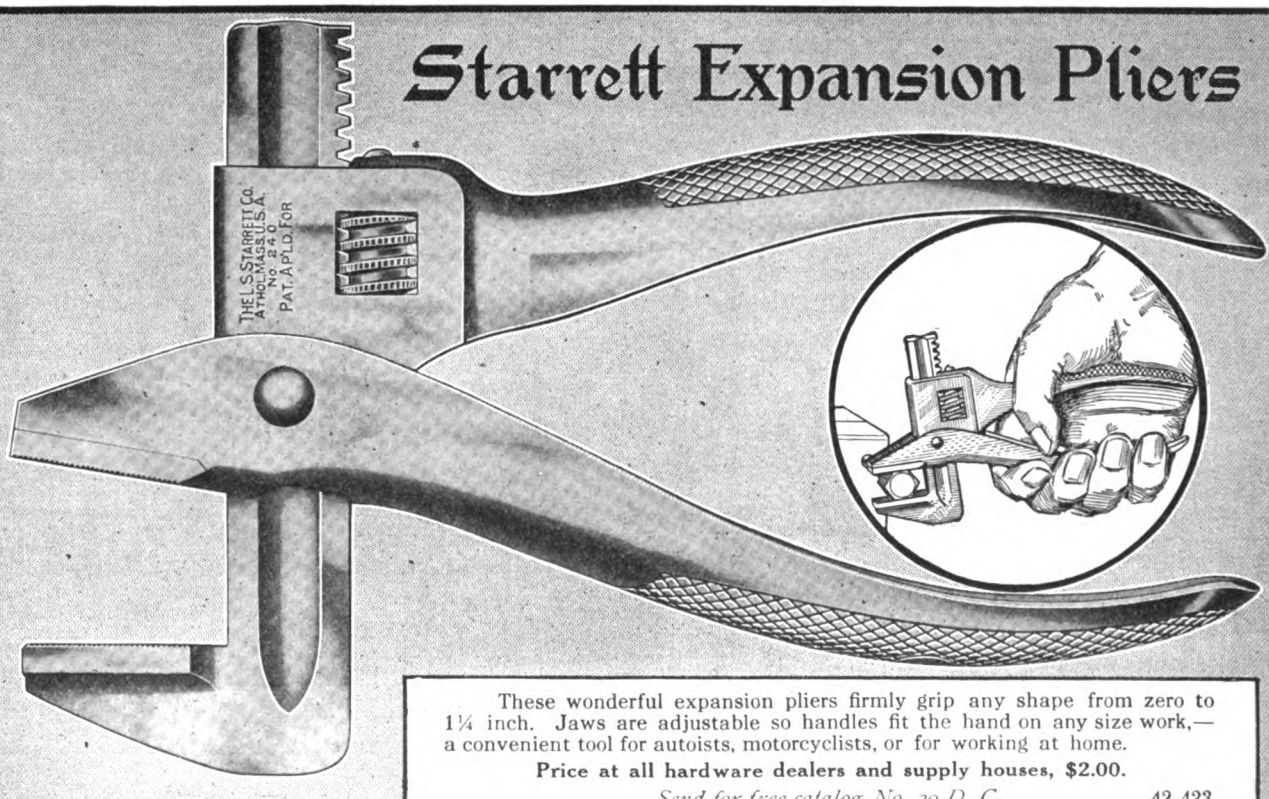
When Writing for Prices, State Name of Car, Model and Year, also whether Silk Mohair, Khaki or Imitation Leather.

RUNABOUT TOPS AT LOW FIGURES **Shipping Points—Michigan and New York**

Send for samples of material and information on how to get the top business, without any expense to you.

HERCULES RUBBER CO. ONE-MAN-TOP DIVISION **2 Hudson St., New York, N. Y.**

Starrett Expansion Pliers



These wonderful expansion pliers firmly grip any shape from zero to 1¼ inch. Jaws are adjustable so handles fit the hand on any size work,—a convenient tool for autoists, motorcyclists, or for working at home.

Price at all hardware dealers and supply houses, $2.00.

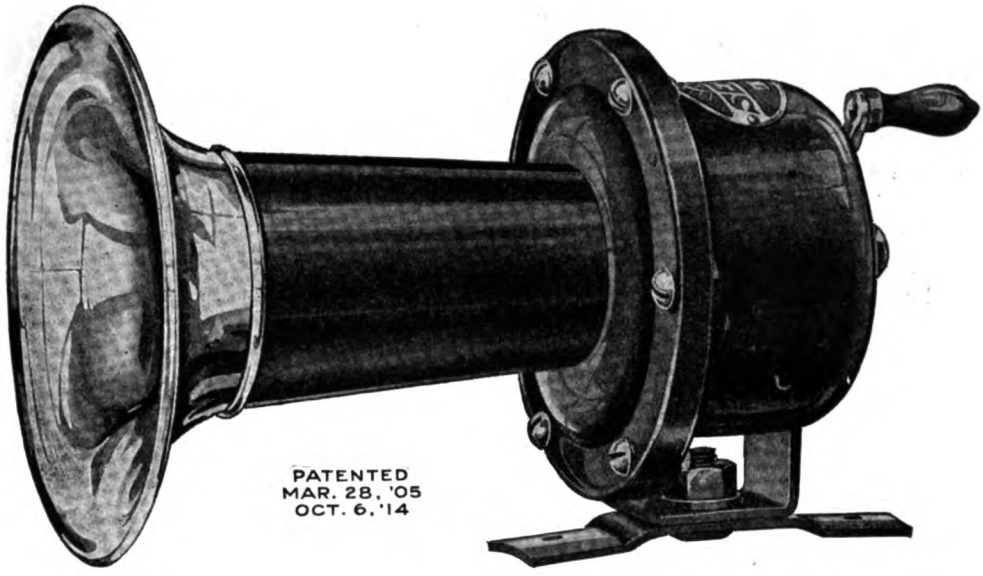
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World's Greatest Toolmakers

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Double-Acting Mechanical Horn

A powerful, commanding warning signal—the surprise in Mechanical Horns.

Operated by touch of hand—turning either to right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

A Horn that commands respect both from the character and volume of signal given and from its finished appearance and design and high mechanical construction.

$4

Guaranteed for 10 Years

The SEISS Horn is made to wear and last for years through the hardest daily use.

No Springs or Ratchets. Only three Bearings, automatically oiled and preserved from one cup. Nothing to get out of order. Impossible to wear out. Highest grade material throughout. Vanadium Steel Diaphragm. Mechanically and constructively perfect.

$4

A Horn to be used—a Horn to be proud of. Finished in Black Enamel—Baked—with highly polished Nickel Bell—or Brass—or all Black.

At your dealer's or direct from factory—with 10-year guarantee—only $4.00

WRITE TO-DAY FOR PRINTED MATTER

The Seiss Mfg. Company, 443 Dorr St., Toledo, Ohio

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Firestone Cementless Tube Patches



LIKE all Firestone Accessories—simple to use and sure to hold. Note the tab, which permits easy removal of muslin from rubber.

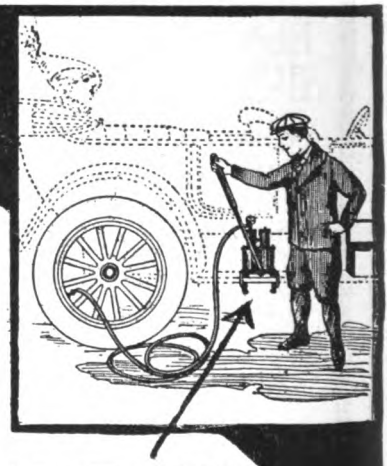
YOUR business is bound to benefit by the advertising you get with Firestone Accessories. They are so uniformly reliable in service.

Send for Firestone Catalog, with description of entire line, including Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Motorcycle Tires, Fire Apparatus Tires, Rims, Tire Accessories, etc.

Firestone Tire & Rubber Co., Akron, Ohio—Branches and Dealers Everywhere

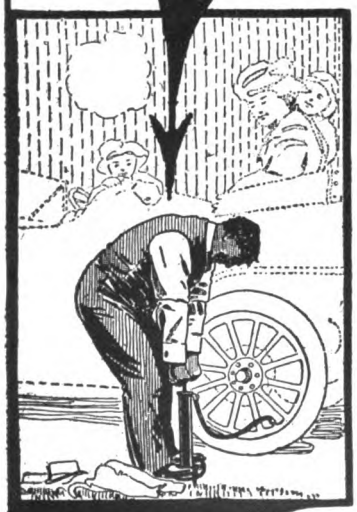
"America's Largest Exclusive Tire and Rim Makers"

Mr. CAR OWNER



SAVE YOUR BACK

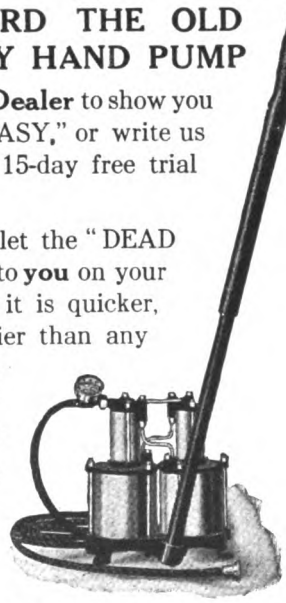
DISCARD THE OLD LEAKY HAND PUMP



Ask Your Dealer to show you the "DEAD EASY," or write us direct for our 15-day free trial offer.

At Our Risk let the "DEAD EASY" prove to **you** on your own car, that it is quicker, safer and easier than any other tire pump, either engine drive or hand power.

WRITE FOR PRICES TODAY



A Boy Can Operate The

"DEAD EASY"

tire pump and not tire himself in the least.

Watch the gauge—you cannot tell by "the feel" when the tire has all the air it needs because it still works "dead easy" after the tire is filled to its rated pressure.

POWERFUL RAPID DURABLE

GLOBE MANUFACTURING CO., Battle Creek, Mich., U. S. A.

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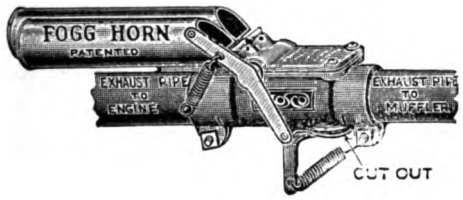
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SPECIALTIES

MOSCO

FOGG HORN

for FORD *and* METZ Cars



Still going! Still blowing its clear, mellow signal on thousands of cars throughout the land. Some of the skeptics tell us that the electric horn has supplanted exhaust whistles, but we notice that the old reliable FOGG still continues to sell. The reason? Because it is the horn

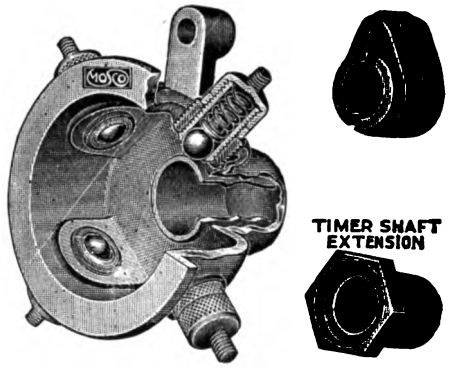
LOCATED BETWEEN the ENGINE and the MUFFLER

where it gets the full blast of the gas. Also because it has a cut-out in the body. So that in buying the FOGG you get two devices in one—a signal and a cut-out.

PRICE, WITH CUT-OUT, - $5.00
WITHOUT CUT-OUT, $4.50

A New FORD TIMER

Bemus Timer
Patents
Sept. 24, 1907
Dec. 17, 1907
Feb. 16, 1915
Apr. 27, 1915
Others
Pending



BEMUS BALL CONTACT TIMER

Every practical man who knows the Ford car recognizes the fact that this short-stroke, high-speed engine requires a Timer capable of rapid, snappy action in the making of contacts and yet having durability sufficient for thousands of miles of running without loss of efficiency.

THE BEMUS IS BEST FOR THE FORD
BECAUSE

IT STOPS THAT SKIP. By reason of the method of mounting—on the time shaft—the main cause of skipping is eliminated. You will be surprised at the improvement here.

IT SMOOTHES OUT THE RUNNING to a degree which you would have believed impossible.

IT INCREASES POWER OF HEADLIGHTS. Because of the quicker contact there is a greatly reduced consumption of magneto current, leaving a surplus of current available for headlights. Brighter lights result.

IT GIVES THE MOTOR MORE POWER, MORE SNAP, STEADIER PULLING, AND DOES AWAY WITH THAT JERKY RUNNING ON LOW THROTTLE.

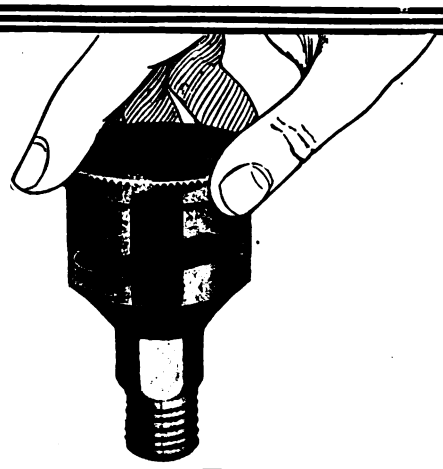
PRICE $2.25

Send for complete description of our large line of Ford and other specialties

MOTOR SPECIALTIES COMPANY

WALTHAM **MANUFACTURERS** **MASSACHUSETTS**

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KLICKET
Ratchet Grease Cup
"HEAR IT KLICK"

The Cap Locks On

You can't lose the cap from the "KLICKET" Ratchet Grease Cup. Easily put on and adjusted with one hand. But it can't come off—unless you unscrew it.

Simple, sturdy interior key keeps it safe. A new one free if you lose the cap or any part breaks. One set guaranteed to outlast any car.

No more grit in the bearings. Makes a loud "klick" at every quarter turn. No more guesswork about the amount of grease forced in each day. Adjusted as accurately in dark as in daylight. Threads cannot cross. Made in all sizes—for all cars—in steel, brass and nickel-plated. At your dealer's for 15c and up.

Handsome Free Counter Display

To every new dealer we give this striking two-color display card—19x39 inches in size. It sits on the counter, in the window, anywhere. Card is punched to carry 3 dozen assorted KLICKETS. They sell at sight. Place it on your counter and get sales you are missing now. Make more grease cup money without any more investment.



Write for Sample

Send 25c for sample KLICKET. Just give inside diameter of cap, size of pipe thread required on bottom of cup, or diameter of bearing hole. Return KLICKET if not O. K. Your 25c credited on first stock order.

Get our attractive dealer proposition and prices. Your jobber will gladly supply you with KLICKETS. Write now.

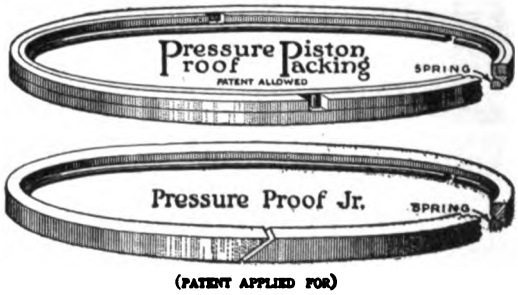
KLICKET AM. STPG. CO. Battle Creek

American Stamping Co.
602 Burchard St.
Battle Creek, Mich.

KLICKET AM. STPG. CO. Battle Creek

Ford Special: Replace both steering knuckle oil cups with brass Klickets for 50c, postpaid.

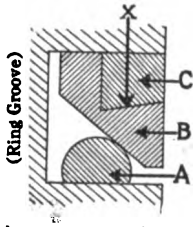
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(PATENT APPLIED FOR)

NEW FEATURES OF PISTON RING CONSTRUCTION YOU CANNOT AFFORD TO OVERLOOK

Notice the construction of this ring:



The expander A acting on the bevel on the main ring B forces it outward against the cylinder wall and upward against top of groove, making a *continuous* contact at both these points.

How do *other* piston rings act in worn grooves? At each reversal of motion of the piston the ring moves from one side of the groove to the other, allowing a leakage of pressure and oil around the *entire circumference* of the ring.

Carbon is the result of these small leaks, the oil working *under* the loose rings on the suction stroke.

Ordinary piston rings should fit the piston groove to one-half a thousandth of an inch, or oil will work by, no matter what attempts have been made to make the *joints* tight. How many rings are so fitted? Are yours? How long will they *stay* so?

Pressure Proof Rings are *self-adjusting, always tight.* Can YOU afford to accept a piston ring that does LESS than the Pressure Proof? A proved success. Pressure Proof Piston Rings ask only the opportunity of proving to YOU, in YOUR motor, that a tight piston ring is absolutely essential to POWER, ECONOMY and EFFICIENCY. Satisfaction guaranteed.

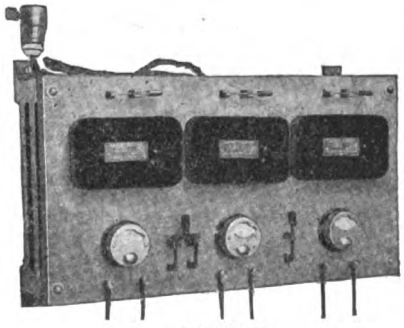
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PRESSURE PROOF PISTON RING CO.,
3368 Washington Street, JAMAICA PLAIN, BOSTON, MASS.

MONEY MADE

CHARGING STORAGE BATTERIES

If you are not equipped for charging batteries you are losing real money every day.



3 MF Type

YOU can install a complete plant for less than $50.00

THE ST. LOUIS BATTERY CHARGER

is sold to you on such reasonable terms that it will pay for itself and at the same time earn *you* a profit.

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ST. LOUIS ELECTRICAL WORKS
ARLINGTON & EASTON ST. LOUIS, MO.

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On The Hill Or Level The Simplex Takes Hold



Here is the jack that does perfect work in any position, wherever the car stops, on hill, in mud, or rut.

Up goes the load faster and easier than with any other jack made.

SIMPLEX JACKS

lift any load from the Ford to the heaviest truck. No barking of knuckles—hand away from the car.

This is the jack that won the gold medal given by the American Museum of Safety for the safety of jacks.

Never drops the load. Greatest range of lifts. For the motorist—the perfect jack. For the dealer—a fast selling accessory.

TEMPLETON, KENLY & CO., Ltd.

Manufacturers of

SIMPLEX JACKS FOR AUTOMOBILES, RAILROADS, AGRICULTURAL AND ALL CLASSES OF INDUSTRIES

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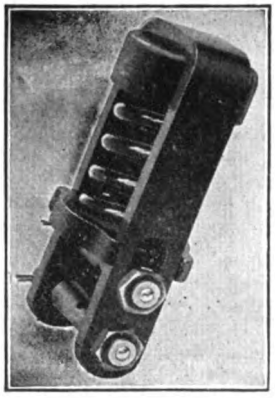
You can take the load from any position on the cap, the bottom shoe, the detachable shoe. Up she goes on hillsides, in mud, anywhere.



A Jack for Every Job

No. 36—½ Ton Capacity.
No. 41—One Ton Capacity.
No. 42—Two Ton Capacity.
No. 43—Three Ton Capacity.

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LEAVITT
Shock Absorber
For Ford Car

Simple
All Steel
Right Price

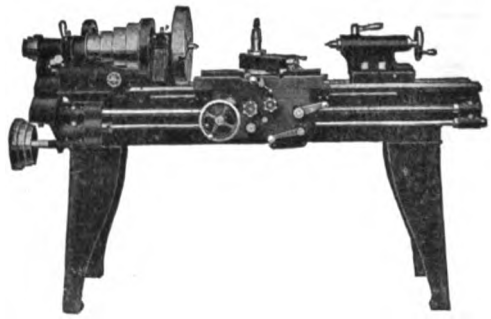
$5.00 Set of 4

Easiest applied. Every set guaranteed satisfactory or money refunded.

The winter is when you require shock absorbers. Send for catalogue.

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LEAVITT MANUFACTURING CO.
40 Sibley Street Detroit, Michigan



14"x6' Monarch Lathe
Other Sizes, 16, 18, 20-Inch

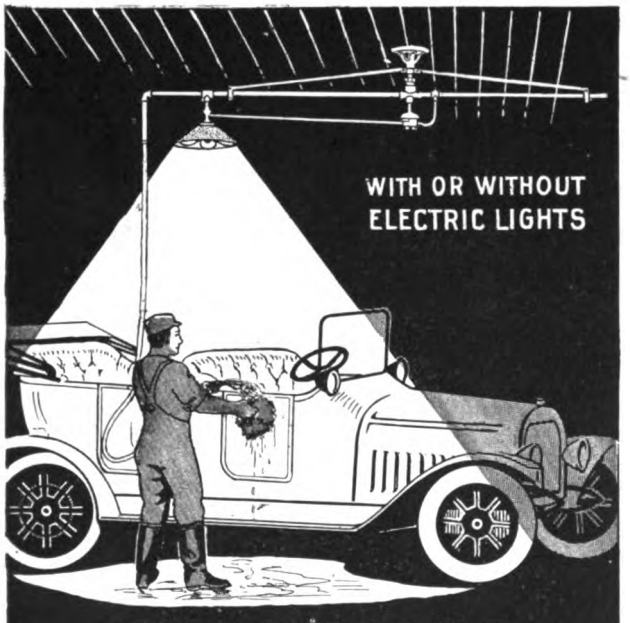
Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 6 and prices.

THE MONARCH MACHINE CO.
SIDNEY, OHIO



THE RHODES
OVERHEAD VEHICLE WASHER
PATENTED
THE VEHICLE SPECIALTY CO.,
26 STATE ST.,
HARTFORD, CONN., U.S.A.
SEND FOR BOOKLET AND PRICES

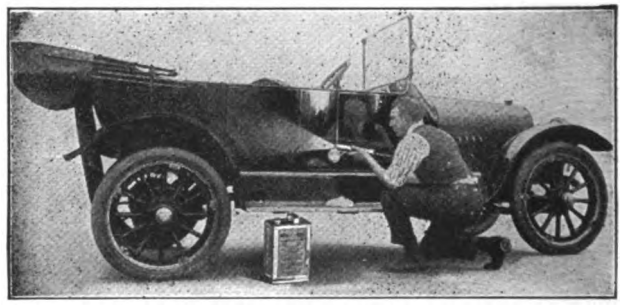
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Cleans and Polishes

It removes dust and stains and restores the original lustre to any polished surface.

It contains neither acid, gum nor any other injurious substance.

It preserves and protects the finish.



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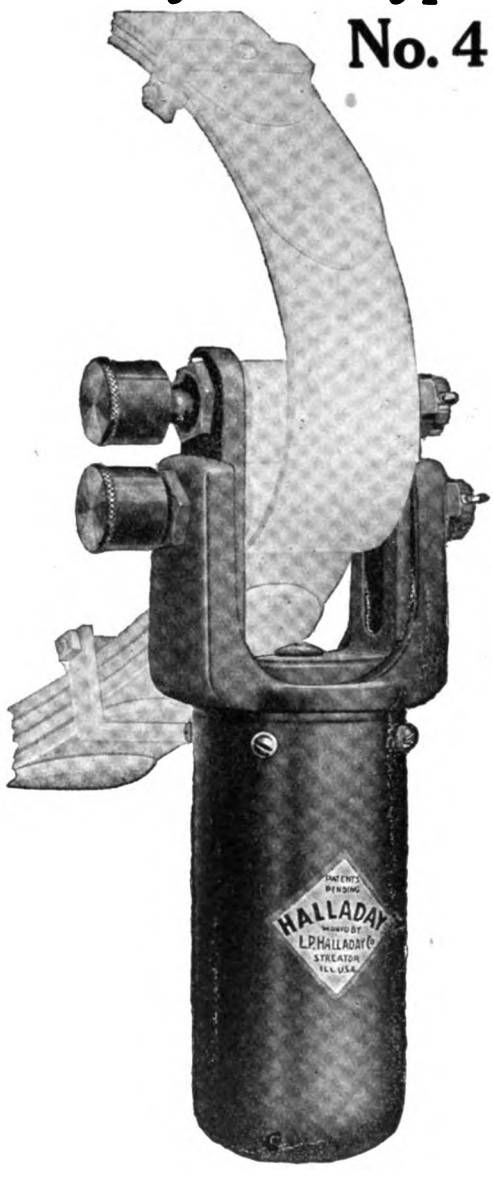
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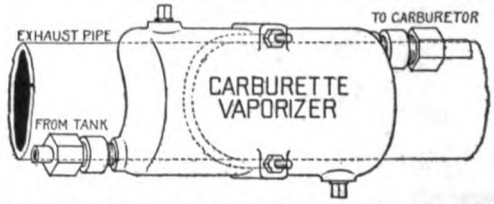
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Car Owners Have Long Been Looking for this Device———

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The **K-C Safety Lock Patch** completely encircles the inner tube. The Lock, formed by edges dovetailing and secured with a wire key, makes spreading or bulging through the blowout hole an impossibility.



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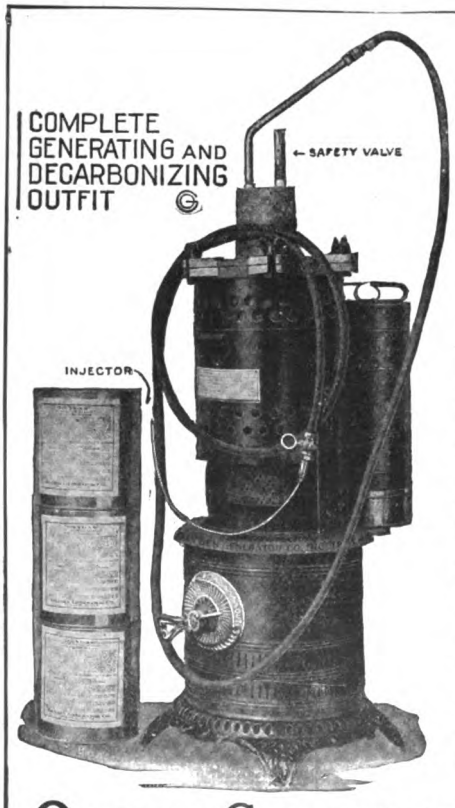
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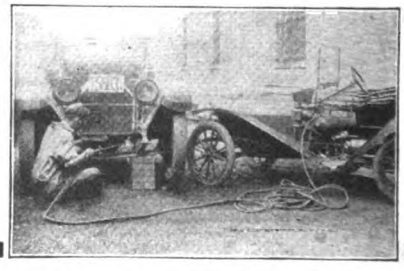
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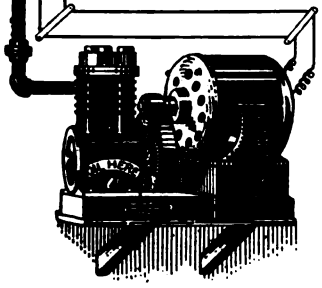
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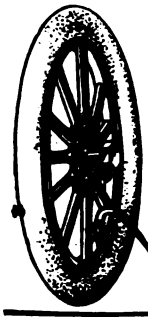


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A JOURNAL OF PRACTICAL MOTORING

Registered in the U. S. Patent Office

VOL. XIX, No. 4. NEW YORK, JUNE, 1915. PRICE { 10c PER COPY / $1.00 PER YEAR

MOTOR STARTERS.

Various Electrical Systems Employed—Separate Units and Motor Generators.

BY C. P. SHATTUCK, M. E.

The most interesting part of the electrical equipment of the automobile is the motor starter. It converts electricity into mechanical motion of sufficient energy to rotate the crankshaft of the engine at a speed of 150 revolutions a minute, or three times as fast as the average strong person can spin the engine with a hand crank. The motor starter is also interesting because of the fact that although productive of less than one horsepower (generally one-quarter or three-quarter) it will crank a 4½x 5½ six-cylinder motor at from 120 to 140 revolutions a minute, and with an 80 ampere-hour capacity storage battery as a source of current supply.

Considerable improvement has taken place in the motor starter since it was substituted for the hand crank. The units are made considerably lighter, are more compact and accessible, and are highly efficient. The most notable advance made by the manufacturer is the reduction of the amount of current required for starting. When it is considered that the efficiency of the starter depends largely upon the battery, it will be seen that economy of current is a most important factor.

The starting system, that is classed as the separate unit, is very simple, consisting as it does of a motor, switch, battery and two wires. There is, however, the reduction between the motor and the engine, and the method of the application of the energy to be considered. Because of the fact that

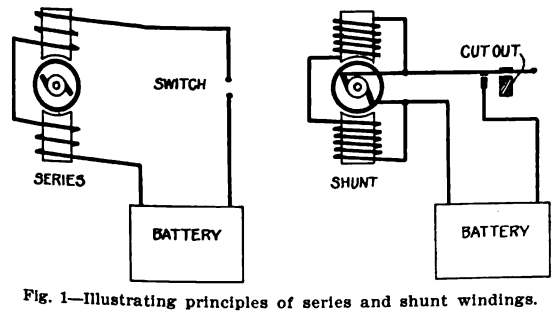


Fig. 1—Illustrating principles of series and shunt windings.

some manufacturers have combined the three functions of the electrical equipment, starting, lighting and ignition, a number of varying arrangements are presented which are not generally understood by the layman, and frequently minor faults of these systems create trouble for the repairmen.

Classifications of Systems.

To simplify the discussion of starters they will be divided into two types, the single or separate, and the two-unit. The single type as previously explained, is utilized solely for cranking. The two-unit consists of a motor and a dynamo, termed a motor-generator; that is, it functions as a motor when current is supplied it, and also generates electricity for maintaining the battery in a properly charged condition and for supplying current to the lamps. This classification is in contrast to that

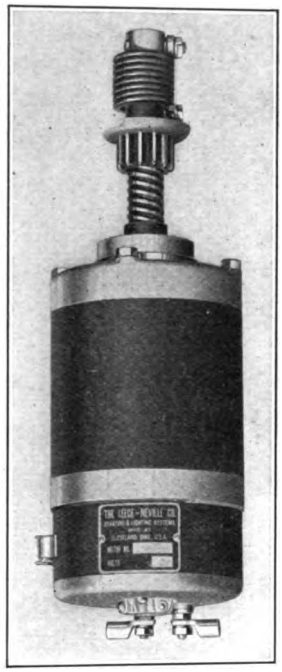


Fig. 2—Jesco Motor-Generator, a motor and generator in the one housing.

usually employed when considering starting, lighting and ignition systems, for the motor-generator even when it includes an ignition distributor is termed a single unit, and the separate motor and generator is classified as a two-unit system. As the various types are illustrated their constructional difference may be easily noted.

A motor and a dynamo are very similar, and their operation will be more easily understood if we apply the fundamental laws of magnetism which are that two unlike poles of a magnet, north and south, attract each other, and similar poles repel. There is an important relation between a wire through which electricity is flowing and a magnetic field. If we take a loop of wire and so suspend it that it will rotate around a supporting member, and connect the two supports with a battery, when a magnet is placed near one side of the loop it will be set in motion. The loop will rotate either toward or away from the magnet, according to the direction of the flow of current. This is the simplest form of the electric motor. If we reverse the conditions, that is, cause the loop to rotate through the field of the

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magnet by mechanical means, a current will be generated in the wire, and we have the principle of the dynamo or generator.

Function of a Commutator.

In practice, however, the motors do not employ permanent magnets but have coils of wire wound around the frame or magnet core, and the ends of the frame become the poles of an electro-magnet with the introduction of an electric current. Instead of a loop of wire, many loops are employed, and their ends are connected to metal segments comprising the commutator, a copper cylinder which extends around the armature shaft. The segments are insulated from each other by mica, and in contact with the commutator and diametrically opposed are two stationary brushes which are connected to opposite ends of a complete loop of wire on the armature. The function of the brushes is to connect the successive loops to the stationary windings while the armature or rotating part is in motion. A continuous pull is obtained by the connection of successive loops of wire, for as fast as one breaks connection with a segment, another takes its place, automatically shifting the current from one coil to the next in order.

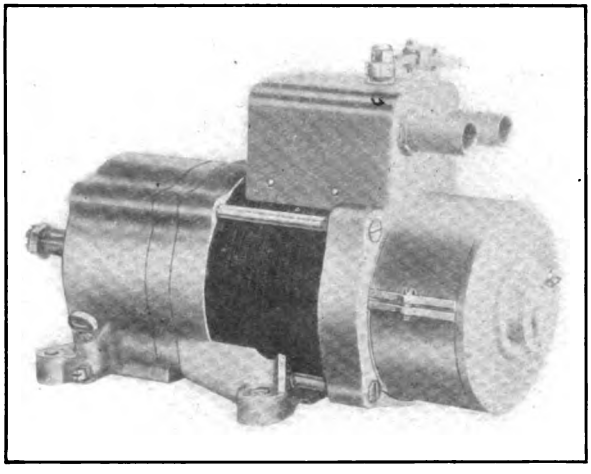


Fig. 3—Leece-Neville series-wound starting motor.

When the electricity is first passed through the armature the unit is known as a series-wound motor. When the current is divided, part of it going through the field windings and the balance through the armature, it is termed a shunt-wound motor. The advantages claimed of a shunt-wound type is that it permits of more positive regulation of the currents passing through it; that is, the amount of electricity flowing either through the armature or field coils may be changed without affecting the other. The series-wound motor is employed for starting as it has the desirable characteristics of high starting torque and diminution of current as the speed increases.

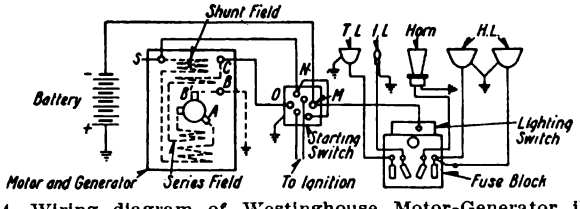


Fig. 4—Wiring diagram of Westinghouse Motor-Generator illustrating wiring of series and shunt-wound fields.

Compound-Wound Machines.

The combining of the two types of windings in a compound-wound unit adapts it for service either as a motor or a generator. A compound winding is obtained by utilizing a shunt-wound unit and placing a series winding around the field magnets. With such a unit both the series and the shunt coils are so wound that both provide a positive pole at one end of the magnet and a negative at the other. When a compound-wound machine is utilized as a motor-generator it is sometimes so arranged that the series winding is utilized when the unit is functioning as a motor, and two separate commutators and brushes are employed for each field winding. The motor-generator does not always consist of two separate windings on the one armature of the same machine, generator and motor windings, but may be two separate instruments within the same frame or housing. These are known as the double deck arrangement. Each have a distinct field and armature, and they may be placed on the same shaft, one behind the other or in tandem fashion. This arrangement is possible as the generator is not functioning when the motor is operating. Generally the double deck units are so arranged that the drive is through the armature shaft of the generator, with a train of gears providing suitable reduction between the motor and the dynamo shaft.

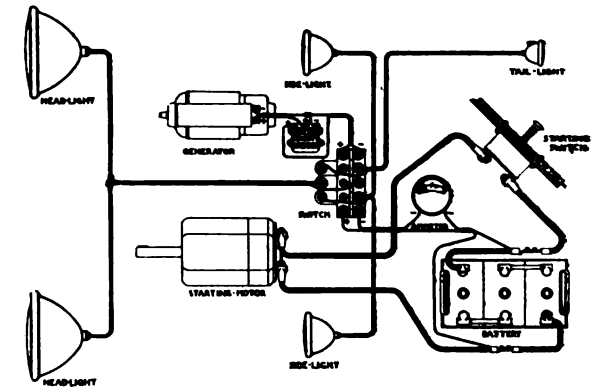


Fig. 5—Two-wire system employed with Auto-Lite motor.

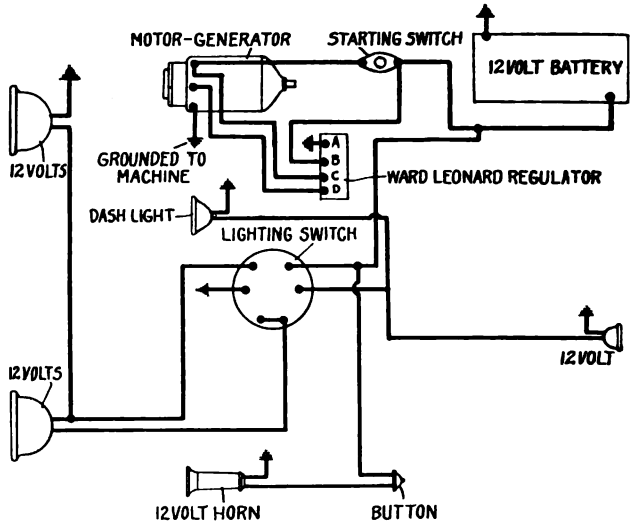


Fig. 6—Illustrating single or ground return wiring of Disco Motor-Generator.

Ratio of Reduction.

As a rule the energy of the motor of the motor-generator is imparted to the crankshaft of the engine by chain, and usually without clutches. The desired reduction is secured through the use of different size sprockets, and the ratio is generally about 3 to 1. Motor-generators are so installed that

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the engine is cranked through a pinion engaging with teeth cut in the periphery of the flywheel, and the dynamo is driven by the pump shaft. A popular method of taking the drive for the generator is from the camshaft of the engine.

Since the introduction of the motor starter the use of the flywheel of the engine for taking the drive from the motor has been favored by the majority of car manufacturers and this form has gained many adherents during the past year. It eliminates the use of sprockets, chains, over-running clutches, etc., as the desired reduction is provided by the pinion and the teeth of the flywheel. Instances are noted, however, where the separate type of motor is installed at the forward part of the engine, and the drive taken through silent chain or gears to the crankshaft. Exceptions are made

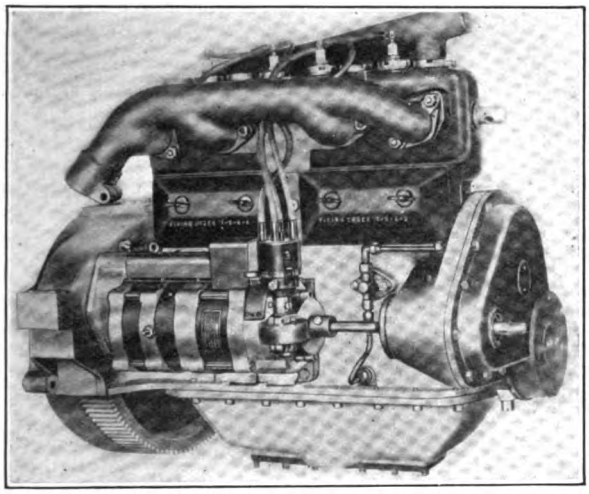


Fig. 7—Jesco Motor-Generator with ignition distributor, also showing flywheel drive of motor and pump shaft drive of dynamo.

to these conventional methods, one maker producing a model that can be installed at right angles to the crankshaft directly in back of the flywheel. The armature shaft of the motor is fitted with a worm which meshes with a worm gear on the clutch shaft, and the drive is through the gearset.

The motor-generator differs from the separate unit in that several types have non-stalling features; that is, at low engine speeds the motor-generator functions as a motor, causing the engine to restart

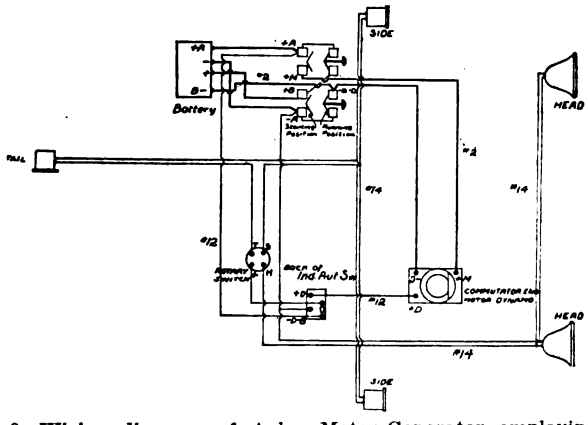


Fig. 8—Wiring diagram of Apico Motor-Generator employing 12 volts for starting and six volts for lighting.

if it stops. One particular model has but one armature, one set of field windings, and is geared to run at a fixed speed, regardless as to whether it is functioning as a motor or a generator. The system consists of the motor-generator, a battery and a switch. The switch is incorporated with the ignition switch, and closing the latter permits current to flow to the motor. Ordinarily the unit operates as a motor for

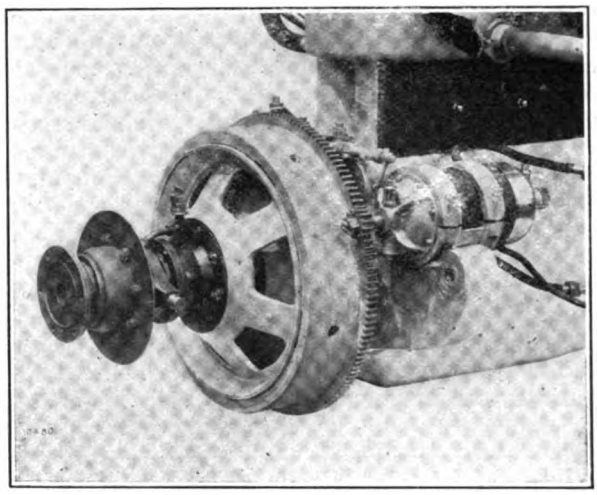


Fig. 9—Illustrating application of Bosch motor, a method very generally employed.

only a few seconds, but as long as the voltage generated by the instrument is below that of the battery the motor will function, aiding in rotating the crankshaft of the engine. Upon the voltage rising, the current generated flows to the battery. The sepa-

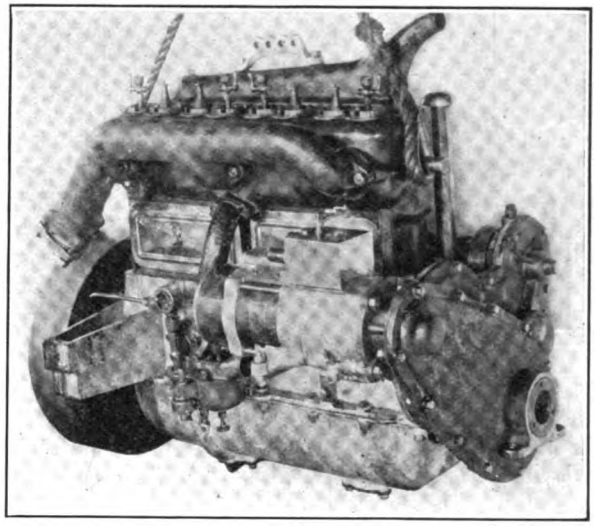


Fig. 10—Jesco Motor-Generator in which drive is taken and energy imparted to crankshaft by a silent chain.

rate unit type operates only as long as the switch is closed and current flows to the motor.

Cranking Speeds Vary.

The cranking speeds vary according to the engine, and a selection of six different types and sizes of multi-cylinder engines show that the engine of smaller cylinder dimensions is cranked at a much higher rate of speed than a large one. For example: A four-cylinder engine having a bore of 2.87 inches and a stroke of four inches is cranked at 210 revolutions a minute, while a six-cylinder engine 3¾ by 5½ is cranked at 104 revolutions a minute. These figures are not exact but will give the reader some idea of the speeds employed.

The current consumed varies also; that is, the draw upon the battery, it ranging from 65 to 150 amperes, according to the motor and the engine.

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One manufacturer claims that his product will spin a six-cylinder engine having a bore of 3¾ inches and a stroke of 5¼ inches and 60 pounds compression to the square inch, at 100 revolutions a minute with a consumption of 95 amperes. It is estimated that six volts every horsepower developed by a motor draws about 150 amperes from the battery, and that for starting that the rush of current is considerably greater than this. This current draw is bit for a fraction of a second, while overcoming the resistance of starting, and after the compression is overcome the consumption is considerably less.

Wiring Methods Defined.

Both the six and twelve-volt starting systems are used, with the former most generally employed, although the wiring is optional with the manufacturer. One make of motor-generator employs twelve volts for starting and six volts for lighting. Two six-volt cells are utilized and these are connected in

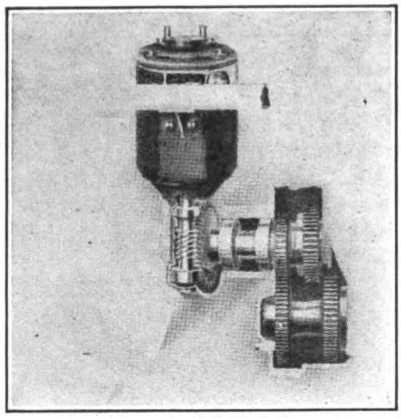


Fig. 11—Unconventional installation of Auto-Lite Motor.

series through the switch. This does not affect the voltage to the lamps as a six-volt current is supplied at all times. Upon the starting switch being released, the two battery cells are connected in parallel and charged as a six-volt unit.

There are three systems of wiring, single, double and three-wire. The single or ground return provides for the positive wire leading from the battery to each of the components of the system, and the other side of each part is connected by a short wire to the metal frame of the chassis. The advantages

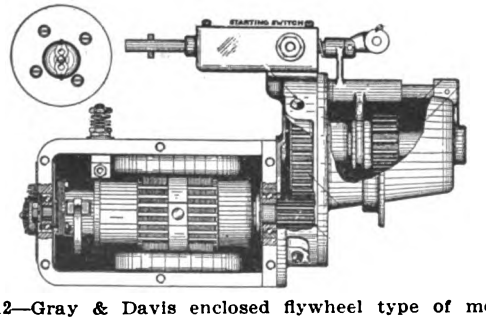


Fig. 12—Gray & Davis enclosed flywheel type of motor.

claimed of the system are: Smaller number of connections, more available space where room is limited, low voltage loss and the elimination of short circuits.

The two-wire system, officially designated as the insulated, consists of two wires, a positive and a negative running from the source of current supply to the components, thus obtaining a complete wire circuit both from and to the battery and members of the system. The most common of the three-wire system makes use of an 18-volt battery of nine cells, these being twelve and six-volts respectively. The

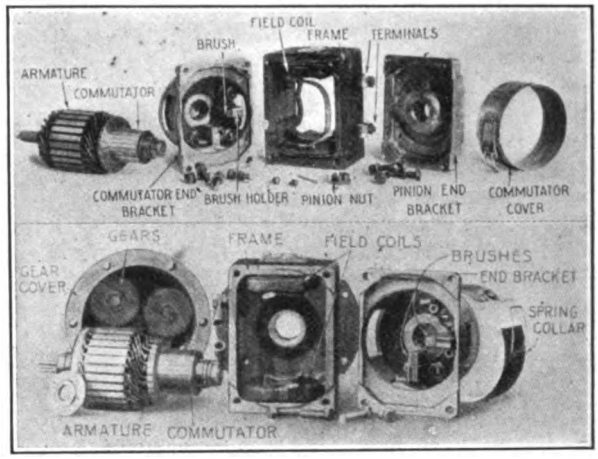


Fig. 13—Components of Westinghouse Motor, showing self-contained reduction gears.

negative poles of the two groups are connected, and this side is wired with the lamps, taking six or twelve volts. When it is desired to utilize a twelve-volt current with any component of the system, one side of the part is connected with the negative wire, termed the neutral, and the other side of the component is wired to the positive side of the twelve-volt section of the battery. Similarly a six-volt current may be obtained.

(To be continued.)

A LESSON IN GEAR CHANGING.

And It Makes a Charming Story of Romantic and Absorbing Interest.

From Wayside Gossip, in Motor, England.—It is quite a romance—my first case. She was a most fascinating little person, with a charming—well, I suppose one should divulge the rendezvous in general before disclosing the precise setting of the scene. It was Brockley Hill—that long deceptive rise from the outskirts of Edgware to Elstree. It is an excellent test hill, and quite a deceptive one. It is usually a case of a low gear climb, and any car which could not climb it under such conditions would not be worthy of the name. However, to our story. I drove up to the difficult spot just near the top in the wake of a two seater Ford, which seemed to go up very well. I then "anchored" my car against the curb and sat me down to see what would happen. It was a glorious morning, and I flattered myself that I was in for some good sport. As it chanced, I was. I had hardly lit a cigarette before I espied my first victim in the distance.

It was a 1911 14-h.p. model, and the sole occupant was the before-mentioned "she." As, perhaps, was only to be expected, she hung on to top speed far too long, until, in fact, she was forced to change. O, that change, and the awful grunting of it! However, the car stood it, and came along very uncomfortably on third. The change had been made much too late, and the little engine did not like it. In fact, it refused to behave itself as it would have done if properly treated, and demanded another change. Reluctantly the fair passenger fell

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in with the suggestion, and there was a repetition of the clanging of steel. By this time the car with its fair passenger was almost up to my observation post. I was looking at the car and its driver with the minimum of intensity which I could muster—in view of the pleasing appearance attached to the latter. Suddenly she looked up at me—and I don't think she liked me.

I wondered if she had read any of those nasty notes criticising driving exhibitions as observed on certain noted hills. I almost think something of the sort was in her mind, as she suddenly decided to change into low gear, although there was no need so far to do so.

That was the climax. She foozled badly and stopped both car and engine exactly opposite me. As the sound of brakes and so forth died softly away, I heard one little word—something like "dash," only it wasn't "dash." I could not help smiling—until I glanced up and found her looking at me. Then I was quite sure she did not like me. Her eyes were eloquent witnesses of the fact. Luckily I had walked up a little way beyond my car, so that the situation was not yet one of urgency, and the road was reasonably clear. I was now quickly debating in my mind whether her solitude precluded me from offering the assistance which chivalry would instantly have dictated had she any companions with her.

I had just decided to risk it and run out and give the engine a swing, when I found that I was too late. She was out. With one dainty hand she patted the top of the radiator—presumably to see if it was hot "as usual." Apparently she seemed satisfied with the radiator, and then spent a moment or two looking around, and I must admit that she appeared as though everything was quite as it should be, that she was completely mistress of the situation, and that she had really only stopped because she wanted to have a look around. However, another car was now visible on the top of the hill coming down towards us. It was a beautifully lined 20-30 h.p. car, and as fine as one could wish to handle; it had a happy party of people aboard, including some children. The driver, seeing the lady of my story apparently in mechanical distress, slowed down, presumably with the intention of offering assistance. However, seeing me sitting calmly on the bank, quietly puffing away at a cigarette, and the other car just below, he apparently came to the conclusion that assistance was not required.

Anyway, he proceeded on his way. I watched him down the hill and then, as innocently as I could, let my eyes wonder in the direction of Miss Charming, who was endeavoring to start up. As I glanced at her she let go of the starting handle and began to feel the radiator again. That was my chance. Her failure to accomplish something which she had attempted warranted me in intruding (more forcibly) my presence upon her. Trying to look nonchalant, I threw away my cigarette and walked up to her.

"May I be of any assistance?" I queried.

"No, thank you," she replied; "at least, I think it's only the engine that's stopped. It's got rather hard to turn, though."

Well, it had got rather hard to turn; so hard, in fact, that either the clutch had to slip, the gear wheels break, or the brakes allow the car to travel forward, before it could turn to any appreciable extent. In short, the change-speed lever was comfortably ensconced in the low gear position. Fortune was favoring me.

"It is rather stiff," I said; "perhaps it would be better to wait until the engine cools a little."

I keenly felt my degradation in descending to this mean subterfuge, but I really wanted to get an opportunity of giving her a lesson in the art of accurate gear changing. She was so attractive in herself that—well, it seemed a pity that any discord should enter upon the scene, and it certainly did enter when she was gear changing. I suggested that I should back the car to the side of the road, to which she agreed. This gave me the chance I wanted, and I managed to get the gear out under the cover of a carefully-manoeuvred cough.

We now began to get on in a less icy atmosphere. Presently she confided that she was only beginning her motoring career, and that she had bought the car second-hand to learn on, and that she was then going to buy a new car. After a short while we became almost affable, and I began to feel that my original smile at her discomfiture had been forgiven. I elicited the information that she was only out for a practice run, had intended having a little lunch in the country by the roadside somewhere, and then to return home.

I thought we had now become sufficiently reconciled to venture a suggestion as to the art of gear changing. I started by referring to the deceptiveness of the hill and its difficult nature. This proved quite a good line, and, to cut a long story short, it was eventually agreed that I should have the honor of giving her a lesson on the hill in question. Needless to say, several cars had passed up the hill by now, but I had been too pre-occupied to study their performances in detail. When we came to cranking over, the engine was quite nice and easy about it, and started instantly, as though to prove its appreciation of the rest which I had so wickedly obtained for it. I turned the car, and we went down the hill.

Conversation was by now much easier, and by the time we were ready to ascend the hill I felt that I could discourse on motoring matters as though I had been duly apointed to the post of instructor.

"There are two ways," I told her, "of making a good change on a hill, and, by both methods, the change can be made successfully at any speed desired. One must always change in good time in any case. One system is known as the double declutch, and the other as the slipping clutch change. With the clutch on this car you can do either, but as it is quite suitable for the slipping change—which is the easier of the two—we will try that to start with. You see, we are now doing 23 m. p.h. on top, and if we let the car go on it would go much further up the hill before a change was absolutely necessary. However, we're going to change now. You see, the clutch pedal is pressed down gently, thus, until the engine commences to race a little—d'you hear it?—and then we merely move the change-speed lever into third, like that. Easy, isn't it? Now, you see, that was quite a good change, and we have the advantage that the engine is still running fast and therefore giving more power than if it had been allowed gradually to slow down on top gear."

At that moment there was a shriek from a 12-

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volt Klaxon behind, and a well-known West End garage manager flitted by at about 40 m.p.h. on a sporting Spanish car. Almost as he passed us he "nipped" into second as cleanly as possible, and away he went with the engine roaring at about 3000 r.p.m. with an open exhaust. The lesson was not lost on my fair pupil, and a better example of a good change at high speed could hardly have been presented. By now it was nearly time for us to come into second.

"You see," I said, "we could go much further on third before changing if we wanted to, but if we go into second gear, with the engine running comparatively slowly, it will not be able to accelerate on the stiff part of the hill. If, however, the engine is turning at a good speed on second gear when we get to the stiff bit, it will probably be able to keep up its speed till the top of the hill, instead of slowly laboring its way up. Therefore, we change again sooner than we actually need to. There, you see, quite as good a change as the other and nearly as easy, only one has to pass through the gate fairly quickly."

True to my prophecy, the engine did keep up speed well, and finished the climb in good style on the second gear. My fair passenger was quite pleased, and was now so unbending as to prove graciously grateful. Should she try it? Why, certainly. Might I accompany her again in case—er? Er—yes. And so to the bottom of the hill again, as friend Pepys would say.

I must not vaunt my prowess as a teacher, so I must put it down to her ability as a pupil that she managed the climb this time beautifully. She was charmed with her success. I now fear, however, that we have come to the point where the rest of the story of that day cannot be truly said to appertain to my work as a roadside critic. It was not yet lunch time; but I am bound to confess that I studied no more cars that day. After all, one naturally likes to make sure that one's pupil will perfect what knowledge she has already acquired, and, all said and done, I could easily continue my studies with other cars on the morrow.

THE OXY-ACETYLENE TORCH.

The Proper Flame, Its Importance and How to Get It.

BY M. KEITH DUNHAM, OXY-ACETYLENE ENGINEER.

The garage or repair shop using the oxy-acetylene flame has at its command one of the best money-makers possible. It will, as well, make friends by the score if its principles are understood. But the best apparatus in the world in the hands of a man not understanding it, will drive away trade and shatter forever the faith of customers. There are hundreds of garages with oxy-acetylene apparatus, the users of which do not understand even the first principles of welding. To become proficient in the use of a welding flame is not easy; to master its principles and do ordinary repair work, however, is simply a matter of careful thought and some practice.

Two gases are used, acetylene, rich in carbon and very high in heating value, and oxygen, which is air with the diluting agent, nitrogen, left out. The apparatus may be, and usually is, a cylinder of acetylene, a tank of oxygen, reducing valves for both gases, and a torch which properly mixes the two gases. The construction of a torch which will operate without flashbacks and burn the correct proportions of gases is one of exactness and knowledge.

The point that is most difficult to drive home to the mechanic is that this welding torch may be adjusted to give three different kinds of flames, only one of which is correct. To the ordinary man, heat is heat, but the fact is that there are different char-



Fig. 1.

acters of heat and the effect of the wrong flame on melting iron can be deleterious and result in a weak weld, consequently a break in service and the loss of a customer.

A correctly adjusted welding flame is practically neutral in character—it will melt the metal without any ill effects.

A flame with too much oxygen in it—we call it an oxidizing flame—will burn the metal, take away all its strength and leave the metal in just about the



Fig. 2.

same condition as an old rusted iron piece, for rust is nothing but nature's way of oxidizing.

Too much acetylene puts too much carbon in the weld, hardens it and makes it brittle.

Learning to adjust the welding torch so that a neutral flame is obtained is the first principle of successful welding.

Fig. 1 shows the acetylene lighted and blowing away from the tip slightly. Fig. 2 indicates the appearance of the flame as the oxygen is turned on. Note that a cone is beginning to appear in the center of the flame, white in color, verging towards blue. Continue increasing the oxygen until this cone appears as in Fig. 3, sharp and distinct, but stop right



Fig. 3.

there. Failure to do so means an oxidizing flame as in Fig. 4. To make sure the flame is correct, increase the acetylene pressure slightly; if the flame begins to take on the shape illustrated in Fig. 2, decrease the acetylene pressure until the ragged edges of the cone just disappear.

Here is the basis of all the poor steel welds—why that frame broke, why the shaft you built up and turned down was full of holes, why you burn every steel job you attempt, so that learning to adjust the flame is one of the big factors in successful welding.

It is not sufficient to be satisfied that once adjusted the flame will stay neutral. Heat expands the gases and this expansion need not be the same with both gases, so that after you have started

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welding, the flame should be tested at intervals by increasing the acetylene, as previously outlined.

Flashbacks are at first puzzling and are always a nuisance, the flame burning back into the mixing chamber with a whistling noise and the tip emitting yellow sparks and soot. They cannot always be prevented in the particular torch you may be using but the modern torch rarely if ever flashes. A flashback may be caused by the orifice in the tip being very uneven, by the flame getting in too close contact with the weld, by excessive heat radiated from a hot casting and by an insufficient pressure. When



Fig. 4.

it occurs, the oxygen cock on the torch should be quickly closed and ordinarily the acetylene then burns out, when the flame may be instantly adjusted again. Sometimes, however, it is necessary to shut off both gases and cool the head of the torch by immersing it in water. If the flashbacking is persistent, force the pressure of each gas to the limit—all the tip will stand, without the flame blowing out. Experienced operators usually stop a flashback by pinching the oxygen hose sufficiently hard to shut off that gas temporarily.

The inexperienced operator should not be alarmed when the torch flashes. Accompanied as it is by considerable noise, it is somewhat startling but there is no danger. The gas (or gases) should be shut off quickly, however, since the continued burning inside will destroy the torch.

Here then are the two chief trouble-makers for the beginner explained. Understanding them does not by any means make you a welder. You are simply started right and by thoroughly grasping the importance of the neutral welding flame the first principle is mastered.

CARBON DEPOSITS.

What Causes Them in Cylinders and How They May Be Removed.

One of the worst of motor defects and inefficiency is carbon formation in piston heads and combustion chambers. Unless this carbon is removed in some way it soon becomes impossible to drive the car except with the ignition fully retarded and with the throttle only partly open, so that the hitherto lively car becomes a dead, unpleasant machine which cannot be driven with any pleasure, and requires a change down from top gear on the smallest incline.

All this is well known, yet it cannot be said that all or even most motor manufacturers have recognized the seriousness of the trouble, as it is a serious matter to have an engine which will not run a thousand miles before it is cleaned out, and there are many engines on the market to-day which will not do much better than this, though a few will run up to five and even ten thousand miles without requiring decarbonization. Of course, these remarks apply to the poppet engine only; so far as the sleeve valve engine is concerned, it is extraordinarily insensitive to internal dirtiness, and runs well in the natural condition of an internal combustion engine. Twenty thousand miles and more is the record of the sleeve engine without requiring decarbonizing, and not an exceptional record either. On the other hand, there are comparatively few poppet engines which will run much beyond two thousand miles without requiring cleaning. It is well worth while to examine into the reason for the exceptions, as if this once be appreciated it should be easy to bring the troublesome engines up to the same standard.

For a very long time the main causes of carbonization were not understood; some engines were much better than others, and no one quite knew why. Then, the dust which is inhaled by the engine, excess of gasoline through unduly rich mixtures, lubricating oils which carbonize readily, and so forth, were all blamed, and, to a certain extent, rightly. Nevertheless, an engine with a carburetor in perfect order, with dust filters and other requirements to keep the inhaled air clean, and with the best possible lubricating oil, may carbonize almost as badly as it would without these safeguards.

The main cause of carbonization is oil getting above the pistons. It is generally agreed that, when the engine is working hard with a fully open throttle, comparatively little oil passes above the pistons, but that when running with the throttle closed or nearly closed, the suction in the cylinders exerts itself more and more upon the contents of the crank

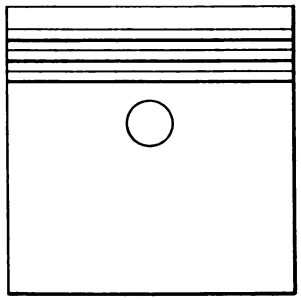


Fig. 1—An ordinary piston with three rings above the gudgeon pin. Sometimes four rings are used, but in any case this type allows oil to pass into the cylinder heads.

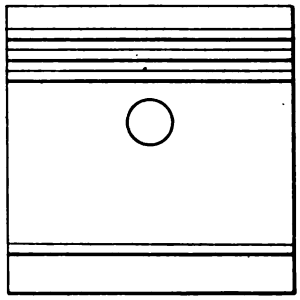


Fig. 2—A piston with a scraper ring near the bottom of the skirt, otherwise identical with that shown in Fig. 1. This passes less oil, but is not much of an improvement.

chamber, as the partial vacuum in the combustion chambers cannot be wholly filled through the restricted throttle opening, and consequently, oil is drawn up past the piston rings. Some of it is burnt in the engine, and expelled through the exhaust pipe in the form of blue smoke, but much of it is only burnt and forms carbon, and in due time the deposit becomes so thick that the engine is rendered more or less inefficient. It is obvious, therefore, that the thing to aim at is a piston which does not permit oil to be sucked past its rings into the cylinder head; the carbonization which then occurs from slightly rich mixtures and from dust and other impurities will not be serious.

All this is a recital of facts which are well known, and while so many engines remain on the market which carbonize rapidly it must be admitted that the mere knowledge of the facts does not appear to have been of great assistance in the majority of cases.

The mission of the piston rings is two-fold, as they have to make a gas and pressure tight, but freely sliding, joint between the piston and the cylinder. Piston rings should not be asked to do more

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than this. Undoubtedly, ordinary piston rings, while serving well enough as pressure retainers, do not keep the oil from getting above the piston, and to prevent this many makers fit what is known as a scraper ring. This is practically another piston ring below the gudgeon pin, and its mission is not to retain pressure but to act, as its name implies, as a sort of squeegee or scraper to remove the excess of oil from the cylinder walls at or near the base of the piston. Figs. 1 to 6 illustrate various piston designs.

On comparing experiences with owners in many cases these scraper rings appear to be almost useless, and in others quite satisfactory. It is obvious,

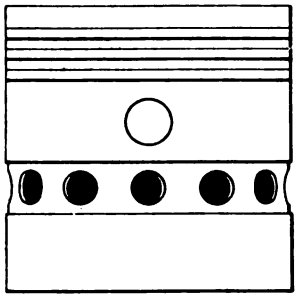


Fig. 3—The piston shown in Fig. 1 lightened by drilling holes in the skirt below the gudgeon pin, but it is little if any better, except for lightness, in the matter of allowing oil to pass.

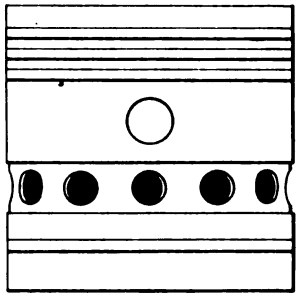


Fig. 4—A great improvement for the scraper ring is relieved of suction by the groove and holes above it, but the oil is forced behind and above the scraper ring.

therefore, that there is some other factor to be considered, and this, we believe, has been recently discovered by one of the Rolls-Royce (England), engineers. The important point which the Rolls-Royce engineer has recognized is that the scraper ring to be effective must not be under the influence of the suction of the engine, so that the pressure immediately above the ring is the same as that in the crank chamber. In other words, if there be no suction on the scraper ring it will scrape the oil away and none will be drawn past it up the piston and beyond the piston rings proper. The word "none" is used loosely here, as, of course, some oil is left, and must be left, on the cylinder walls, otherwise the piston would not be lubricated, but the scraper ring should remove the excess of oil and leave merely a thin film sufficient for piston lubrication.

When we recognize this basic principle we see at once why some scraper rings are satisfactory and some otherwise, as about halfway down the piston there is a groove all around and holes are drilled through the piston walls at this level. This means that well above the scraper ring there are holes in the piston in direct communication with the crank chamber, and that, therefore, the pressure over the lower half of piston and above the scraper groove is the same as the pressure below it, and there is no suction effect. This probably explains why some engines with scraper rings are clean and others dirty, because it has happened that in some cases designers have drilled out the pistons above the scraper ring merely to lighten them, not recognizing that in so doing they were building better than they knew.

The receipt, or at any rate one receipt, for a clean engine may be summarized as follows: Ordinary piston rings above the gudgeon pin; below the rings the piston should have a waist, or reduction in diameter, and holes should be drilled at this point through the piston walls; then at the bottom of the piston there should be a scraper ring, and below the scraper ring plenty of clearance between piston and cylinder to allow the oil to get back to the crank chamber. The same principle can be carried out with the scraper ring a little way up the piston if preferred—and some designers do prefer it for reasons into which we need not enter—but in this case holes must be drilled below the scraper ring so that the oil removed from the walls can pour through them back into the crank chamber and not be forced behind the scraper ring into and above its groove.

So far as we know, this appears to be a simple remedy for the carbon trouble. Of course, we recognize that it is quite possible that other inventors, by some particular form of scraper ring or rings, may be able to overcome the difficulty without removing the suction from the rings. We illustrate, in addition to the more usual designs of pistons, the combinations (Figs. 5 and 6) which appear to keep down the oil satisfactorily, as everyone who has had experience with the later English Rolls-Royce engines knows that they run for very long periods indeed without getting dirty, and this despite the fact that, as they are large engines, they must cover a considerable portion of their mileage with very small throttle openings, when the suction on the crank chamber past the rings is at its greatest.

In the accompanying diagrams it will be noticed that the Rolls-Royce piston (Figs. 5 and 6) has the waist formed with holes through it in line with the gudgeon pin, whereas in Figs. 3 and 4 the waist

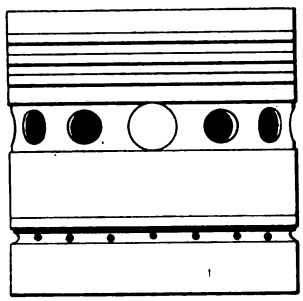


Fig. 5—This design overcomes the defect of the type shown in Fig. 4, as the small holes in the skirt below the scraper ring enable the oil scraped off the cylinder walls to escape to the interior of the piston.

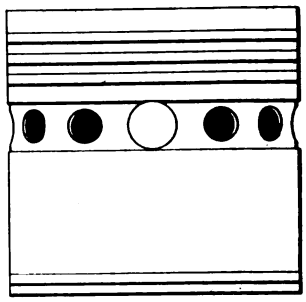


Fig. 6—Either of the designs in Figs. 5 and 6 provides a piston which will not allow oil to pass, because the scraper ring is relieved of suction from above and is untrammelled in its working below.

and the holes are below the gudgeon pin. The latter is the usual method, but possibly the Rolls-Royce arrangement possesses virtues which are not apparent without consideration. For instance, if the holes were larger and lower down they might allow too much oil to get on the cylinder walls above the scraper rings.

The slightest leak between the carburetor and the combustion chamber of the cylinders will tend toward irregular firing, especially when running slowly.

If the paint on a car is not too badly cracked and chipped, it may be much improved by cleaning it perfectly, and then revarnishing it with thin spar varnish.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1613 Exhaust Explosions.

From J. W. Butterfield, Pennsylvania.—I have a Ford car, model T, 1910. I had it overhauled by an experienced man but am having trouble with it. It runs and starts easily, as a motor should that has just been overhauled, but the trouble is that the explosion occurs in the exhaust. It is not a back fire as it does not go through the carburetor. The valves were seated and new springs put on to all but two. It seems to have very good power and the compression is fine. I have tried to overcome the explosions in the exhaust by changing the carburetor and also the vibrator. It has a K. W. vibrator.

Reply.—Explosions occurring in the exhaust indicate missed explosions in one or more cylinders. The unburned mixture of air and gas is pumped into the exhaust, a charge at each alternate upward or outward movement of each piston in the cylinders which are missing explosions. This condition may be due to defective ignition, imperfect carburetion or some other cause, such as a bent exhaust valve stem, weak valve springs, etc. If you will locate the cylinders which are missing explosions, you will probably find that in two or three cylinders the explosions occur regularly. If such is the case we do not see how changing the carburetor, or K. W. vibrator could remedy matters. You may have a defective coil unit, not at all improbable, or the plug porcelain may be cracked, or one or more of a score or two little defects will be found to be the primary cause for the blame all too frequently laid at the door of the carburetor. Muffler explosions most frequently indicate a rather rich mixture.

1614 Life of a Car.

From R. O. M., West Virginia.—I would like to have the editor or some reader, who has had experience, give me some idea as to how much mileage can reasonably be expected of the average thousand dollar car to-day. And if there is any noticeable difference in the life of such a car, if it be used in a practically level country or in the mountains, where the motor must necessarily be pulled much harder.

Reply.—Anywhere from 25,000 to 200,000 miles, depending altogether upon what one means by the "life" of a car, and, of course, as much more upon how the car was used and where it was used. A car will last longer in a level than in a hilly country.

1615 Transmission Trouble.

From L. R. McGaughey, Nebraska.—I have a model 10 Buick automobile. The low speed and reverse is obtained by pushing a pedal forward which contracts a band around the transmission. I have plenty of power with the low speed and can go through anything that the engine can pull through. But when it comes to backing up I have very little power. I put a new lining of Multibestos in both and found that the reverse worked splendid while it was dry and new, but soon become glazed so that I have no power. In fact the old one that I took out was worn but a very little, but I thought that I would put in a new one while I had it out. Is there anything that will cut the glaze and make this band hold on the reverse? Or if that is not the trouble what can be done to rectify the difficulty? The band grips the drum in good shape but it does not hold it nor can one push hard enough on the pedal to make it hold. It has a planetary type transmission.

Reply.—The planetary transmission, standard equipment with all Buick model 10 cars, is subject to wear just like any other gearing which gets severe use. When bushings in the gears become worn the gears operate off their true pitch lines, and much power is lost as a result. There is another prevalent loss of power, if we might call it so, which some users do not seem to realize. This is from a dragging reversing band when operating on low speed ahead, but much more likely from a dragging low speed band when in reverse. Your reverse band should never slip. It is the slipping which eventually causes it to glaze. If it begins to slip and is not properly taken up it will slip worse until eventually it will hardly hold at all. Your statement that the multibestos worked well when new and dry, but soon did not hold should satisfy you that proper attention was not given it when new to prevent initial slipping. We advise a new multibestos lining and that it then be given careful use.

1616 A Starting Trouble.

From R. P. Johnson, North Dakota.—I have a 1912 Overland, 35 horse power Schebler L carburetor, Remy magneto, in good condition, new plugs and new dry cells, but this car will positively not start till I warm the carburetor or prime it. When it is warmed up it starts with the first turn of the crank and runs good. It has always been that way. What can be the reason, do you think? I see lots of cars that start with the first turn of the crank even in cold weather. Why the difference? Would a newer model carburetor help, do you think? The car is rather slow to pick up, too. It has run 5,500 miles. Do you think that the crank boxes are worn enough to be taken up? It is a little noisy. Last fall the car didn't run good at all, and after looking everywhere for the trouble, we found it in the auxiliary air valve. The little burr that holds it together was off, so it couldn't work right.

Reply.—It is not at all unusual that your car will not start until the carburetor is warmed and primed. With the present hard to vaporize gasoline, we don't know of any cars that will start easily in cold weather unless the carburetor is primed and warmed. The model L Schebler carburetor is a good one and your Overland car motor is likewise a good

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one. We suppose your carburetor is furnished with a heating jacket around the throttle which should be connected with the hot water. Before adjusting the carburetor be sure that your ignition is properly timed and that you have a good hot spark at each plug. See that your valves are properly timed and seated and that all connections between your intake valves and the carburetor are tight. Bear in mind likewise, that the carburetor should be adjusted to the motor under normal running temperature, and not to a cold motor.

1617 **Skips on the Magneto.**

From Dr. E. G. Heaton, New York.—I drive a 1912, four-passenger Mitchell. It gave me absolutely no trouble until late in the fall of 1913, then it began to skip when running on the magneto. If thrown on to the batteries for a minute or two and then back on to the magneto, it might or might not run for a good while before skipping again. All wiring and the switch was gone over carefully without finding the trouble. A Mitchell man told me the trouble was in the coil, but as it was late in the fall I decided to wait until spring before buying a new one. When spring came the trouble seemed gone, and I ran all last summer without annoyance. Now it has appeared again. I ran all right on the batteries but the skipping appears when running on the magneto, especially if the motor has to pull hard. So now I have to use my batteries for heavy work and the magneto for level or down grade. The system is Splitdorf low tension magneto and coil. If the trouble is in the coil why don't I get skipping when running on the batteries?

Reply.—In relation to the missfiring of your car when running on the magneto, the intensity of the current increases with the speed. When running slowly the spark produced in the cylinder will be weak and the charge will be ignited slowly. At high speeds the strength of the current being greater causes the charge to ignite more rapidly. Possibly if you decrease the gap of your spark plugs it might remedy the matter. The gap should not be more than 1/64 of an inch. The current of a magneto, while of greater amperage and heating value, is of less voltage than with the battery system. Of course there is a possibility that your magneto itself may be somewhat weakened, but your letter does not indicate it.

1618 **Misses and Finally Stops.**

From Ford Hawley, Iowa.—I have an Overland, model 60T, 1912. It will not throttle down when idling but will throttle down nicely when pulling. When I crank it up I have to keep the throttle one-fourth open or it will miss and finally stop. When the motor is speeded up or pulling it runs fine. It seems to run a trifle better on the batteries. I took the motor down this spring and cleaned out all carbon and ground the valves. I have a Schebler carburetor, model L, but I do not think it is in the carburetor. I have tried adjusting it. It is equipped with a Remy magneto. The platinum points are in good condition. The car has been run 6,500 miles. I use the light grade cylinder oil. When I am driving it will stop firing on the magneto. I switch on to the battery, run a few seconds on the battery, then switch back and it runs again for quite a distance, then I will probably have to do the same thing over again.

Reply.—Possibly you may not be aware that a magneto does not give quite as good a spark at low speed as at high. However, this may not be the cause of your trouble. Assuming that your carburetion is correct, which you seem to think, there may be an air leak somewhere between the carburetor and cylinders, and this would dilute the mixture more at low speeds than at high. At low speeds and open throttle likewise the compression is greater and a spark is thereby rendered more difficult. Although it may not be the common experience, we have found that as a rule no car throttles down quite as accurately in running idle as when pulling.

1619 **Hudson Car Compression.**

From Charles Ferguson, Massachusetts.—Would it not be possible to get more power and greater economy out of my model 33 Hudson, were I to replace the hollow ended valve cap plugs with solid ones, in order to reduce the clearance and thus increase the compression?

Reply.—Our advice is to let well enough severely alone. You can rest assured that the Hudson engineers use the compression which best suits conditions of reliability, economy and power. Every embryo gas engine designer and inventor seems to have the "high compression bug," but after one experience trying to operate an engine with an abnormally high compression, this malady seldom again appears. There are to-day on the market more cars with too high compression than with too low.

1620 **Ignition Trouble.**

From E. Hallenbeck, New York.—I have a 1911 Cadillac, 30, which has a Delco system or vibrator. This vibrator will start the motor when it is working well, but at present you can crank the motor with the switch in one place, as well as another. This is very inconvenient, because you cannot stop the motor, and more than that it runs the batteries off so soon. The switch has been taken apart and there can be no trouble found in it. I will be very pleased to receive any information along this line.

Reply.—There is undoubtedly something wrong with your wiring, for with the switch lever in the "off" position the battery circuit should be broken, and it should be impossible to start the motor with such setting. The push button normally cuts a vibrator into the circuit. In ordinary running the vibrator is not in the circuit. If you will write to the Dayton Electrical Laboratories Co., Dayton, Ohio, they will send you a diagram of the wiring of this single spark battery ignition system, from which you should be able to trace out the evident short circuit.

1621 **Car Comes Slowly to a Stop.**

From Geo. F. Wardle, South Dakota.—I have a model 31 Rambler car, 2 cylinder, about a 5-inch bore with a model R Schebler carburetor, 1¼ inch. This car pulls good against a strong wind or in mud for about 20 rods, then it begins to slow down, and finally misses. The engine will run all day with-

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out missing, if I don't pull it for too long a time, then when it starts missing I run it free for half a minute and it is good for another half mile hard pulling. I have taken off all the gasoline pipes and they run a full stream. I have also adjusted the carburetor every way. This trouble started last summer. I had a model L Schebler on at that time. Thinking it was in the carburetor I put on a model R. I use a good heavy grade of oil and have tried all grades of gasoline, some with a real high test, but it make no difference. If you can give me any information, please do so. I have repaired all kinds of automobiles and gas engines for seven years and never had one that would stick me but this. This car runs on batteries, only I use six and eight and master vibrator and it works perfectly.

Reply.—If your statement is accurate, the action of your car is indeed singular, but as a rule when an engine stops slowly and with missfiring it indicates that the batteries are exhausted or the plugs fouled through over lubrication. If the battery is weak you will note a very weak vibrator action and a weak spark. It may be possible, likewise, that there is water in the gasoline. This will sometimes create a condition of the sort you refer to, or the gas tank may be air bound.

1622 Floating Axles.

From M. R. Homer, California.—Kindly explain in your next issue the exact difference between a full floating rear axle, a ¾ floating rear axle, and a semi-floating rear axle, and give some cars that use ¾ floating axles.

Reply.—A full floating axle is one where the

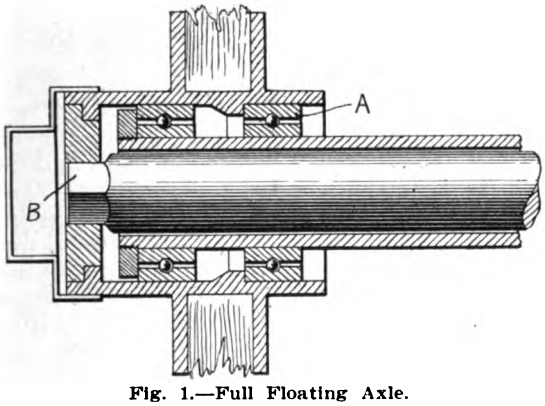


Fig. 1.—Full Floating Axle.

weight is taken from the axle and supported on the housing through which the axle passes. The hubs of the wheel are outside the housing and the bear-

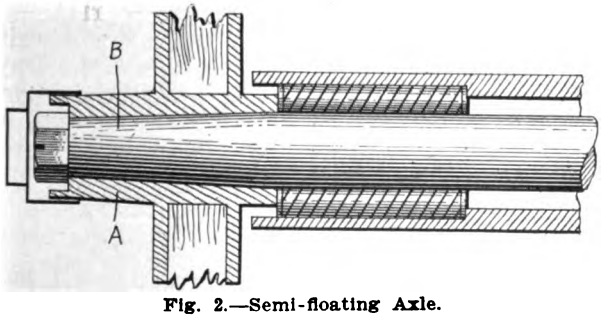


Fig. 2.—Semi-floating Axle.

ings are between the inside of the hubs and the outside of the housing, as shown at A, Fig. 1. The ends of the axle are square, as at B, and over these square ends fit caps that screw or are bolted to the outside of the hub. When the axle revolves, the caps transmits the movement to the wheels. With the semi-floating axle, shown in Fig. 2, the wheel, A, is attached directly to the transverse driving shaft, B, and secured. The driving shaft in this case not only propels the wheel but it supports the weight of the car. The three-quarters floating axle,

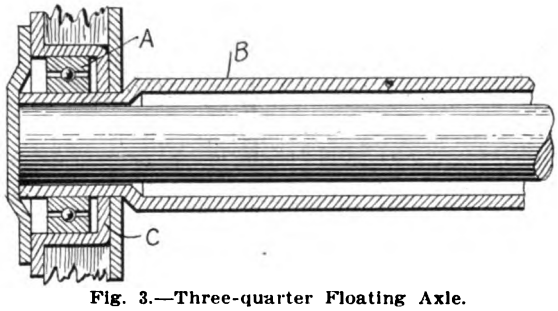


Fig. 3.—Three-quarter Floating Axle.

shown in Fig. 3, is one where the inside ends of the shafts are somewhat flexibly squared into the main differential gears, but the bearings, A, of the outside ends of the axle shafts are upon the outside of the surfaces of the tubular casing, B, and directly in the wheel hub, C, so as to relieve the shafts of the car weight, but the wheels are rigidly fixed upon the shaft ends. As far as we know there are few cars now using the three-quarters floating axle.

1623 A Constant Knock.

From Henry Sechtem, Kansas.—About one year ago I read in your Trouble Department about a Metz car, 22, that had a knock or rather a tapping noise in the engine. I have this same kind of noise, and therefore have been watching your paper for an answer to this, but to date find none. My 1913 model Metz has a knock that sounds like striking or tapping of a steel rod against a solid metal object. I have had the engine thoroughly looked over and tightened up, but the results are the same, the "tick" at every revolution of the engine is still there. This car has run about 20,000 miles, and this noise developed soon after 3,000 miles use. If anyone can solve this for me I should appreciate it very much, as no repairman has as yet been able to locate it.

Reply.—We assume that the knock you refer to is surely in your engine. This indicates loose bearings, if it occurs on level roads and regardless of speed or anything else. It may likewise be due to carbon deposits. Possibly your connecting rod bearings are loose. Of course you are aware that engines will knock if the spark is advanced too far, they will knock if the mixture is too rich and they will knock if the carburetor float is leaking or water-logged.

1624 Misfires at Low Speed.

From R. Strehorn, Colorado.—I have a 1913 model T Ford, which I have driven over 20,000 miles. I have taken the best of care of this car and have never had the engine out of the frames, neither have I replaced a brake band, reverse or low gear band, and have only tightened the high gear twice. So you see I am a careful driver. Of late I have had some trouble in the car missing on a heavy pull on high gear. Running on level ground up to 30 miles per hour the engine doesn't missfire, but in starting after the car has stood for an hour or

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so, it will miss a few times and then is all right. I have the latest model Holley carburetor, the one without the balls. I have put in eight new valves and they fit the guides perfectly with 1/32 clearance. I rebored my timer and put in a new roller. I have a Connecticut master vibrator. This car is equipped with Kingston coil, which is shorted to suit the master vibrator. Will further state that the car commences to miss only when the throttle is wide open. If I close the throttle two or three notches it stops missing. I have put a gauge on my cylinders and have 45 pounds compression and over on each cylinder. Now what is the cause of this missing? I use Champion spark plugs and heavy Polerine oil. The plugs do not foul up at all.

Reply.—A reason for missfiring at low speed and open throttle is due to the fact that the compression is greater and sparking is thereby rendered more difficult. With an indifferent coil and weakened battery and with some magnetos this is often experienced but not always recognized. There is a bare possibility that your carburetor may be unsuitable for low speeds or may lack proper adjustment, but you ought to be able to decide this point yourself.

1625 **A Missing Cylinder.**

From C. L. Thwing, North Dakota.—I have a model "T" Ford touring car, 1913. It has been run about 4,500 miles. Had it taken down and cleaned late in the winter before the season for use opened. Found it in perfect shape, so the mechanic said. I had a new timer put on recently as the old one showed some wear. Lately it has been missing in the fourth cylinder. I have a Heinze coil and K. W. master vibrator. Thought the trouble might be a defect in the coil, but changed the cells all around and the "miss" is still in the fourth cylinder. The other three are as regular as clock work. Cannot think the trouble is in the new commutator, though I think the miss is a little more pronounced since it was put on. Can you suggest what the trouble is? I think I have read that it is ruinous to a master vibrator to locate a missing spark, by cutting out or short circuiting the different spark plugs by the use of screwdriver, file or other instrument, while the engine is running. Is it true? What is the effect on the master vibrator?

Reply.—Your case is practically the same as described by O. Wallin, Minnesota, appearing in this issue. Our reply to his inquiry suits your case to a "T." Have no fear of possible injury when short-circuiting your spark plugs, except to yourself should you be careless enough to use a screwdriver or file not sufficiently well insulated. When a plug is shortcircuited no extra stress or duty is placed upon the master vibrator.

1626 **Car Lacks Speed.**

From R. E. Melvin, Illinois.—I have a 1915 model T Ford touring car, bought in November, 1914. It has run about 3,700 miles. I seem to have plenty of power, it works fine, and I get 25 miles per gallon of gasoline when I try, but it hasn't much speed. About 35 miles is the limit. I've tried several things, timed it one notch ahead, but on account of kicking so when cranked on batteries, I changed it. The motor seems to get hot quickly on a hot day, when running 15 miles. At 25 miles per hour it will boil and always has done that. Nothing seems to drag or be too tight. I can push it easily and it works well or I couldn't get my 25 miles per gallon. I don't care to go a great deal faster than 35 miles, but want to know that I can should I want to. Other Fords around here run from 45 to 55 miles over the same roads with the same amount of gasoline and everything. Any information you can give will be cheerfully accepted.

Reply.—The heating may be due to the fact that the cooling or lubricating systems are not working properly. After starting the spark should be advanced as far as possible at all times unless the engine labors. Maybe your valves are incorrectly timed or you have a clogged muffler. Your compression may be poor. If the engine gets hot and loses power it may be due to burned gases leaking past the piston rings, which have become worn or broken. Possibly the exhaust valves do not lift enough. Of course when you say your car has plenty of power but lacks speed one would imagine that something may be slipping, but in your case you probably lack both power and speed.

1627 **A Thumping Noise.**

From J. H. Handley, Maryland.—I have a 40 horsepower National touring car, with a 1911 National motor in it, in fine condition. I have had it thoroughly cleaned this spring. However, I find in running the car with spark advanced there is a thumping noise in the motor. When running with the spark retarded there is no thumping noise. The party that cleaned it appears to be at a loss to know exactly what causes the thumping, therefore I write you this letter in the hope of learning the cause.

Reply.—Thumps, such as you are experiencing, are caused either by pre-ignition or lost motion. The fact that your cylinders have been recently cleaned should dispose of pre-ignition as the direct cause. The lost motion may be from worn connecting rod bearings, upper or lower; the upper end of a connecting rod may vibrate from one side to the other; a piston may fit too loosely in its cylinder, or one cylinder may miss explosions. To locate the trouble you should first note in which cylinder the knock occurs. A physician's stethoscope is an excellent means to this end. In all probability you will find it to be in the same cylinder all the time. Of course advancing the spark too far with the motor running at low speed will make any motor knock. Lost motion in the timing control connections will sometimes cause pounding, the timing lever on the magneto not working synchronously with the lever on the steering wheel. When the timing is advanced there is greater pressure exerted against the heads of the pistons, the connecting rods, and crank pins, and a little lost motion might cause practically no pound until the engine is called upon for more work by advancing the spark.

1628 **Fastening Hand Horns.**

From E., Nebraska.—Is it possible to fit a hand horn or a hand Klaxonet, to a Metz car, model 1913, and where could it be placed? I find the bulb horn inadequate in traffic.

Reply.—These signals are usually fitted to the side of the car opposite the entrance, either at the

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top or by fastening down the inside, the support being from the footboard.

1629 **Gets a Dim Light.**

From R. Blondel, Massachusetts.—Will you kindly answer by letter the following: I have a Ford T car; have a New York Uni-Coil for the timer. I run it on six dry cells and I use the magneto for lighting only. Why is it I can get only a very dim light while running, but get a good bright light when running on neutral. I am using 6 volt, 8 candlepower lamps in series. If I am running 15 miles per hour I get no light, and if I drop into neutral the light flashes out fine, but as soon as I let in the high speed the lights fail. I have it connected up all right, and ground on radiator support.

Reply.—The fact that you are using a New York Uni-Coil ignition system should in no way cause your lights to be poor, as a matter of fact the Uni-Coil system has a shorter contact and therefore will not draw as much current from the Ford magneto as when the regular four vibrating coils are employed. You will understand that the reason your lights burn brighter when you go into neutral is because the engine speeds up immediately upon being released from driving the car. As soon as the high gear is engaged the speed of the motor is greatly reduced. Of course if your magneto has become weakened from use, its current output will become low with a corresponding decrease in light. We would recommend that you have some Ford repairman who is conversant with the matter examine the lights and he can tell you at once whether or not your magneto is below normal.

1630 **Steering Gear Rattle.**

From J. A. Sinclair, New Jersey.—How can I take the rattle out of my steering bar? The car is a 1913 Overland, No. 69 touring. It seems as though the spark rod and throttle rods vibrate in the steering tubing. Can they be wrapped? I don't care to use any filling.

Reply.—You do not state which way the spark and throttle rods vibrate. Sometimes they vibrate what may be termed, up and down, and in others with side play. If you wish to take out the side play, it will be necessary for you to put in new bushings in the top of the steering post. If the trouble is due to end play you should tighten up the nuts on the rods at the top of the rods.

1631 **A Dull Thump.**

From Olof Wallin, Minnesota.—My Ford has run about 5,000 miles and has lately been overhauled. Carbon cleaned out, every bushing that showed least wear has been replaced. Valves that showed least wear on stems replaced with new ones, carbon cleaned out and everything possibly done that a mechanic saw necessary. The car is equipped with the latest automatic advance Atwater-Kent ignition system and with the latest Stromberg carburetor. It has unusually great power and snap but the old and dull "thump" is still heard in the fourth cylinder when the car is running and pulling heavily on the road. If I connect an insulated wire to the fourth cylinder spark plug and short circuit it when the car is running and pulling the "thump" stops. It sounds like hitting with a hammer on the bottom of an empty wooden tub. What is the trouble? We would appreciate very much to find the answer through your paper.

Reply.—Knocks or pounds can only occur from preignition, or as a result of lost motion. The fact that you have had the cylinders cleaned of carbon should dispose of the former possible cause, while to enumerate the conditions under which lost motion could be present to cause the pound we have but to consider the following in the order most usually found: Loose lower connecting rod bearing; loose upper connecting rod bearing; wrist pin hole in the piston not at right angle to the bore of the cylinder. A loose fitting piston sometimes causes a pound, while missing of explosions as the result of defective spark plug or some other part of the ignition system, such as coil or wiring will result in pounding. A loose connection between the crank shaft and transmission would show in the fourth rather than in any other cylinder.

1632 **Throttling Down.**

From B. T. Hinckley & Son, New York.—Am running a 1913 Ford runabout and would like to know through the columns of your paper how to throttle it down (on high) to six or eight miles an hour and still run even. Our crosswalks are bad here and do not like to slip the clutch too often. I turn the carburetor down as far as possible but cannot get below ten miles per hour.

Reply.—We do not believe you could do anything to your engine or car that would permit running it at that speed on high gear, in the manner you seek. With the throttle nearly closed the cylinders are not nearly emptied of the burned gases from the preceding explosions, and there are always more or less leaks of air past the valve stems to impoverish the mixture of air and gas to such an extent as to cause irregular explosions, and missed impulses.

1633 **Quite a Problem.**

From Hiland & Son, Indiana.—We have a Remy magneto on a model 10 Buick, running at crankshaft speed. We can put an armature with a commutator in this and use it to develop probably 8 volt for lighting purposes, direct current. Can we put a suitable armature in this to run this slow and develop about 8 volt, or we could belt it to the flywheel O. K.? If possible to run this slow, how many sections armature should be used, and what size wire? The armature could be 2⅝ by 4½ inches with six magnets 4 by 7.

Reply.—You have a desire to experiment, and if you cannot curb it we advise you to purchase some elementary electrical text books, learn the difference between alternating and direct current magnetos, how a constant voltage may be obtained irrespective of the speed of rotation of the armature and then be sensible and buy a lighting outfit it has probably cost years of effort and thousands of dollars to perfect. Get something that will answer the purpose for yours never will. You have before you a problem of problems. Replying to your query as well as we are able, and probably the engineers of the Remy Electric Co. could not do better, we would advise using all the sections possible and the correct size and amount of wire (which we nor no one else probably knows).

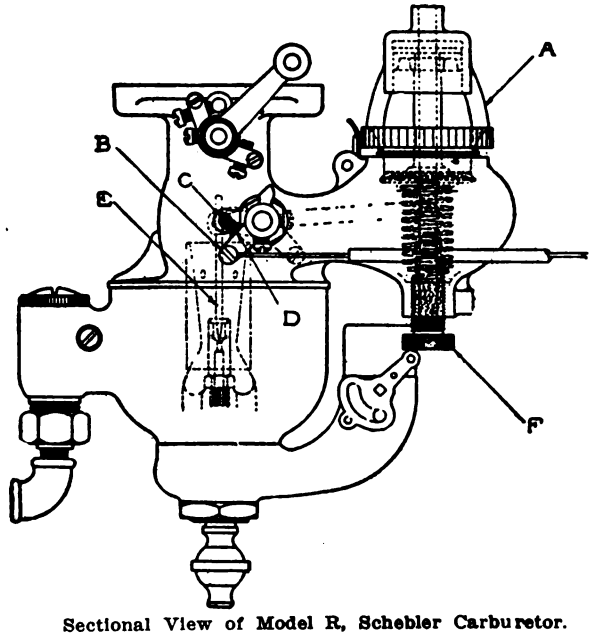
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1634 The Schebler Model R.

From S. F. W., Georgia.—Will you kindly explain in next issue of your valuable journal the correct manner of adjusting the model R Schebler carburetor for high speed, low speed, rich and lean mixture? Thank you.

Reply.—The Model "R" Schebler carburetor is a single jet raised needle type of carburetor, automatic in action. The air valve controls the lift of the needle and automatically proportions the amount of gasoline and air at all speeds. It is designed with an adjustment for low speeds; as the speed of the motor increases, the air valve opens, raising the gasoline needle, thus automatically increasing the amount of fuel. The model "R" carburetor has but two adjustments—the low speed needle adjustment, which is made by turning the air cap, and an adjustment on the air valve spring for changing its tension.

The model "R" carburetor has an eccentric which acts on the needle valve, intended to be operated either from the steering column or from the dash,



Sectional View of Model R, Schebler Carburetor.

and insures easy starting, as by raising the needle from the seat an extremely rich mixture is furnished for starting, and for heating up the motor in cold weather. A choker in the air bend is also furnished.

This carburetor is made in four sizes: 1 inch, 1¼ inch, 1½ inch and 1¾ inch. It should be connected to the intake manifold so that it is located sufficiently below bottom of gasoline tank so that it may be filled by gravity under all running conditions. Where pressure feed is used, it is unnecessary to locate carburetor below the gasoline tank; also when pressure is used, it is never advisable to carry over two pounds. Before adjusting the carburetor, make sure that your ignition is properly timed and that you have a good hot spark at each plug; that your valves are properly timed and seated, and that all connections between your intake valves and carburetor are tight, and that there are no air leaks of any kind in these connections. Also the carburetor should be adjusted to the motor under normal running temperature, and not to a cold motor.

When the carburetor is installed see that lever B is attached to steering column control, or dash control, so that when the boss D of the lever B is against the stop C the lever on the steering column control or dash control will register Lean or Air. This is the proper running position for the lever B. To adjust the carburetor turn air valve cap A clock wise or to the right until it stops, then turn to the left or anti-clockwise one complete turn.

To start the engine open throttle about one-eighth or one-quarter way. When motor is started let it run till engine is warmed, then turn air valve cap A to left or anti-clockwise until engine hits perfectly. Advance spark three-quarters way on quadrant, if engine backfires on quick acceleration turn adjusting screw F up (which increases tension on air valve spring until acceleration is satisfactory).

Turning air valve cap A to right or clockwise lifts needle E out of nozzle and enriches mixture; turning to left or anti-clockwise lowers needle into nozzle and makes mixture lean.

When motor is cold or car has been standing move steering column or dash control lever towards Gas or Rich, which lifts needle E out of gasoline nozzle and makes rich mixture for starting. As motor warms up, move control lever gradually back towards Air or Lean to obtain best running conditions until motor has reached normal temperature. When this temperature is reached, control lever should be at Air or Lean.

For best economy and power we recommend that slow speed adjustment be made as lean as possible. Be sure that your gasoline tank and line are clean and contain no particles of dirt, scale or foreign substances, as flooding troubles are invariably caused by dirt or foreign substances preventing needle valve in carburetor from closing.

1635 Carburetion and Ignition.

From S. H. Showalter, West Virginia.—1—Can you give me some information in regard to the 1913 model T Ford car? It seems to run all right when it is standing still, but when I open the throttle three or four notches to put the car in motion, it will choke the motor down. The carburetor is a Holley, 1913 model. What would be the remedy for the carburetor to prevent the choking? 2—How do you test the coil units to tell when they are weaker than they ought to be to run the motor satisfactorily? The car has been run 6,000 miles.

Reply.—1—The early model of Holley carburetor with which your car is equipped has either a parity "loaded" float, or the float is set so high that too large a puddle of gasoline is in the low part of the air passage, the result being on opening the throttle much too rich a mixture enters the cylinders. We believe that the latest model will be found much more suitable for handling the heavy gasoline of to-day. 2—The very best way to test the coil units is to take units from some other Ford car that operates satisfactorily, temporarily replacing your own with them. If the motor misses with yours and does not with the others you could have no surer proof that they need renewing. To test for a broken down or perforated condenser you can open and close each primary circuit. If a spark appears at the ends of the wire as they are quickly separated it would indicate a probable imperfect condenser, for

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one of the missions of the condenser is to prevent arcing when the circuit is broken.

1636 **His Overland 1912 Car.**

From Geo. Casper, District of Columbia.—1—I have an Overland, 1912. It is model T, No. 60. I have a great deal of trouble pulling hills, unless I put the spark all the way down. If I don't do that it has a rattling, knocking sound. The car came equipped with a Schebler carburetor and a Remy magneto. It is impossible to make it hit on low throttle. After every short trip I have to clean the plugs as the oil oozes through. I have cleaned all carbon and ground all valves but it still has that knock. 2—If there are six passengers in a five-passenger car, and the chains are on, would that cause the front wheels to skid? 3—Or, in riding in second would that cause it to skid in wet weather?

Reply—1—The fact that oil leaks past the piston rings sufficiently to necessitate frequent cleaning of spark plugs in itself indicates the need of new and better fitting pistons and rings and probably re-grinding of the cylinders. You will probably find it necessary to have inlet valve stem bushings renewed and new inlet valves, to prevent leak of air at this point to prevent diluting the mixture of air and vapor to such proportions that it will not ignite regularly with the engine closely throttled. 2—It should not. 3—We do not see how it could.

1637 **Gear Trouble.**

From H. C. Zinn, Illinois.—1—I have run up against a problem I would like to have answered in the Trouble Department. I own a Halladay 30, 1912, made by the Streator Motor Car Co., Streator, Ill., and my problem is the transmission, which is a Warner, 3 forward and reverse. I have the car out and make a stop and when I am ready to start I go into low, make a short run and then try to go to second speed, but I can't get the lever out of low. I can't get back to neutral. The gears are locked fast and I can't get out of low. All I can do is to shut off the power and stop the engine or motor, take the top off the gear case, and take a screwdriver and pry the gears around until the little arm that shifts the gears is in the right place and then everything is O. K. again until the next time, which may be six months and may be six days. This has happened three times in a year, and I would like to know what is the cause, for besides taking time it is a very dirty job and takes the pleasure out of motoring to know you may be up against that job the first time you stop. 2—My car has a Wisconsin motor, Briggs magneto. I have never been able to start on the magneto, but after I get a start on the batteries, which is always easy, it will run fine on the magneto. I never use the batteries except for starting. Why do my batteries run down so soon. I use five dry cells and in the good road season they will only last about two months. I can always tell when they are getting about gone, for the motor will commence to miss on the magneto and will soon get so it won't pull at all on the magneto. I put in fresh batteries and it is O. K. again and will pull like a draft team on the magneto. If you can give me any enlightenment on these questions, I will appreciate it very much.

I will say to G. S. Herbert, Missouri, that he will very likely find his trouble in a leaky gasket and manifold, making the mixture too thin until properly warmed up, the batteries making a hotter spark on slow engine speed than the magneto. As soon as you get plenty of heat and proper speed, the magneto will fire O. K. I had the same trouble and a new gasket was just what it needed, as I had no more trouble.

Reply.—1—This inquiry, it seems to us, would better have been sent to the Warner Gear Co., Muncie, Ind., who would no doubt have been better able to answer it intelligently than we could be expected to. They would also have been able to tell you just what part is defective. We have to say that it looks as if the secondary gear shaft were either sprung or worn, or the bearings needed attention. It seems to us that almost any capable automobile mechanic should be able to divine the cause of the trouble. 2—The magneto is so set that the "peak" or greatest intensity of the spark occurs with early setting. In starting with ignition set late at the breaking of the circuit in the breaker box there is not sufficient strength of the current to ignite the gas in the cylinder. The motor is designed to be started on the battery and run on the magneto. It looks much to us as if you had a short circuit somewhere in your battery wiring, for new batteries should not affect the operation of the magneto. If by any chance your battery is discharging through the magneto wiring you will have more serious trouble. Our advice is for you to send to the Briggs Magneto Co., Elkhart, Ind., for their wiring diagram and look your wiring over very carefully for defects.

Just One Drop of Water.

From R. J. Martin, North Carolina.—I bought a Ford touring car November 27, 1912, and at that time I knew little about an automobile. I have had very little trouble with my machine. I am a farmer and do not drive regularly. I am still using the tires on the front wheels that were on them when I bought it. One of them has never been taken loose from the rim, and as my speedometer has been out of fix a part of the time, I cannot give the exact mileage this car has run, but I will say it has run close to 12,000 miles. I have stopped on the road only once to change tires during this time. I will say for the benefit of J. A. Mandel, South Dakota, that last year I had trouble with my engine. It would start and stop. I asked an experienced repairman about it, and he told me to give it more gas, but that did not do any good. I took the carburetor to pieces and cleaned it and that stopped the trouble. I do not really know what caused the trouble, but I believe it was caused from water in the carburetor. I had read somewhere in the Automobile Dealer and Repairer that one drop of water on the spray nozzle would cause all sorts of irregular running.

Should Be Anything But "Frequent."

From M. L. Mead, New Jersey.—I have owned a Buick, model 19, 1910, car for the last four and a half years, and have never experienced any difficulty in getting my license renewed until recently, and in regard to same would ask if this is of frequent occurrence, and what course you would advise me to pursue?

Early in January of the present year I wrote to the Department of Motor Vehicle Registration, at

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Trenton, N. J., for license blanks and promptly received the same. The blank for a driving license was filled out and forwarded to the department, together with my check for two dollars and in a few days I received my driver's license card. A few days later I filled out the car application blank, and with this I enclosed a check for seven dollars and a half, and mailed it to the same address, and now have the voucher showing that it was received. For a week or more I watched my mail carefully for the desired word, then other matters absorbed my attention, and as I had letters from the department to show that I had made application, I did not think of the matter again until recently. After a careful investigation I became satisfied that I had not received the card, and therefore immediately wrote the department, calling their attention to the same, and the following is their reply:

"My Dear Sir:—In response to your letter of the 15th, would advise you that we did misunderstand your former letter and thought it was the tags you did not receive. The certificate is always enclosed with the tags and no doubt you have destroyed the same if you did not find it at that time. We cannot at this late date furnish you with a duplicate card free of charge. The cost of the same will be $1.00, and we are enclosing herewith application, if you desire to obtain a duplicate. Yours, etc., Wm. L. Dill."

Free of charge, what do you think of that, after I had remitted $7.50 for it?

Now it isn't the thought of having to pay another dollar that annoys me as much as it is the principle of the thing, and the fact that I have not received that for which I have paid $7.50 and cannot operate my car without.

I should like to hear whether any other readers of your magazine have had this experience and what redress they received if any.

Why He Likes It.

From C. B. Stucky, Kansas.—I sometimes happen to read that someone has quit the subscription of the Automobile Dealer and Repairer just on account of it having so much in it about the Ford cars. Well, for one reason I would not kick on that account, is because there are so many of these Ford cars that it can't be helped. The more the better. I started my Reo car two winters ago, when we had 27 degrees below zero out here in Kansas, without any priming or any boiling hot water or any jacking up of the rear wheels, and throwing it on high speed gears, and turning it on the rear wheels. All I do is turn on the switch, shut off the air on the dash, and with from five to ten turns my motor spins every time. That is a good car.

Wheel Traction.

From "Engineer," Michigan.—I have read with a great deal of interest the article in your February number by James Hobart, M. E., relative to the trials of truck drivers, in starting the cars after being left standing at the curb, or elsewhere, when the ground is covered with packed snow or the streets are otherwise made difficult of passage. The inertia of the front or steering wheels is, as he states where the chief difficulty lies, if not entirely.

The problem has been one interesting to me for years. My means of overcoming this exasperating condition is through a four wheel drive, which I have successfully built in cars for my own purposes. I have found it unnecessary with this arrangement to use either chains or the various expensive non-skid tires. Rubber, as is well known, has extraordinary friction qualities. Where given half a chance, the smooth rubber will give traction on surface smooth as glass. There is something seriously the matter with the design of cars that cannot get enough road adhesion with chains to go through any condition of roads that any reasonable man would expect to travel with horses.

Thus the automobile falls short of giving the necessary all-the-year-round service on schedule which is necessary in industry. So also with the car of the physician that must go at all times and under all road conditions in all localities. The difficulty there lies with even the small runabout or closed coupe type of pleasure car as used by them generally. Complaints are heard in such cases that it is necessary to keep a horse drawn equipment to tide them over bad weather. The "pleasure car" is thus, alas, too rightly named. It has come to be known only as a pleasant weather car. It is in such cases my device as I use it is most efficient, does not detract from appearance of car and has been quite inexpensive to me.

A Narrow Escape

From F. A. Londenberg, Missouri.—Lessons for Drivers is worth the price of the magazine. One in particular saved me from having a serious accident. This was relative to a skidding car. I happened to be caught out in a hard rain, which came up in a hurry. I hit it up, thinking I could make it home. I had a very steep hill ahead of me, and when I had gotten two-thirds way up I learned by the report that I did not have gasoline enough. My wife said, "the back of the car is slipping towards the ditch." I immediately followed your instructions by steering the front wheels in the same direction as the rear wheels were taking." All was well, otherwise I would have landed in the creek. I drive a cross country Rambler, 38 horsepower, and weighs 3,250 pounds. Imagine the consequences if it were allowed to take its course on that dark and dreary night.

For Too Much Oil.

From Charles Fjerestad, Montana.—I have seen so many inquiries in your trouble department, from owners of cars that use too much lubricating oil or else do not have the necessary compression or power. I had the same trouble with an E. M. F. until I saw the advertisement in your paper of the "No-Leak-O" oil packing piston ring. I immediately secured a set and since installing the same I have twice the compression and power and does not use one-third the amount of lubricating oil and about one-third less gasoline. Excessive oil can not get past this piston ring nor can the compressed charge leak past it. I bought these rings from the Automobile Accessories Co., of Baltimore, Md.

Metz Car Power.

From E, Nebraska.—In your April number C. A. Sleeper, of New Hampshire, is right when he says, "The Metz car on hill work can do all that any car, with engine of equal horsepower, can do—and then some." I have driven one for two years, and know.

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NOMENCLATURE AND KNOWLEDGE.

A Strong Plea for Elevating the Automobile Business as It Deserves.

From F. L. Angier, Illinois.—We employ a number of men in our shop and we give them all of the various motor magazines, if they desire to read up. There are, however, several features about motor magazines and about the contributors to those magazines which the writer feels should have attention called to. At the present time the motor car industry is not as staple as some of the older industries, but it has long since passed the experimental stage.

When the writer started in the motor car business twelve years ago the repair business consisted of experimenting until you got the job half way correct and a large number of those old types of cars needed considerable experimenting. Today the motor car industry is 90 per cent. perfection and a general accepted branch of service in every city, village and town throughout the United States, but one of the peculiar things of the industry at the present time is the great number of men running repair shops at the present time throughout the United States who have not learned the trade, but simply have tinkered with various makes of cars, until they are able to keep a business based on motor car repairing, afloat.

Perhaps the quickest factor of determining whether these men are really mechanics or just experimenting in the various stages is by reading the letters they write the Automobile Dealer and Repairer. A large number of these men are entirely ignorant of the correct names for a great amount of the simplest parts in use.

There are write-ups appearing in magazines in every issue in which the authors display their ignorance by the terms which they use in mentioning the various tools and component parts of a motor car.

One general term which is being used extensively is the word automobile, and which a great number of men engaged in the industry realize does not give the correct understanding and, therefore, the words motor car, have come into general use. The daguerreotype was a form of photography, still we do not call every photograph a daguerreotype. The greatest number of errors, however, occur in calling bearings, boxes, journals and brasses. Applied to the motor car these words are incorrect.

A very small percentage of the repair men really know that a burr is not a nut, but a washer made in such a way that it will act the same and give the same result as the head on a rivet and is used to put over rivets. The term S wrench is applied indiscriminately to angle wrenches and other various types and ofttimes box wrenches, and dozens of other words which are not applicable to the motor car industry are used every day by men who claim to be mechanics.

A motor car mechanic who thoroughly understands the business has to possess great intelligence, incorporating as the business does a partial knowledge of the blacksmithing trade, machinist, electrician and numerous other occupations. Why, therefore, would it not be advisable to start a course of education in which they can talk intelligently instead of making mistakes which they do?

We know of one man who invariably refers to Whitney keys as half-moon keys and did not know enough to answer a customer over the telephone when he asked for the correct article, that they carried them in stock, and I wish to call your attention to the article appearing in your May issue, which starts on page thirty-eight, written by N. G. Near, of New York, in the statement in his letter in which he took a car out for a test and allowed it to coast with the clutch in and after overhauling the motor found that it coasted further than it did prior to that.

I beg to state that if this man worked for us his discharge would be quick, as the amount of work done on the motor and transmission in taking up the various parts, should have put the motor in such shape that when attempting to coast with the clutch engaged, if the rings were properly fitted and the valves were properly timed and ground, it should not have coasted as far. In fact, if it was a high compression motor with no spark on and the grade was not too great it should have held the car.

We have the only repair shop not connected with the sales business in the state of Illinois, which positively refuses to allow any other make of car to drive in except a Ford and in the last three years our men have done no other work at all except on Ford cars.

We do not wish any other kind of work and devote all of our efforts to give the Ford owners satisfaction and we find that after overhauling a car and taking up the bearings, going over the differential and the transmission and replacing all parts that are worn beyond a certain percentage, the motor when finished is very stiff and very frequently we receive the remark from various customers, "My motor drives and acts like it did when it was new," and we, therefore, take exceptions to the statement that when a car needs overhauling it will coast further with the clutch in than it did prior to that, as it takes from 100 to 200 miles of limbering the car up thoroughly after being overhauled, if a proper job is done.

This letter is written, not in a spirit of criticism, but in a spirit of reminding the various repair men who may read it, that when they write a letter in which their descriptions are not accurate to men who have made a close study of the motor car business, this thought occurs: there must be an awful lot of experimenters working on motor cars.

One of the things which we insist on every one of our men doing who works for us is to take a machinist's catalogue and the various motor magazines and look over the advertising.

If a man will study a machinist's catalogue, issued by any firm which sells machinist's supplies, he will gain more knowledge by a close application to this and other literature than some men will get by working in an ordinary shop for five years. He will know the names of tools and how to use them, parts and supplies by their right names, as well as hints and suggestions valuable in time to come, if recalled and put into use.

Let us make the business one in which, when a man states he is a repair man on motor cars, the public will look at him with new interest and feel that he is a skilled mechanic in his special line, and not just an experimentor who tinkers, that he knows tools, parts and construction and can

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discuss intelligently such work, without misrepresenting the simplest parts, and if he wishes to discuss shop with a mechanic who combines technical knowledge with experience, he can do so, and not state as a repair man did to us that "the burrs loosened on the pitman and it broke the crank-box and bent the gudgeon pin."

Let us elevate our profession equal to others, mentally, practically and scientifically.

(Note by the editor.—The friendly criticism of Mr. Angier is undoubtedly timely, although there is another side to the matter. His last paragraph is particularly important, however. But one difficulty encountered is that the automobile business or profession is an open field, and anyone can engage in it without an examination for fitness or knowedge. It is thus unlike any of what may be called the "learned" professions. Quite likely the matter will adjust itself sooner or later, and the unfit will be weeded out by the action of a wiser and more discerning public. As to automobile nomenclature, it might be improved, but uniformity of terms will be of slow growth where the field of use is so wide. The same condition exists in other branches of industry, although perhaps not to so great an extent, and likewise in those of hundreds of years of existence. In relation to the coasting of the automobile, the better or worse coasting depends something upon the condition of the car when taken to be overhauled, and what was done in overhauling it. The writer of the article referred to is both practical and honest. He possesses the science to know and the art to do. Yet this in no way militates against the reasoning of Mr. Angier, which is absolutely correct. But automobiles are often overhauled which do not need increased compression, and as stated, how much or how fast a car will coast depends not only upon the amount of compression but upon the steepness of the grade, yet neither fact disproves the statement of Mr. Near. Mr. Angier's communication is not only readable, but in a friendly way, he calls attention to certain matters that cannot fail to be of benefit to the business.)

AUTO GAS POISONING.

A Real Danger That Has Not Yet Received the Attention It Deserves.

From Lester Curtis, M. D., Illinois.—It is surprising that so little attention is paid to the toxic action of the exhaust gases of gasoline cars. Few of my friends seem to know or care anything about the matter. It is scarcely referred to in any of the books of my modest automobile library or any other such books that I have seen. The only mention of the subject in the popular prints that I know of, was a short article by the medical editor in a recent issue of a Chicago newspaper. Yet serious accidents from these gases are of frequent occurrence. Not long ago a Chicago physician was found dead in his garage from these fumes. This man was presumably intelligent but he was so imperfectly informed of the danger or so little impressed by it that he lost his life in consequence. Not long after this accident another physician working in his garage "noticed that the engine of his own person was sparking poorly. He took heed, groped to the door, managed to turn the lock, and fell unconscious in the open air. Help was hurriedly summoned and an hour or two later he was on the road to recovery."

Many cases are reported of chauffeurs while engaged with cars, experiencing vertigo, fainting and nausea or even coma from which it was difficult to arouse them. People working in the cabins of gasoline launches, or about motor boats, aeroplanes or other gasoline engines, often have toxic symptoms—headaches, dizziness and so forth. These symptoms appear rather slowly and insidiously. They may not develop until after the person has gone into the open air, and they are persistent. A case has been reported of a patient who recovered from the immediate effects of the gas but became mentally unbalanced nearly a week later.

The gas discharged from a gasoline automobile is a complex substance whose composition varies with every change of speed, barometric pressure and many other conditions. It is therefore difficult of analysis. Whatever has been done along that line has been under regulated conditions of combustion. So far as I know, no attempt has been made to study the gas when the car was in actual use on the road. Nor has any attempt been made to analyse the effect of the gas on the organism. Our knowledge then is far from complete, but we do know some things; three gases at least are present; carbon dioxide, (carbonic acid gas), the vapor of unconsumed gasoline, and carbon monoxide. The effect of carbonic acid gas is well known. It suffocates not by its poisonous action but by excluding oxygen. Gasoline vapor causes toxic symptoms which are unpleasant but not fatal. The case of carbon monoxide however is quite different; it is a dangerous poison; it unites with the blood corpuscles and destroys them. In other words it produces serious structural changes in the tissues which may be fatal, and even if the patient escapes death, may result in permanent injury.

The Encyclopedia Britannica says: "Most (gasoline) engines at certain speeds discharge considerable quantities of carbonic oxide (i. e., carbon monoxide) into the atmosphere." * * * "Experiments have been made * * * which clearly prove that in some cases as much as 30 per cent. of the whole heat is lost in the exhaust gases by imperfect combustion." What proportion of this discharge is carbon monoxide is not stated, but undoubtedly it is very large. "The enormous increase in motor traffic makes it important to render the exhaust gases as pure and innocuous as possible * * * in the interest of the health of our large cities." Enc. Brit., Vol. 20, p. 37.

We have then the danger to the health and even the life of individuals who are engaged with gasoline automobiles, but when we see the crowds of gasoline automobiles in the shopping districts and gathered around the entrances to places of amusement, each one belching forth large quantities of smoke and poisonous gas, we can not but wonder what will be the effect on the health of that particular locality and of the city in general.

Further study of this subject is sorely needed. In the meantime what we do know should be as widely published as possible and should be better heeded than heretofore.

Let your clutch in gently; thus you will keep your tire bills down.

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AIR LEAKAGE.

An Important Consideration In Gasoline Engine Efficiency.

J. S. V. Bickford in Autocar.—In almost every book or paper one reads on the design of gasoline engines one finds references to the leakage of air into the combustion space by way of the valve stems, but I have never yet seen any statement as to the amount of this leakage. I have only seen one reference to the total amount of leakage of air into a gasoline engine, and that was made by Prof. Morgan at a meeting of the Institution of Automobile Engineers some time since. He gave the figure for a quite new 40 h.p. Daimler engine as 2.5 cubic feet per minute. Now I know that this is not nearly as much as the leakage into a 14-20 h.p. Wolseley engine in good working order but not new; what the actual figure is I am not certain, but estimates, based on the measured engine vacuum running down hill at different speeds and the amount of fuel required to run such an engine unloaded, lead me to the conclusion that the leakage is between 3½ and 4½ cubic feet per minute. At any rate, I can say that a carburetor designed on the assumption that the leakage in such an engine is 4 cubic feet per minute gives entirely satisfactory results, and the engine when fitted with such a carburetor runs smoothly when unloaded, and there is no noticeable amount of soot from the exhaust. If, then, we assume that into a four-cylinder 90 mm. bore engine air leaks at the rate of 4 cubic feet per minute, it is interesting to enquire the source or sources of this leakage.

By actual measurement I know that a ¼-in. bore round hole under the influence of a vacuum equal to that noticed in such an engine running idle will pass only 10 cubic feet of air per minute. It follows that into a 90 mm. bore engine as much air leaks as would pass through a round hole nearly 3-16 inch in diameter under the influence of a vacuum of 20 inch of mercury. Or, put in other words, if we assume that we have 5-16 inch valve stems, such a leakage would require that all four stems should be very nearly 1-32 inch slack in their guides, and since such wear as this would, of course, be uneven it would probably mean that the stems would be something like ⅛ inch slack at the worst point; that is to say, they would be in such a condition that no one would consider the use of them for an instant.

As a matter of fact, I have actually measured the air leakage past a well-worn valve stem 5-16 inch diameter in a cast iron bush 2½ inches long, the valve stem being 2½ thousandths of an inch slack, which is about the slackness of the valve stems of my Wolseley engine after a year's use. I first of all tried to obtain a measurement direct on my carburetor testing plant, putting the valve stem on the careburetor flange, and attempting to measure the air delivered into a gasometer. The amount was, however, so small that leakage of the plant rendered the results hopelessly variable. I therefore adopted another method.

The intake branch of my testing plant is provided with a stop cock, below which is a bend carrying the flange to which carburetors to be tested are fitted. I noticed that when the cock was closed, the vacuum measured by the mercury gauge fell comparatively slowly. It occurred to me that if I noted the time taken by this column to drop from one point to another, I should have fairly accurate data from which to calculate the leakage. I therefore measured the capacity of the apparatus below the cock by filling it with water. This was exactly 1 lb. or 27.7 cubic inches. I then closed the valve stem bush with a soaped rubber pad and noted the time of fall of the mercury column, thus measuring the rate of leakage of the joints less the leakage through the cock. As this leakage would be the same whether there was valve stem leakage in addition or not, all I had to do was to deduce this leakage from that recorded with the valve stem in position to get the net leakage past the stem. The stem was washed in gasoline to remove grease. The amounts were calculated by assuming that the volume of free air in the bend at any moment is directly proportional to the absolute pressure in the bend, temperature being neglected.

It appeared that the maximum net leakage of this valve stem is only .02 cubic foot per minute, that is to say, as compared with the total leakage into the engine it is negligible.

The question then arises as to where the rest of the leakage into an engine takes place, and the most obvious answer is past the pistons. But the reader will probably say that, if the pistons fit so badly that they will pass 4 cubic feet of air per minute under the influence of a pressure from the outside of less than 15 lb. per square inch, they would be useless against the explosion pressure of 300 lb., and the compression would be negligible.

Last spring when I was overhauling my own engine, I found, I believe, the solution of this puzzle. Next time the reader has a piston out of an engine which has run more than 10,000 miles, let him carefully remove the upper ring and rinse the ring groove out with gasoline, being, however, careful not to scrape it in any way, and then let him examine the groove under a magnifying glass. If his experience is like mine, he will find that while the lower face of the groove is bright and clean, the upper face is coated with carbon.

Here, then, is the explanation. On the explosion stroke the pressure is on the upper part of the ring which is driven down on to the lower face of its groove, where, the surfaces being good, a good tight joint results; on the suction stroke the pressure is from below, and the ring seats on a scale of carbon providing ample room for leakage.

I suggest that, if it be desired to restore the slow running of an old engine, replacing the upper rings of the pistons is a much more promising expedient than packing the valve stems, and I also suggest to those who have noted improvement in running from the latter expedient to recall whether, in fact, they did not at the same time make some alteration to the pistons and rings. In the nature of the case, a man is very likely to overhaul his pistons when he sets to work to pack or replace valve guides, and he is apt to forget this and to attribute the subsequent improvement in the running to the part of the job on which his attention was specifically concentrated, i. e., the valve guides. Even if no alteration has been made to the pistons it is possible that he has adjusted the tappet clearances, and, as we all know, this alone has a marked effect on slow running.

The valve stem which I tested, was not in really bad order.

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For Carbon Removing.

From A. K. Wheeler, Massachusetts.—I noticed in your valuable publication, issue of January, an article written by Mr. S. W. Scovell, entitled "A Good Carbon Remover." I wish to endorse Mr. Scovell's article, for I tried this out on my Maxwell "35-4" 1914 model car, and it works to perfection. I am troubled a great deal with carbon, and have to clean it out for every six or eight hundred miles of travel. It is very handy to get at, by removing the valve plugs and scraping it out. I can usually do this in 2 hours, but by using the wire dish cloth as recommended by Mr. Scovell, it can be done much more quickly and it is very much easier.

I cleaned out two cylinders at a time, removing the valve plugs, putting in a little kerosene, and putting in a piece of wire dish cloth. I closed the cylinders, and removed the spark plug wire so that the cylinders should not fire, and ran the engine for about ten minutes. I then removed the plug and took out the wire dish cloth, and found that the top of the cylinder and the ends of the pistons were perfectly clean and bright. The only places any carbon was left was around the valves where the dish cloth does not hit, but this is right in the opening where it is easy to take out, and I was able to clean all of the cylinders in that way in 1¼ hours.

This method is perfectly safe and harmless, and is the best scheme I have ever tried, and the knowledge of this is worth one year's subscription to your magazine.

For Rusty Rims.

From J. A. Hogg, Hawaii.—The following is the best "dope" for springs and rims I have ever used. Gasoline, beeswax and powdered graphite. About 8 oz. beeswax to 1 gallon gasoline, and 6 to 10 oz. powdered graphite; two coats on each leaf, allowing time for drying. If springs are rusty, thin out the above and paint the rim or spring and in about thirty minutes you will be able to knock the rust off with a hammer. This mixture is oil and water proof. It is the best "dope" I have ever used for rims, and out here steel will rust over night. I think the above receipt was in the American Machinist. I keep a pot of it in the garage, and all threads and nuts have a little put on, and I know we will always be able to take them off again easily. I have received so many valuable hints in your periodical that I hope the above will help others.

Gasoline Storage Dangers.

From E. F. Sult, Colorado.—In your May issue, page 57, Mr. Walter L. Wadger, chemist, of the Massachusetts Police, shows the dangers of handling and storing gasoline. To me the article is not altogether clear. Are we to understand that the danger of handling gasoline may be avoided by not using any insulating material, such as chamois skin or wood? I think the article should be made a little more clear as the matter of safety is of vital importance to every owner and user of an automobile. I believe you will serve the best interests of your numerous subscribers by giving them a little more light on the subject.

Note by the Editor.—We concluded from the article referred to that if no insulating material was used in handling gasoline, and care was taken to avoid frictional electricity, that it was practically safe, especially if the gasoline was stored under ground. At this time we are unable to secure any further information on this subject, but hope to do so before the next issue is printed.

Easy Starting for the Ford Car.

From E. H. Thompson, Ohio.—I have just solved a problem similar to that of question 1608 in the May number. I have 1912 Ford with K-W master vibrator and have had no end of starting troubles for six or eight months past. First, I adjusted the float until the supply of gasoline in the needle valve chamber is slightly below the top of the small cup at the bottom of the chamber. This improved matters some but did not end my troubles. Next I discovered that the ball socket joint connecting the actuating rod to the rod at the foot of the steering wheel was worn so much that the spark lever could be moved several notches without changing position of timer. Placing the switch on the batteries, I moved the timer, retarding the spark, until contact was made, indicated by the buzzing of the vibrator, and lenghtened the actuating rod until with the spark lever in the fourth notch the timer would be on contact. Then I dressed off the ragged edges of the vibrator points and adjusted them with the engine running until all cylinders fired regularly and smoothly.

It now starts with one turn of the crank when cold, a quarter turn when warm and often on compression. A new ball socket joint and enlarging the actuating rod at the connection with the timer to take up the wear there will put it in first class condition so far as starting is concerned.

Opinions Differ.

From M. A. Foster, Arizona.—I notice in your April number, that Mr. Sleeper of New Hampshire, appears to have taken some exception to my reply to Mr. Archer of West Virginia. Mr. Sleeper appears to think that I am knocking the Metz car, which I am not. But I will say that the Ford is superior to most any car, regardless of make and price, for negotiating the mountains of Arizona. I have passed cars that cost twice that of the Ford car on the mountains here in Arizona. The large and heavy cars cannot climb with the Ford; neither can the friction drive climb with the Ford. They may do it with a new friction installed, but I doubt it. I have often seen the friction driven car stalled —not the engine—but the car, on account of the friction drive not being sufficient to draw the car up the hill. Now when Mr. Sleeper thinks that a 20 per cent. grade in Arizona isn't any harder to negotiate than a 20 per cent. grade in West Virginia, this is ignorance on his part. He must remember that West Virginia is an old, settled state and that the state has a system of road work, while Arizona has only been admitted to the states a few years, and, to my knowledge, the state has never appropriated a cent for road fund in this section of the country, as this is government reserve territory, covering a distance of 95 miles. The government expends a small amount of money on the roads here every year, but nothing like enough to make good roads. While a 20 per cent. grade in one place is the same as 20 per cent. grade in another, the difference is in the road bed, which we are short of,

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but usually find a ledge of rock projecting out of the supposed road bed.

And right now I want to tell you that the little friction drive don't get over them. The fault may be in the driver for all I know, but it is believed to be in the friction drive. Now I stated in my article to Mr. Archer, that if the Metz car back in West Virginia was superior to the Ford car, they must have a new breed that we did not have here. I can furnish Mr. Sleeper with the evidence as I have stated, and believe that a hill climbing contest could be arranged very easily here, which would settle all disputes as there is no argument on the subject here in Arizona. Now, on the square, Mr. Sleeper, don't you own a Metz car?

That Hudson Car Clutch.

From A. D. Lent, New York.—In one of the queries which you published some numbers back and to which an answer was given it appears that one of your correspondents has had trouble with the clutch of his Hudson "33" (1912). The clutch let go only with difficulty so that low gear could be thrown in, in starting only, after considerable clashing of the gear teeth. You advised using thinner oil so that the disks would not adhere. I had a similar difficulty with my car of the same make and year, and I tried using thin oil but without success. I finally found that there was a small set screw projecting from the inside of the fork of the casing which carries the transmission and against which the lower end of the clutch throw-out lever abuts when the foot-lever is pushed forward in order to throw out the clutch. I screwed in this set screw one or two turns so that the foot lever could be pushed forward further than before. After this I had no further trouble.

Some Good Points.

From Dr. F. W. Boots, Illinois.—In the April number of your magazine J. N. Bagley of Nebraska tells us that storage batteries using a sulphuric acid electrolyte are made up of zinc plates. This is new to me, for I have always been informed that the plates are either of metallic lead or of litharge pressed into grids of metallic lead. Does any storage battery use plates of zinc?

In the trouble department of the April issue, M. R. Chappell of Colorado tells of his Studebaker missing on direct drive at a speed of 20 or 25 miles, especially on open throttle. I believe that his only trouble is a weak magneto, probably low voltage from weak magnets. A spark so weakened will ignite the richer charge of gas obtained by a closed throttle, but the leaner charge of gas which an open throttle should give for the unusually speedier engine requires a much hotter spark, hence his missing. If he will pull the cable from a plug while the engine is running, and allow the spark to jump from the terminal to the engine, he will find that the gap it will bridge is only a quarter inch or less, while it should be a full half inch.

I find that chloroform is greatly superior to gasoline for cleaning rubber preparatory to patching punctures and the like.

Note by the Editor.—Readers will much appreciate the foregoing. Concerning battery plates, they are sometimes made of zinc composition.

For Bad Weather.

From Reader, New Jersey.—I am no lover of wind screens. In fine weather, the exhilaration of a drive seems doubled if the car have no screen; the wind pressure seems to pump oxygen under pressure into my pores when I face the unimpeded gale. In bad weather, the raising of a screen and hood almost invariably creates draughts, and I reach home with a crick in my neck, or threatenings of pain in a stopped tooth, or the like. Hence my present car is hoodless and screenless; in their place I normally wear a big oilskin coat, and a similar make of storm helmet always lies handy under the cushion. Last month I was regularly trapped for a supreme test of my theories. I was compelled to drive ninety miles in the teeth of a cold rainstorm not unaccompanied by driving winds; and I had never a soul to speak to. I reached my destination dry, warm, but uncomfortable. The driving rain had inflamed my face, though the rest of my anatomy was cosy; and the soft skin round my eyes was pulped red. I cannot think that the genuine long distance all-weather man will ever take very kindly to hoods and screens on light cars unless draughts can be eliminated more successfully than at present; but, beyond question, the head needs some protection in really bad weather; and the eyes are the most vulnerable item in one's face.

In cold weather there are two expedients: One is the low, narrow panel of wire gauze, beloved of racing men; the other is an extremely ugly notion which a commercial traveler showed me during the aforesaid storm. Much experience of stiff necks and dental neuralgia had inspired him to devise a narrow celluloid curtain, which depended vertically from the front edge of the peak of an atrocious cap. The affair looked appallingly ugly, but it shielded his face and was transparent.

Who Can Tell Him?

From a Reader, Nebraska.—Does the editor of this department know of any device that can be attached to a pressure feed gasoline system, which will allow the keeping of a constant pressure from a motor driven air pump, but which will at the same time prevent excessive pressure in the fuel tank. These excessive pressures are caused by the expansion of the gasoline when driving in very hot weather. Two pounds pressure in the tank gives good results. Four or five pounds is entirely too much. It appears to me that a small spring controlled relief valve might possibly do the trick. The tank is located under the front seat where it gets the benefit of lots of heat from the engine. Therefore the aforesaid expansion.

An Improvement Suggested.

From G. W. B., Connecticut.—I have had the stem on a four point differential spider break and cause trouble and expense. I beveled the four ends and then when assembled peined the housing over the bevel to hold it in case of breakage. I took down another make of car this past winter and found the same conditions. I took out the spider, beveled the ends, and when put in place hammered over the housing. If the stem breaks at the base it cannot get out into the gears. The makers should overcome such a point.

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Making the Fuel Efficient.

From Reader.—To No. 1597 I would add that I do not know what the material is that he mentions but a small amount of high fire test cylinder oil added to the gasoline will very often add power. This it does not by making the fuel more explosive but by better oiling and packing of the piston rings at the upper portion of the stroke where the pressure is greatest and the loss fastest and where the cylinder usually gets less oil than it should. Practically everybody tries to keep the quantity of oil used as low as possible to avoid fouling of the spark plugs and accumulation of carbon, and every hard pull is likely to burn off and push away the oil that should remain on the upper walls of the cylinder. The result is gas leaking past the rings and the loss of power both by lost pressure and added friction. A very small amount of proper oil with each charge of fuel overcomes this. That there is a well recognized need for better results at this point is shown by the number of piston rings offered, all of which promise to hold the pressure. Many engines get so dry at the upper end of the cylinders that they pound on every hard pull. I have used and sold oil to be mixed with the fuel for many years and speak from a long experience. But many people fail to find the result desired because they do not use a proper oil. The oil must be of very high fire test or it simply vaporizes and instead of adding power it interferes with the proper proportions of the mixture and lessens power. Many people are using a cylinder oil of such low test that it does this very thing. It works fine so long as they keep their engine running fast. But let them pull the engine down to a slow speed and it lies down at once. The oil on the cylinder walls vaporizes so fast that the mixture becomes overfast while being compressed and either will not fire at all or if it fires it burns very slowly and with little power. In my humble opnion the only oil for a gas engine is one having a very high fire test.

For the Metz Car.

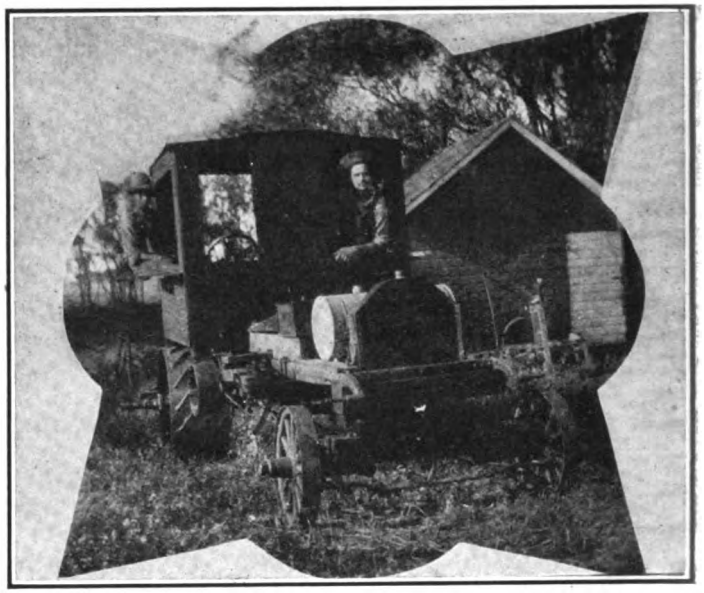
From W. H. Horner, New York.—Your answer to No. 1575 W. E. T., Maryland, should be to tell him to put in new Metz and only Metz piston rings, if the compression is any way poor, and a Holley carburetor, the same as on the Metz 1912, 4 cylinder runabouts. There is no spring or clutch on the Metz. Tell him to get a blacksmith to make him, out of ⅜ by 1 in. iron, two pieces the same shape as the clutch cross member, and bolt them on to reinforce the same, as they get weak after using a short time. I hope you can understand from this rough sketch what I mean. The Metz guarantee their fiber friction to last 3,500 to 5,000 miles. I have run my 1912 over 12,000 miles and the fiber is still good, because I have no slips.

For Radiator Cooling.

A reader says he has seen in some publication an arrangement described which was called a condenser, and which attaches to the filling cap of a radiator so that the funnel portion of the condenser faces forward, thus constantly allowing cold air to condense the water vapor and thereby increasing the radiator efficiency. Will any of our readers give the name and address of the manufacturer of this device?

His Gasoline Tractor.

From E. A. Klerrig, North Dakota.—I enclose a kodak picture of a gas tractor which I made out of a Peerless car. I have 18 horespower in the belt and on the draw bar. It has three speeds, varying from 2 to 8 miles an hour. It will pull a 12 inch triple gang plow in stubble, and haul hay and grain on the road. It grinds feed and cuts silage. It is not a very attractive machine but it does the business. If any



Mr. Klerrig's Motor.

reader has a Ford or some other light car I would be glad to trade some horses for it, as they are cheap and I am overstocked. However, I will not sell for a low price.

A New Hat Ready.

From J. L. Allen, Kansas.—To C. A. Stone: I saw your article about bracing the Metz car. I have one and we have always had trouble with our car and never could tell what was the matter with it until I saw your article. I have braced my car and now it works fine. I thank you a thousand times. If you will send me your address and size, I will send you a new hat, for I have burned up gas enough in a few miles to buy several hats.

Carburetor for Each Cylinder.

From G. W. B., Connecticut.—As some cylinders have more compression than others, I have often thought that some motor builders might try an individual carburetor for each cylinder. It would be much smaller, but it could be set to meet the requirements of each cylinder.

That Ford Car Knock.

From Walter Sanders, Wisconsin.—As I am one of your subscribers and take great interest in your journal, I will endeavor to write and tell you where I think the knock in the Ford car owned by W. H., of New York, is. I am a repairman myself and had the same experience. If I'm not mistaken he will find it in the front cam shaft bearing. The bearing no doubt was too tight in the first place and it cracked and parts of it fell away causing this bad knock. December number, page 49, No. 1471.

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MAGNETIC INFLUENCE.

Hidden Force Discovered in Two Pole or Series Spark Plugs for Two Point Ignition.

In a series, or double pole plug producing two point ignition in a cylinder, to secure effective results the current must be entirely free from any undue influence, in its travel from one spark to the other. M. T. Minogue, the originator of two point ignition produced by spark plugs, who has spent several years time experimenting and perfecting the double pole or series plug has discovered a hidden force that has been heretofore detrimental to perfect ignition in spark plug two point ignition, and is explained herewith.

Two conductors each parallel to each other imbedded in an insulated member, the current passing down one conductor or electrode, as it is commonly called, jumping the gap to the other electrode on the inside of the combustion chamber and passing directly out again through the same insulation, and thence to another plug, sets up an agency known as static currents that causes a magnetism surrounding the insulation which clogs and greatly diminishes the current at the spark gap. In some cases where this condition arises to a high degree, the current is entirely choked from the sparking points. The current instead of being strong, forcible and hot at the spark gap similar as that obtained in a single plug is greatly minimized and causes the motor to skip and act in a very bad manner, because there is not enough of strength at the firing points in the current to properly ignite the gases, especially when a motor is running at slow speeds. Very frequently it occurs that it is impossible to get a motor to throttle down properly as it naturally would if it received its full volume of spark at the sparking points.

Many motorists using a series plug for two point ignition who had the experience that is herein related, have tried various means to overcome this annoying difficulty of weak firing and missing thinking that the trouble was in their carburetor or spark coil or else that their spark gaps were too wide and that their magneto was not strong enough to jump the resistance of the two gaps in both plugs.

The resistance of the two spark gaps in a series is so little that it can scarcely be noticed upon any make of magneto, providing that it is free from any choking or magnetic influence that is set up in its travel through the circuit. This can be plainly demonstrated by placing several plugs in series and it will be noticed that when the current is switched on that unless the battery is extremely strong, it will not spark over three or four plugs connected in this manner, but by eliminating this damaging influence to the path of the current passing from plug to plug, a dozen or more plugs can be placed in series, and when the current is applied they will each show not only a spark at the gaps, but will show a strong, hot energetic spark. This plainly shows that the resistance of proper adjusted spark gaps is very small indeed.

This influence spoken about is not found in a single spark plug where the single electrode passes through the core or insulation and jumps the inside ground. This action of the current traveling through the insulated member and returning through same in a parallel manner sets up this condition which is something similar to the magnetic influence that is excited in a dynamo or generator when driven to speed.

Mr. Minogue has not only discovered this action as taken place in a series or two pole insulated plug, but has also discovered a means whereby the magnetic influence is entirely eliminated, which has been proven by late tests of the new construction, which will show a good fat spark on a dozen plugs at each gap, while before eliminating the static influence from the plugs the current would entirely quench with only four plugs in series, also its effectiveness is proven in the perfect ignition of the motor at all speeds.

As two point ignition is now being so largely used, this discovery will be of great interest to those who are using two point ignition.

WELDING PRACTICE.

How to Handle Broken Parts of Automobiles and Other Machinery.

From J. N. Bagley, Nebraska.—A few years ago welding machines were found only in the larger

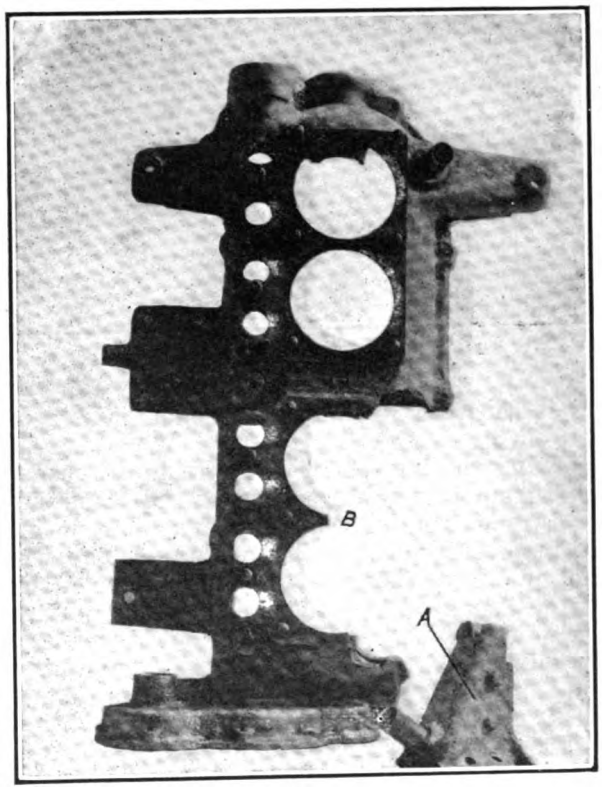


Fig. 1.

cities, but to-day we find them scattered over the country and in many of the smaller shops. Repairmen have begun to realize the necessity of the machine as well as the profits derived from it. No time since the welding machine made its appearance has there been such demand for the skilled operator, as a man who can handle the welding machine can get work much quicker than the man knowing nothing about it. An experienced operator can handle almost any kind of metal with success such as broken cases, crankshafts, machine castings, etc.

In the spring there is all sorts of planting machinery with broken castings, which can be fixed at a very good profit to both the farmer and the operator. A little later on or soon after comes the cul-

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tivating time and a different kind of machinery is brought into play and this must be repaired as well. Then after this come the time of harvest or the busy time, as we call it in the West, when every machine that can harvest grain is brought into use. When one of the harvesting machines gets out of repair on account of a broken casting, the farmer

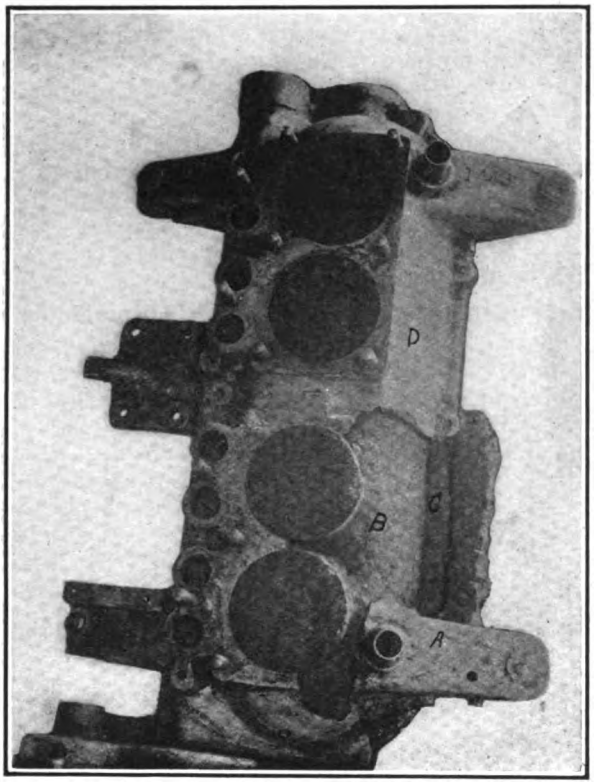


Fig. 2.

wants it repaired just a little sooner than is possible to do it.

Following the harvest is the threshing season, to get the grain into the bins before fall rains set it. The only man able to keep such machines in order is the man with the welding machine. The writer has had many welding jobs come a distance of thirty miles for repair in a busy time, and by having a machine to do the work, the advertisement was worth much in after years. Next in rotation will be the fall plowing and seeding which is generally crowded along as fast as possible for the plant to get a foothold before winter closes in, and at this season of the year we find the welding machine very profitable. We have been the round of the seasons and find that every one of them demand different machinery, which must be kept in repair, and the welding machines will play an important part.

Now what are we going to do with the welding of broken parts of automobiles, which are used nearly all the year around? Stop and think a moment and figure, if your shop will not afford a machine at the price they can be purchased for at this time, and good ones, too.

Difficult to operate? Not a bit more so than your lathe, your vulcanizer and a dozen other tools about the shop. It just requires a mechanical fellow, or to put it plain, a man with ideas. When a lathe job comes to the shop no matter how difficult to chuck or hold, we manage somehow to get the job done in very good shape. The same with the welding machine. The job may look a trifle hard or impossible, but if you have ideas and put them to use it will surprise even your own self how successful you can be. The writer never saw a welding machine until a few years ago and that was a home-made affair, and he never had a lesson from an instructor, but he gets on very well. Of course, some of my early jobs were not good. Now and then one would be a failure entirely. Nevertheless, I kept at it, learning a little from time to time until I was as successful as the average.

Aluminum at first was a sort of a bugbear with me, and I would send my work of this kind away to have it done, but one day I thought I would make an attempt, and luckily it proved a success. From that time on I kept all my work at home and got it out in some manner, but it all passed. I told my customers I was not an expert but would do my best and if it broke would do it over free of charge. Of course, I had some to do over, but by so doing I "killed two birds with one stone;" I got the experience and held my customer.

Fig. 1, shows a case from a Buick car, as it was brought to the shop for repair. All the pieces, save the support, were gone, as the customer when he saw what happened was angry at his ill luck and had left them lying in the road. I was not exactly decided as to how I would get the job out, but after

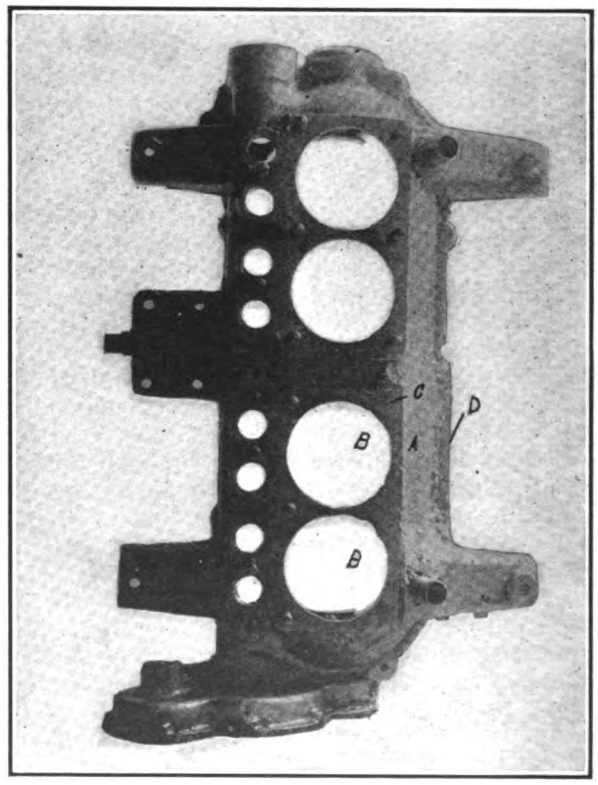


Fig. 3.

spending some little time thinking the matter over, I decided to try it. The arm A, was all that I had to build to, as all the parts, as at B, were lying in the road many miles away.

Fig. 2 shows the job well under way. The case was placed on a level surface and the interior of it at B was filled with moulding sand and shaped up to the exact shape of the case. Bringing the sand

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to a line with the interior of the case acted as a core for the metal that I intended to pour. At C, was a cored place for a rib to bolt the pan to, as it was entirely gone. Now with a piece of light black iron I formed a piece that would take the outside shape of the case and fitted it carefully over the case, leaving a place at the extreme top for a funnel

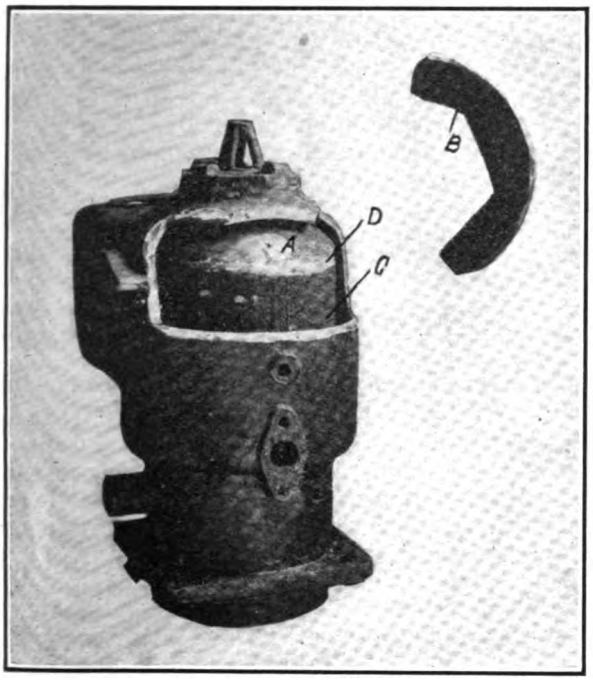


Fig. 4.

to project into the opening between the core and the cover. After the metal cover had been placed and shaped I covered it over with moulding sand, building up well around the funnel. I melted the metal and poured it into the funnel, having a sufficient amount to leave the funnel full after filling the case. This is a necessity to hold the metal close so there will be no bubbles or coarse places in it. After pouring I left the job in this shape to cool, and every once in a while I would come over and take a look and wonder how it would look when it came out. When I took it out I was surprised to find a very good side in the case, and all there was to do was to weld up the joints that were left where the new metal came to the old, and the job was done, except some filing and drilling for the studs to hold the cylinders to the case.

Fig. 3 we have the case when it was finished except the drilling of the holes as mentioned. The edges of the openings B, were a little rough but were smoothed with a large half round file, C was a little high and I cut it down with the shaper A, the new side, which needed no dressing or filing. The added part D, needed a little repair or rather dressing where it fitted to the oil pan but all this required very little time. This job has been in use for some time and has stood the test well. Since this experiment I have repaired many cases with good success and it never bothers me whether or not the pieces are all brought along. In welding work of this kind I never remove the core as I call it until all the welding is done from the outside. When the joints are all welded I remove the sand from the inside and place it in the oven and heat it up to prevent cracking and weld up the inside and place it in the oven and close the drafts and kill the fire and leave it to cool. If preferred it can be left to cool in a box of air slacked lime which will prevent the cold air cracking it.

Fig. 4 is a job I considered a trifle difficult in my earlier experiences. It is a cylinder which has been broken at the combustion end because of a piston being driven through it. The crack at A, runs about three inches around the head and it was necessary to remove the portion of water jacket as shown. The part B, was cut with a saw and lifted out of the way after which the crack was ground with the wheel until a large V notch was its entire length. The interior of the cylinder was filled with moulding sand and the entire heated until it was almost red when the crack was welded at D. As soon as welded the water space was filled with hot sand and the jacket B placed back in position which had been previously ground to a V along the edges. The part was welded in and the entire cylinder buried in lime to cool. After it was cooled it was ground smooth and placed on the car as soon as the sand was washed from the water jacket. This cylinder was just as perfect looking as the balance of the cylinders and could not be told from them. It has been in service for many months and shows no signs of weakness.

Fig. 5 is the body of a spray pump, a very simple job to handle. The crack at A, being about 8 inches long, extending in a curved direction around one end as shown. This was ground almost through with a thin wheel leaving a place for the filling with the filler rod. The inside of this case I packed with sand and heated the entire piece to a dull red after which I buried it in the lime to cool. I have found that where the sand can be used and the entire mass heated together, the air has less chance to get at it and the sand holds heat. Consequently a

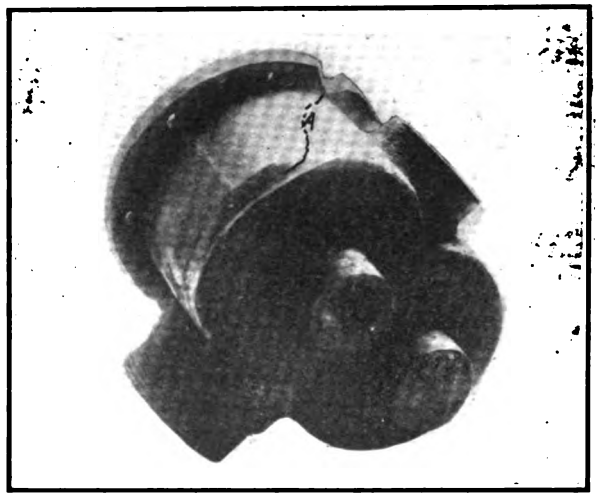


Fig. 5.

long crack will not take as much gas as without the sand, as the larger the body the slower the heat will radiate away. Aside from this there is less chance for a casting to warp. There is some little knack in keeping the filler rod soft enough to be filed after it has cooled in place. This is hard to explain or describe but can be found by experience. The flame should be played on the rod frequently above the crack and keep the rod almost a "mush," as we call it, so it will seem to flow from about a half

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inch off the end of the rod. This prevents air bubbles and makes a better job. After the temperature has dropped a trifle and the torch is turned back on the weld it will nearly always leave a few air spots in the work which may not do any particular harm, but it makes the work look a little rough.

VALVE LIFT.

Claims it Has Nothing to Do with the Running of the Engine.

From J. F. H., England, in Motor.—The question of degree and duration of valve lift appears to have attracted some attention of late, and the suggestion has been made to employ a camshaft with variable cams as a possible solution of the problem of providing an engine which shall combine the advantages of the slow-running engine of low mechanical efficiency with those of the high speed engine of maximum mechanical efficiency, both of equal volumetric measurement.

Apart from the doubtful advantages of increasing the mechanical complications of an engine by incorporating a movable camshaft having cams of varying degrees of lift, it appears to the writer that such an arrangement is rendered quite unnecessary in view of the fact that the lift of the valve adjusts itself automatically to the requirements of engine speed owing to the inertia forces of the valve mechanism, which are at all times proportionate to crankshaft revolution.

In all engines there is a critical point in speed at which the tappet roller ceases to follow the cam profile closely, and thereafter the degree of "bound," if it may be so termed, is commensurate with the rate of increase in speed, and this is why, in the writer's opinion, any proposition to vary the lift of the valves by mechanical means is altogether unnecessary. If it were logical to assume that the tappet roller follows the cam profile closely at all speeds, then there would be sufficient reason for the suggestion to vary the valve lift mechanically up to the point beyond which varying the lift ceases to have any effect, but in view of the inertia forces set up by accelerated motion, there does not appear to be any necessity for the adoption of a device of the description suggested.

In the opinion of the writer, assuming the valves of an engine to have the correct degree of lift, and the gas passages to be proportionate to cylinder dimensions, the effect of varying the degree of valve lift mechanically would be merely equivalent to that of throttling the gases in the orthodox manner. Assuming an engine to be of maximum mechanical efficiency, then the whole question would appear to rest upon a determination of the correct degree of valve lift in proportion to gas passage area, and, when this condition is fulfilled, no further increase in lift can have the slightest effect on the speed of the engine; the maximum effective lift of a valve covering a gas passage, say 2 inches in diameter, is ½ inch, and nothing would be gained by increasing it; in actual practice it is not customary to go to the maximum.

Therefore, it will be obvious that, if the sluggish engine is sluggish with correct valve lift and throttle fully open, it will remain sluggish to the end of its days; the only possible means of putting "life" into it will be by advancing the ignition. Beyond this its case is hopeless; its sluggishness is entirely determinate upon and co-equal with its degree of mechanical efficiency, and this latter feature it is not possible to alter.

The "lively" engine can at all times be toned down by throttling the gases and retarding ignition, and it is difficult to see wherein lies the difference between throttling the gases in the gas passages leading to the cylinder and throttling them in the cylinder itself by means of varying the valve lift. The question resolves itself into one of giving proportionate power at all speeds; that is, no falling off beyond that which must naturally follow reduced speed, and no mechanical arrangement for varying valve lift can possibly be necessary or beneficial when we have already at command acceleration and deceleration by means of throttle and ignition control.

EXHAUST VALVES.

How to Keep Them in Good Condition for Satisfactory Service.

As the result of improvements, an average distance of 1,500 miles can be covered before the exhaust valves of an automobile show signs of requiring attention, and there are doubtless many instances of much greater distances having been covered without the valves having been taken out. It is not advisable, however, to leave the valves without attention for an indefinite period, and after every 1,500 miles they should be taken out and examined. It is much easier to deal with a valve if it has not been left to deteriorate to any marked extent than it otherwise would be. In the former case simple methods of treatment will suffice, whereas if a valve has been neglected so that it has got into a bad state it cannot be dealt with except in the lathe and by the use of special tools to cut a new surface on the valve and possibly also on its seating.

Concerning the actual details of grinding in a valve it is not necessary to repeat these, as the manipulation is such common knowledge; it is, however, proposed to refer to some of the points which are liable to be overlooked or insufficiently attended to.

It is important when the valves are taken out that some sort of test should be made to see whether they are approximately true and concentric. This applies more particularly to the exhaust valves, subjected as they are not only to the mechanical shock of operation, but also to the intense heat of the exhaust gases. The tendency to warping is considerable at that part of the valve stem just below the head. A properly designed valve is intentionally made much stronger at this point than elsewhere, and it should not warp appreciably if the engine has been run normally, but if otherwise, and the valves have been severely overheated, even the extra strong "neck" provided may fail to keep it true.

If a lathe is convenient, valves can be easily tested for accuracy between the centers. Failing this, the condition of them will have to be tested with a straight-edge, or better still, a gauge cut out of sheet metal so as to fit close along the stem, neck and head of the valve. Once made, a gauge of this sort can be used indefinitely with the same set of valves, and with a little practice in testing a valve

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at various positions the slightest inaccuracy can be detected. The truing of a valve stem is best done by pressure and not by hammering, which is liable to do more harm than good. With suitable grooved blocks of metal, or even hardwood, and the pressure obtainable between the jaws of an ordinary vise, it is a simple matter to "reset" a valve by applying the pressure at a proper point, and thus forcing back the stem where it diverges from a straight line.

There is no doubt that many engines are run with the valves defective as regards this matter, and consequently not only does the valve never obtain a proper seating but a great deal of unnecessary wear is caused on the valve guide. This worn condition explains why so much oil leaks down the valve guides of certain engines. Grinding-in should be done intelligently, always keeping in view the fact that it means a certain amount of wear on the valve and seating—especially the latter—every time the operation is performed. It is, in fact, not unusual to find that the grinding-in has been so vigorously and so frequently done that the valve has sunk well down into the seating. If it be found that the valve face has some unusually deep "pit" marks in it, the better plan is to have the valve refaced in the lathe or by the use of a valve cutter, otherwise by the time the marks are ground out the seating will have been worn to an excessive and disproportionate degree.

A point which does not as a rule receive attention is that of preventing the abrasive material used in grinding from reaching places where it can do harm. The tendency is to use far more of the abrasive material, such as emery or carborundum, than is necessary for the actual operation. The surplus amount is very liable to reach the valve guides, and possibly also the cylinder, as the abnormal marks or scratches sometimes found on the cylinder surface indicate. A precaution against this taken by careful operators is to pack some cotton waste into the port and below the valve head. Failing this, great care should be taken after the operation thoroughly to clean all around the valve and down the guide with a paraffin-moistened rag to clear away any trace of the abrasive material. Finally, should it be found, after say 1,500 miles of running, that the exhaust valves get into a bad state and show signs of intense heat, the surface showing what is termed "scaling" or flaking, some abnormal circumstance in the running may be suspected, such as faulty carburetion or water circulation, or it may be a throttled silencer, and this should be attended to.

Efficient Piston Rings.

From N. G. Near, New York.—Here is a test that every efficient piston ring should be able to

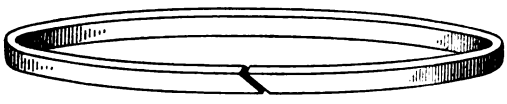


Fig. 1.

stand: Take the ring, or any part of a multi-part ring, in normal shape as it appears in Fig. 1. Pull it apart as in Fig. 2, twist as in Fig. 3, and compress as in Fig. 4. If suitable for its work the ring will spring right back to its normal shape, Fig. 1. Any ring that takes a set under one or all of these three tests has not the resiliency to stand its insertion on the piston and best adapt itself to a perfect fit with the cylinder wall. Even if rings sprung in handling do not break, they are apt to leak. A good way to distinguish between good and bad metal used in piston rings is to break the rings and compare the crystalline structure. Coarse grain indicates an inferior metal, utterly wanting in flexibility. Too often, unfortunately, piston rings are made of this



Fig. 2.

"pot metal," consisting of scraps melted together and cast into long sleeves from which the rings are machined one after another. Such rings frequently break in being put into place, and even if not they are unable to stand the twist without permanent internal strain.

Close, fine, uniform grain of specially processed gray iron is now used in the best piston rings. Any

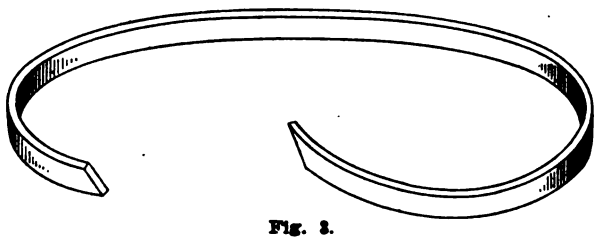


Fig. 3.

metal expert will tell you that these fractures indicate extreme resiliency, immunity to distortion in assembling, hardness to assure long life, and that the fine grained metal does not deteriorate so quckly under even the high heat from the combustion as does the coarser grained structure. These characteristics and assurances of correct service are pos-

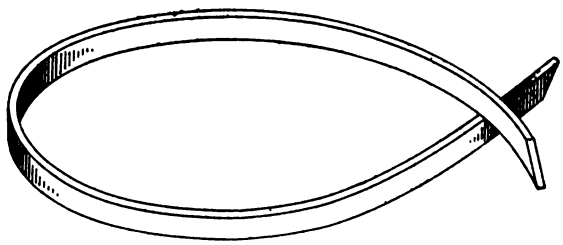


Fig. 4.

sible in the highest degree only by making each ring or ring part an individual casting. Each part must then, of course, be machined, ground, and tested separately. There must be no slip-shod work.

In ordering rings for a given motor it is always well to state the make and model of car, number of rings wanted, bore of cylinder and width and depth of grooves. Sometimes it is a good plan to send a sketch giving all dimensions.

Piston rings should fit their grooves with only enough ease to permit free seating without lateral motion. Much used pistons in which the grooves have widened should have their grooves turned up 1/32 inch wider than the original width and correspondingly wider rings should be selected. Such machine work, however, is seldom necessary.

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ALL DO NOT RUN ALIKE.

It must not be assumed that all cars of the same model and made by the same firm run equally well or will give an equal amount of satisfaction. Even the highest priced cars of the same model vary in running quality and in expense for repair, and in the case of cheap cars this variation is often wider than would ordinarily be suspected.

Reference is not now being made to a variation that is due to a difference of care in running, but to a variation that is apparent from the moment the car is taken out. The fact is, no matter how comprehensive or careful the testing may be, both in the factory and when tested by the manufacturer outside, no car can be made that is an exact replica of another in quality of material and in size of parts. And even though there be a variation in but one particular, that variation may soon cause a more important variation in another part of the car that will result in no end of trouble and expense.

This fact is referred to for the benefit of occasional readers who express dissatisfaction with their experience with a certain car even when they have used it judiciously and intelligently, and who often send us complaints against that particular make of car, when in nineteen cases out of twenty it gives the highest satisfaction to other users.

We have in mind one of the best runabouts of a medium price that is made. The man who owns it is a good driver and a careful driver. Yet he has had so much trouble with it that he has decided to dispose of it at a much reduced price. On the other hand, we recall a woman who owns a car of the same kind, year and model which she has driven 5,000 miles without spending a penny for repairs, and the self-starting system is so perfect that the car has never been cranked.

The foregoing conditions might be expected in the case of the low priced machine-made cars which it is impossible to thoroughly inspect and test, but it can hardly be accounted for in the case of the medium priced cars which are far more carefully made, inspected and tested.

Before us lies a letter from a car owner advising no one to purchase a certain kind of car that he owns "unless he wants to have a car in the repair shop all the time." We chance to know that in this instance, the car referred to is generally giving the best of satisfaction, and it would obviously be a gross injustice to print the complaint the man makes.

It must not be assumed that this condition is a common one. But it exists, and it must not be overlooked. That the testing of a car at the factory before it is sold is most important, and that the running of the car by the purchaser is even yet more important, all goes without saying, but no machine as complicated as an automobile and composed of as many different kinds and sizes of material, can be expected to run exactly the same as all other cars of the same model. That two, or a dozen, or an hundred, or even a thousand medium priced and reputable cars may run so nearly alike that the difference will be scarcely perceptible, is usually the case, but then comes an exception where a car runs badly and unlike any of the others.

BEST FOR A TOUR.

A reader asks which would be the better for a trip from this State to the Mississippi River, an automobile or a motorcycle with a side car. He says he intends to take this trip next month with his wife and wants to go without unnecessary expense and as comfortably as possible.

Even assuming that his means are limited, if he can afford to take the trip at all, he should take the automobile by all means. The writer of this is no "'prentice hand" in touring. He has toured in an automobile, in a motorcycle, on a bicycle, with the Smith motor wheel attached to a bicycle, and—on foot. If distance is of no consequence and the recuperation of health is the aim, there is no better method of travel than by the means nature has given us, or what is somewhat uncouthly called "shank's mare." Sleep out-of-doors and under some pine tree, if you can. Next to this, and where distance is a little more important, the bicycle is a healthful and quite satisfactory means of locomotion. If you want to get somewhere quickly and at the smallest possible expense for a given distance, use a motorcycle. This is not exactly the vehicle for the fair sex, however, either with one as a passenger on the rear of the motorcycle or in a side car attachment. The side car is uncomfortable for a woman and the arrangement itself mechanically unscientific. It is well enough on level and smooth roads, when it comes to steep hills and rough roads or patches of sand first on one side of the road and then on the other, such riding is anything but easy or simple.

On the whole, we believe our friend will find the

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automobile to be by far the most pleasant and convenient vehicle for his trip, and especially if he is to take his "better-half" along.

GASOLINE.

Let no one imagine that there is but one quality of gasoline on the market. There are as many qualities, almost, as there are qualities of cloth, and like everything else the best gasoline is the cheapest.

Although there is a wide variation in the quality of gasoline, this probably is not due to the different kinds of petroleum from which it is made, although this in itself varies widely. Pennsylvania crude oil contains from 1/8 to 1/5 of its volume in gasoline, while Texas and California oil contain only about 1/30. Good gasoline should have what is called a Baume test, or from 65 to 68 degrees, while high quality gasoline tests 72 degrees. The higher the Baume test the easier the gasoline is to start the car, and the smoother it runs.

In the vicinity of New York City gasoline is sold all the way from 12 to 18 cents a gallon, and as far as we can learn, no one can afford to sell good quality gasoline at less than 16 cents a gallon. A good test of gasoline, in the absence of a hydrometer, is to pour a little in the hand. When it evaporates slowly and leaves a little grease deposit, it should be rejected. When it evaporates rapidly and leaves the hand dry and clean, it is acceptable. Water is frequently present in gasoline and is liable to get into the pipes and carburetor. This, of course, impairs its quality. When filling a tank a strainer funnel should always be used. This keeps out the dirt and often prevents a trouble that is hard to locate. Poor gasoline makes a car start hard and run sluggishly.

GRADE CROSSING DANGERS.

Grade railway crossing dangers are causing increased comment and apprehension—save among many automobile drivers who have the most reason to fear them. We get so sick of reading accounts of grade crossing accidents in the face of the constant warnings given, that we sometimes feel—paraphrasing the words of the Psalmist—like "saying in our haste" that all who meet with such accidents meet with just what they deserve. Or at all events, since our warnings seem to have no effect, possibly the creation of a bit of indignation at a sentiment like the foregoing may be impressive. One can sometimes afford to rest under the stigma of being heartless if it will have the effect of lessening a great evil of recklessness.

On Long Island, N. Y., where grade crossings are unusually numerous, the railroad has had warning signs put up, entreating drivers to "stop, look and listen" before attempting to cross a track. But railroad officials themselves are not blameless, by any means. If they were so disposed, gates could easily be placed before all such crossing where flagmen are not now provided. No one can justly ask that all grade crossings be at once removed, for that would be something that neither the combined resources of the State and the railroads could afford, but in remote localities where flagmen are not employed it would be easy and comparatively inexpensive to have gates automatically actuated by approaching and departing trains. Of course, if an automobile driver is so blind that he can't see a closed gate, even such a plan would not be effective.

The fact is, the railroads are naturally adverse to spending anything not absolutely imperative. Where damages for accidents would be more expensive they employ gates and a flagman, but in localities where accidents are comparatively infrequent, it pays better to settle than to make the crossings safe at even a small expense.

JUDICIOUS DRIVING.

Commissioner Goldwater of the department of health of New York City, has announced that he will ask the legislature of the State to pass a law requiring applicants for permits to operate automobiles to submit to what may perhaps be termed a "psychological" test of fitness. "The control of an automobile in the streets of New York," he says, "is no task for a child, an untrained amateur, a neurasthenic or an excitable person. In such hands it is an engine of death. Under the highways law the question of mental ability to operate a motor car is not considered."

No doubt the premises of Dr. Goldwater are correct but his conclusions are faulty. It is true that those afflicted with the defects he refers to are unfit to drive a car in the streets of New York, but a correct determination of such defects by an examination would neither be practical nor positive.

A far better plan, and one this magazine has invariably advocated, is to "make the punishment fit the crime." In other words, make the penalty for driving so that the safety of other users of the streets is jeopardized, so severe that no one will dare do it. It is easy enough for a policeman to know when such an infraction of the public safety is being made, but it would be impossible for a Solomon to accurately determine who would not under any circumstances drive in this way.

WELDING INFORMATION.

Any of our readers who would like information concerning oxy-acetylene welding or the various devices or outfits for welding by such means, are invited to send inquiries to this office. They will be answered by an expert, and such information will be forwarded by letter whenever desired, and afterward published in this magazine. Oxy-acetylene welding is comparatively a new art, and is rarely understood by the average mechanic, and it is felt that such a department will be of general interest to many of our readers. The use of the automobile as well as of much farm machinery has made welding an important adjunct to every garage and repair shop as well to the general machine shop. It may be added that answers to inquiries will be made in a simple way so that they may be easily understood by any one.

FOR SUBSCRIBERS ONLY.

It is hardly necessary to state that the information given in the Trouble Department of this magazine or by letter is for the benefit of our readers only. Nor will such information be given reluctantly or grudgingly. No matter how much time or expense it requires, we consider that our readers are entitled to it. But others who desire information should first send in their subscription order.

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AUTOMOBILE PRODUCTION.

English and American Methods Compared and Explained.

From The Motor, England.—A few days ago I was escorting an American motorist through one of the largest of our motor factories, when he inquired what wages a man he saw looking after one of the machine tools would earn. I told him probably 10 pence an hour.

"How much is that a day?" he asked.

"Something under two dollars. I suppose in America the same man would get three times as much?"

"Why, yes; about five dollars a day." And then he added, "Say, this puzzles me. How is it, with such low wages, you people in this country cannot knock spots off us Americans on your prices?"

I told him we did not think the wages mentioned were so particularly low, when we compared them with the figures paid on the Continent. And this made him more than ever puzzled as to why the Continental firms could not wipe American manufacturers off the face of the earth in competition.

Many things in that factory surprised him. Some agreeably and some, I could plainly see, otherwise. A little later on we came to a man drilling holes in the bottom half of an aluminum crankcase. He was bringing the work into position under the tool and drilling each hole separately, one at a time. This astonished my friend immensely.

"My!" said he, "Why, in America they would do all that lot at once," and he asked how it was we did not do the same over here.

When I explained things to him a bit, he saw the point, and doubtless many others, unacquainted with manufacturing methods, may be interested in the explanation I gave him. Certainly, if the true inwardness of such things were better understood by the public, we should hear less of the newspaper tirades we occasionally get from insufficiently informed, but doubtless well-intentioned people, and from mere politicians, who cannot see how such things as tariffs, for instance, can in any way affect the conditions of an industry and when British producers appear to be losing ground against their foreign rivals, simply denunciate the manufacturers as being ignorant of their own business and behind the times in their methods, and shout to them: "Mend your methods and do not bother about tariffs, and you will be all right."

In this particular piece of work there were probably 20 holes to be drilled and the operations of centering the work under the tool and passing the drill through the metal, probably took three minutes. Now, here was a man doing each hole separately, and what my friend pointed out was that, whereas he was working with only a single drill, in America he would be working with a cluster of drills, each positioned to make its proper hole in the work, and, when the work had once been accurately placed for the operation, the whole of the 20 drills would be brought down together, the actual operation of drilling the entire 20 holes thereby occupying no more time than the man he was observing took to pierce a single one. On the face of it, of course, all other things being equal, the British manufacturer in whose works the observation was made was working in a most wasteful manner by employing methods by which it took a man a full hour to pierce those 20 holes, when, allowing for a little extra time, perhaps, in the first positioning of the work, with a different tool equipment, it could be done in five or six minutes. Indeed, my friend went into figures, and showed that, piercing these holes, one at a time and paying a man 20 cents an hour, the holes cost 1 cent (one half-penny) each to drill, and the labor on this entire piece of work cost 10 pence, whereas, if the man had been provided by his employers with such a tool as he would have to work with in an American factory, he would do the whole work for a penny, and, allowing for the wage rates in the States being approximately three times those ruling here, even there the cost would be but threepence, thus showing a saving to the manufacturer on the labor cost of this one item alone of over 2 shillings in America or 9 pence here, counting British wages. And he observed that this was only a single operation of the many hundreds of operations required in the production of a motorcar, so why we did not just pick up the pennies all around and fill buckets with them he could not understand at all.

The explanation I gave him was this: The firm in question, although one of the largest manufacturers in this country, was producing four or five different models of engine, making only from, approximately, 300 to 1,000 of any one type and averaging, perhaps, 600 of one particular model. Now, taking the latter figure for the purpose of calculation, I showed him that, whilst the machine-tool he saw working could be employed equally well in drilling the holes in the crankcases of each of the four or five models, such a tool as he had seen in American factories would require to be built specially to drill the holes in a single model only. This tool might, very possibly, cost 200 pounds sterling to install, and I showed him that, if installed and completing its work in, say, six minutes per unit, or allowing only five per hour, it would finish off in a fortnight the entire number of crankcases required in a twelve-month, and would, therefore, be lying idle more than eleven months out of the year, occupying space in the workshop and, so to speak, "eating its head off" doing nothing; whilst, allowing 5 per cent. interest on the capital and only 10 per cent. depreciation, without reckoning anything for its share of rent, of floor space, etc., the cost to the manufacturers would figure out at 30 pounds sterling, whereas the saving, even at 9 pence per unit, would be but 22 pounds 10 shillings; so that, on this calculation alone the manufacturer would be out 7 pounds 10 shillings. Further, as the tool was only capable of doing that one particular piece of work, if the next season's design called for an alteration in the part operated upon, the whole or a great part of the machine would be practically scrapped, to say nothing of the fact that, if he were to use such a machine, the manufacturer would have to carry his whole stock of crankcases through the year instead of spreading them over the period, thus locking up a considerable amount of capital, the interest upon which would have to be reckoned in.

Next I pointed out to him that, on a production of 15,000 per annum—which is quite an ordinary output of a single model for any of the leading American manufacturers—that machine could be kept steadily employed for the whole year. Whilst, at a rate of saving of only 7½ pence per piece, the gross saving at American wage rates over the

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British method and wages would be 468 pounds, 15 shillings, an amount which would allow the tool, costly as it would have been, to be thrown away as scrap at the end of the year if need be and still leave the manufacturer over 250 pounds to the good, whilst the saving to the manufacturer at American wage rates would work out at something like 1500 pounds sterling.

My friend then began to see things in a different light, and remarked that it was evident from what I had said that the principal factor governing the situation was the quantity produced, on which I assured him that he had "hit it in once." Here is, indeed, the secret of the success of American methods in reducing the cost of production of the goods and at the same time paying a rate of wage several times that which pertains here. Indeed, it is this high wage rate which practically compels American manufacturers to adopt such methods if they are to compete at all with Europe. There is no mystery about it. And there is no ignorance, or backwardness, or want of enterprise in our manufacturers. They are producing by methods which, under the quantity and wage conditions under which they have to work, give the best results. Apart from the fact, however, that American producers of motorcars have the largest market in the world all to themselves, tucked in safely behind that tariff barrier, they have one factor of the most important character which we have not, and that is enterprise—not on the part of the engineer-organizer, but on the part of the financier, and this greater capital enterprise may be doubtless accounted for by the greater protection for capital which the tariff wall provides. American manufacturers of motorcars did not begin producing in the quantities they are now doing all at once. There was a time when they were producing no more than we are to-day, and if we take the Ford car as an illustration, as probably the highest development of American producing methods to-day, it may be pointed out that the first manufacturing programme laid out for the production of that car was not for the 300,000 turned out to-day, but for 10,000 vehicles only. At that time, however, probably, no manufacturer, either in America or here, produced more than a tenth of that number of any one model, and the Ford programme could then have been carried out just as well in England as in America, for at that time even farseeing American producers thought Ford was mad in laying out to produce such a large number of a single type. Yet, considering the prices ruling for cars in those days, in the States as well as here, had the same scheme been adopted in this country, the American markets, as well as those of Europe, would have been at the mercy of the producer who had done so—despite the tariff wall—until such time, of course, as the American producers tumbled to what was up and adopted the same methods. But here was the point. Ford was able to find capitalists to back him in his enterprise of producing 10,000 cars before he had sold them, whilst the attitude of British capital was at that time—and still is to a large extent—exemplified pretty much by the remark made to me twelve or fourteen years ago by the then Mayor of Coventry: "Motors! Motors!" said he. "Would you ever sell any if you built them?"

Depend upon it that, given the opportunity and the capital, the British producer, not only of motorcars, but of anything else, is fully the equal of his American competitor. But to reduce the cost of labor on hundreds of individual pieces, means a very high initial expenditure, and this is the reason why so many of the lesser American makers to-day manufacture little in their own works, their cars being very largely "assembly propositions." It comes, in short, to a system of co-operative working; for whereas car manufacturers here, for the most part, pride themselves on making their own engines, let us say, and make them, of course, in the same quantities as their cars are produced, and as the British manufacturers of "trade" engines produce only in approximately similar quantities—in America, by reason of having the work of engine manufacture to do for a dozen different car makers an individual firm of engine builders is enabled to pay itself out to produce, say 50,000 or 60,000 engines to one pattern, and can, consequently, adopt all those methods of special tool arrangements which go to reduce cost, and, as a result, can actually supply the different firms using their engines at prices less than they could produce the engines for themselves in their own works, in the quantities in which they could use them.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Automobile Lamps Ignite an Oil Pool.—Two young women were burned beyond recognition, at Oilton, Okla., when the lamps of the car in which they were riding ignited with a pool of oil and gas that had collected in a draw on one of the oil leases. The driver saved his life by tearing off his clothing but was unable to assist his companions.

No Signal Lights Displayed.—A man was killed near Maywood, Mo., by running into a ditch at the bottom of which was three or four feet of water. It appears that an excavating machine had been at work in the roadway and that no light or other signal had been left to warn travelers of the hole. Other occupants of the car escaped but one man was pinned beneath the car and drowned.

Attempted to Make Road Record.—A man was instantly killed and the driver suffered concussion of the brain when driving at the rate of fifty miles an hour near Sugar Grove, Ill. The car plunged into the railing on the bridge at Edwards River. The great speed at which the car approached was occasioned by the determination of the men to set a new road record.

Driving with Lights Out.—Two men and a woman were killed and another woman will probably die, as the result of an automobile accident between Helena and Butte, Mont. The driver of the car noticed that his lights were not working properly and asked the occupants of another machine in the lead to drive slowly so that in the event of trouble he could follow them. At the foot of a hill the lights on the rear car went out. When halfway up the machine skidded and went into the ditch, overturning and pinning the victims beneath.

Steering Gear Did Not Work.—Two persons were electrocuted and two so badly burned by electricity that they will probably die when the car in which they were riding in Cutler, Cal., crashed into an

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electric power pole, breaking the pole and precipitating the heavy wires on the occupants of the car. It is said that the car was going at a slow rate of speed but the steering gear did not work. The pole was declared to be rotten as the impact was not heavy enough to injure the occupants and only damaged the car slightly.

Neglected to Throw Out Clutch.—Near Ambridge, Pa., a man was fatally injured, having received a broken neck and both legs were fractured. It appears that the man started to crank his car and neglected to throw out the clutch. It started forward suddenly knocking him down and injuring him as above stated.

Attempted to Avoid Mud.—Two young men were killed near Lette, Ia., when one of the young men in order to avoid a mud spot at the foot of a hill skirted the edge of the grade which is probably 30 feet high at that point. The machine skidded and left the road throwing the occupants into the ditch below. One of the young men's neck was broken and the other received a fractured jaw that must have caused instant death.

Dynamite in the Car.—Four persons were killed and twelve spectators and employes of plants nearby were injured at Syracuse, N. Y., when thirty pounds of dynamite exploded in an automobile. Two of the men that were killed had brought the dynamite near Onondaga Creek to recover the body of a drowned boy and in unloading it the dynamite exploded. An unidentified infant was killed and heads and limbs were torn from bodies and thrown forty feet from the wreck.

Collision at Crossing.—A mother and son were killed at a crossing near Dalworth, Tex., in a race to reach the bedside of some one who was critically ill. It is believed that the driver thought the eastbound express car which he saw approaching would stop at the station but it did not. The car struck the automobile full force and the occupants of the car were hurled into the air. The mother and son were killed instantly and the driver was severely injured.

Wheel Came Off.—One young lady has a fractured skull and another received a broken arm in an automobile accident at Laporte, Ind. According to reports one of the young ladies was driving and was going at the rate of 25 or 30 miles an hour when the wheel either collapsed or came off.

A Mile a Minute.—Two women may die at Oklahoma City, Okla., as the result of injuries received in an accident when the driver going at high speed crashed into a curbing. Two other women of the party were slightly hurt. It is stated that the driver was going a mile a minute and was returning from a club house where they had been drinking beer.

Too Near the Edge of the Road.—One man was killed, another may lose his eyesight and two others were injured at Livingston, Ill., when the driver drove too close to the ten-foot ditch which parallels the road at that point. The car overturned, pinning one man beneath and breaking his neck. The others were injured as above stated.

An Optical Illusion.—A man was killed at Somerville, Mass., when driving a car in the early morning haze, he started to turn down a street which appeared to be open at the farther end. When he reached the end of the street he realized he had entered a blind way. He was going at high speed and in an effort to avoid a collision with the building which closed the street, he turned a sharp angle and caused the car to turn on its side. The man was thrown out and received a fractured skull. He was dead when picked up.

Failed to Heed Signal.—At Maquon, Ill., a man was badly injured when the car which he was driving turned over in the ditch, pinning him beneath. It is stated that he signaled with his horn for the driver of a buggy to turn out for him to pass, but the man ahead failed to give the road and he was forced to either hit the rig or go into the ditch. He chose the latter and was thereby injured as above stated.

Attempted to Make Turn at High Speed.—Three women were injured at Denver, Colo., when the driver of the car attempted to make a turn while going at a high rate of speed. The driver lost control of the car which skidded and smashed into a telephone pole. Two of the women were badly cut and one received a broken collarbone. They were taken to the hospital for treatment.

Blowout Causes Accident.—One young man was killed near Hinsdale, Ill., when the automobile in which he was riding with three companions rolled over on a dangerous bend in the road. There is a high bank at this point and in order to make the turn cars usually take the curve on the outside. As the driver turned the wheel a rear tire suddenly blew out. The car skidded from the road and rolled over. The other occupants were thrown free from the wreck but the driver held to the seat and was found in a dying condition.

Killed on First Trip.—Losing control of his car which he had just purchased and was driving home, a man was killed near Bad Axe, Mich., when the machine left the road at a curve and plunged into a fence. He landed on his head and his neck was broken.

Steering Wheel Broke.—A man was killed at Charlottesvile, Ind., when the steering wheel broke and the driver lost control of the car. He received a fractured skull and died soon after he was taken to the hospital. The other occupants of the car escaped injury, with the exception of the driver whose face was badly lacerated.

At a Turn in the Road.—At East Northport, Long Island, N. Y., two cars, both traveling at a high rate of speed and in opposite directions, reached a turn in the road at the same time and collided head-on. It is stated that it is impossible to see far around the curve at that point. The lighter car rebounded across the road and turned turtle, crushing a woman beneath and throwing the other occupant out. The driver of the other car lost control of the machine and it turned turtle in the ditch. One woman was killed and three people severely injured.

Smoking While Driving.—Two men were injured at Rochester, N. Y., one having severed an artery in his right wrist and the other being rendered unconscious, when a touring car in which they were riding crashed into a telegraph pole. It appears that the driver was smoking and sparks from his pipe ignited with his trousers and in trying to extinguish the blaze he released his hold on the steering wheel, and the car darted into the direction of the telegraph pole.

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AUTOMOBILE SCHOOLS.

The Kind of Instruction Received in the Y. M. C. A. Course of Lessons.

From Felix J. Koch, Ohio.—In one of the big mid-Western cities, one of the great charitable movements devoted to keeping the youth of the land off the streets, plastered billboards, walls and fences with the slogan: "We want your boy!" Some mysterious wag chalked beneath the query: "What for?" To-day in innumerable cities the United States over the Young Men's Christian Associations are answering this query by replying, in so many words, that they are taking boys and men and teaching them either how to save time and money through conquering waste and breakage on their own automobiles, or to earn a clean, decent livelihood as chauffeurs. Or still again to become repairmen and earn a good living that way. In fact no one phase of educational work for a long time seems to have taken the grip of the Y. M. C. A. auto schools.

Suppose J. Perceval Roosa, for illustration, wishes to enter the Y. M. C. A. auto school. Possibly old man Roosa has yielded to his son's importunities and is to buy a new car on condition that "Jack," as they call him, will attend to it. Perhaps young Roosa has a car of his own and doesn't half relish having to leave it at the repair shop every time there is some mishap. Or, as already suggested, more likely than not Roosa wants to learn the trade of auto-repairman, or turn chauffeur. Whereupon he hies himself to the nearest Y. M. C. A. headquarters that has an auto school attachment.

In most of such schools it is not stipulated that one need join the Y. M. C. A. in order to attend. In one instance the fee charged is $52, and this paid the applicant may choose between a day course, covering five weeks or a night course of ten. Obviously, more take the latter course, leaving the daytime for their regular work. Lessons run from seven o'clock until nine-thirty. New classes start each month and will average say fifteen men to a class. The students are almost all of them young men. Students are taken from the age of sixteen years up.

The first lesson is given, as a rule, in the tire department, students passing in turn from department to department of the school. Starting with the commoner tires, they learn all about them and then how to repair them. This work takes three or four lessons, each point being made so clear that the veriest tyro must know all about it.

Without doubt, one teacher tells me, the automobile tire gives as much, if not more, trouble than any other part. Therefore the construction of pneumatic tires is taken up in detail. Also treads, rims, attaching and detaching, care and repair of the inner tubes and casings. Students do the actual work of keeping the tires in repair on the several automobiles that are used for road practice and also the other machines that are brought into the school work-shop. By this method the student does the actual work and therefore becomes proficient. There is also given a thorough drill on how to save tire bills. The owner of a car appreciates any saving that the chauffeur may be able to make along this line and this fact is made impressive.

The student then graduates to the rear axle. There he is taught by varied examples, the full floating, the three-quarter and the half floating axles. Most cars the men will use have full-floating axles so that most time is given to this. The actual work of dissecting rear systems, says our informant, we find to be the most helpful, as it gives the students a clear insight into the working and adjustment of all the standard systems. Class room lectures are given on transmission and steering-devices, which gives the student the working principle of each system. Brake systems are taken up in detail and the working parts carefully explained to each student. These details are learned in practical shop work. Each student is given opportunity to see the different makes of the school's own cars; also those that are used for repair work.

Having become thoroughly grounded in this, the future motorist continues on a study of the carburetor and engine work, engaging in this for about two weeks. Bright fellows can learn to understand the various carburetors and their adjustment quickly, but there are other phases to be taught beside. The student then passes to a machine equipped with modern lathes, electro-grinders and drills, and all the necessary shop equipment to make it practical for the repairing and up-fitting of cars. In this shop he receives practical instruction in lathe and machine tool work.

The road cars of the school are kept in first-class condition by being overhauled by the students whenever they are in need of repairs. This is done under the supervision of expert instructors. Such practical shop work is of sufficient breadth to enable students to do similar work if they contemplate running a repair shop. A good many students start garages and they always find this part of the course very beneficial.

Then follows the ignition, three weeks to a month of it practically completing the course. The ignition system of an automobile offers greater opportunity for trouble than most any other part of the car, and in order to overcome this, one of the best instructors is in charge and each student is given a thorough, practical drilling upon the different systems.

The course considers batteries and amperage and wiring in series and multiple, together with their construction and proper voltage; magnetos, low and high tension currents, induction coils, vibrations and master vibrators; also single and multiple coils. Then switches of different kinds are taken up as well as timers or commutators and their principles and construction. Spark plugs are also studied until they are fully understood. After the lectures the students are set to work on various parts of the car.

One evening a week, as a rule, is given to a lecture on a specific subject. The next week there are demonstrations and practical work. Breakage is not charged against the student.

Completing this work the students pass to the motor itself where the different styles are taken down and reassembled. An instructor gives his personal attention to each student. After the motors are set up, they are expected to run perfectly, and if they do not, the students themselves are asked to locate the trouble and adjust it. Practical work is given in the grinding of valves, taking up bearings, carbon removing, oiling and adjusting every moving part. This department is given special at-

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tention, as much depends on the thorough understanding of the motor. Motors are provided to give students a thorough understanding of the standard makes employed. The engine used more than any other type is the four cylinder.

By about this time the student is ready for practical experience on the road. If you have a night you think you can spare from a given subject, you take a driving lesson. Or, if you wish, you wait until completing the course. This done, you take the examination. Here there is reviewed everything you have learned. Ninety-eight questions were asked one candidate in a quizz of the sort not long since. Passing successfully, one received a diploma and if desired has his name entered at the several Y. M. C. A. employment bureaus. Then some fine day Jack Roosa receives a call to apply to so-and-so for a position. He goes, the employer looks him over and tries him out. He does splendidly and is taken on. The first lap is thus conquered in the long race to a great garage and endless machines some day, all his own.

BRITISH AUTOMOBILES.

Manufacturers There Acknowledge Benefits of Tariff to This Country.

Henry Sturmley in Motor of London.—A few weeks ago I pointed out how large output enables American firms, by the use of highly-specialized machinery, to overcome their handicap of high wages, and to beat the European manufacturer on price every time, and I further showed how the high wages they had to pay in the States is, in itself, a factor which, by encouraging this specialization and enabling it to be commercially economical on a smaller quantity production than would be the case in Europe, actually helps the American producer towards this end. I now see that a Colonial reader rather takes me to task for defending the British manufacturer on the ground I did, and urges that, had the British manufacturer specialized and laid himself out to produce in quantity at quantity price, he would by now have had the quantity sales which are, of course, necessary to keep such an organization going. In this I fear my critic is wrong, and his criticism shows that he has not fully grasped all the factors in the situation.

Considered without reference to other considerations which affect the question, there is ground for his contention. All other things being equal, the lower the price of an article the larger will be the sale. That goes without saying. But, unfortunately for the British manufacturer, all other things in this case are not equal by any manner of means. My correspondent has forgotten that there are such things as tariffs, and that by far the largest and most receptive market in the world has, until quite recently, been closed to us by a tariff approximating 45 per cent., in addition to the natural handicap of boxing and freight charges, and that even now, although things are better, this tariff wall is still over 20 per cent. on motor goods, which is quite as formidable an obstacle as under the old rate when the local conditions which exist to-day behind that tariff wall are taken into consideration—conditions which themselves are the result of the protection provided by the barrier.

Had there been no tariff barrier between the two countries, British manufacturers would have been upon safe ground in laying out for quantity production, as their market would not have been restricted; but, as it was, five or six years ago, when specialization first took hold of the American motor trade, the entire motor trade of Europe and the rest of the world, bar the United States, was but a very small proportion of what it is at the present time—barring war conditions, of course—whilst the market in the States was already as large, or larger than that of the rest of the world combined, and the American producer was absolutely protected in that market. Moreover, he knew that the factor of price rules the purchaser in America very much more fully than is the case here, and he had the very fullest encouragement to go all out for standardization, concentration of effort and a price campaign, with a result with which we are all of us now familiar.

It must further be remembered that, when this campaign commenced in the United States, conditions were different here from what they are now. Very few firms indeed in this country were making any profits worth talking about in the motor trade, and public opinion in regard to cars was so varied that it would have been difficult to select any one model to work upon. I remember, about that time, interviewing a number of capitalists in regard to the manufacture of a car of considerable simplicity and moderate price, but the opinions I met with were absolutely contradictory. Those who were not motorists seemed to think nothing would be worth tackling except a very much cheaper car than was under contemplation—the £100 car, in short, which at that time was not a possibility—whilst those who were motorists would not look at anything so unpretentious as that which I had in hand, and the only sort of car they felt there was any future for was a 60 h.p. vehicle, which should be better—i.e., faster—than anybody else's. Had we had the markets of the world, and especially the markets of America open to us, as well as our own, very possibly British capitalists would have plucked up sufficient courage to back a 10,000 car proposition, which, it will be remembered, Ford's was in the first place; but, whilst they were waiting to see somebody else make money out of motoring first, American capitalists, taking their courage in both hands, stepped in, and backed their manufacturers, and as a result their smile to-day is of the order that "won't come off." It is still possible, in one or two branches of automobile work, for British manufacturers, if backed by ample capital, to tackle manufacture on the basis of a "price proposition," and in doing so—now that the American tariff has been reduced—to operate for sales in the markets of the world, America included. But these openings are being rapidly closed up by American enterprise, and they do not exist to-day in the direction of the low-powered or moderate-powered touring car, which has been brought to such a figure in the States that even the reduced tariff wall is a full and efficient bar to our entering there. Given free trade throughout the world the British manufacturer would whip the world, but, under existing conditions, he cannot help himself. An adequate protective tariff throughout the Empire would help him to secure and retain the trade of the Empire, and that half-loaf would be better than no bread. Without it, in all competition where price is the ruling factor in securing

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business, he is handicapped out of it, and, as I have so often said before, he must depend upon the high quality of his goods for his market—and a high quality market is not a quantity market.

MOTOR TRUCKS.

A Body Design for a Four Ton Coal or Other Load.

The motor truck is becoming more useful every day in New York, as well as other large cities, as it really is a necessity in mostly every line of business, where heavy loads are carried, for instance, coal, stone, iron, pipe, etc.

The illustrations show a design of a four ton coal body mounted on a Peerless chassis, and is so constructed as to save time in making deliveries in this line of business. With a careful study of Fig. 1 it can be clearly understood what great advantage this design of body has over the designs of the past. First, the driver need not turn a crank to raise the body to the angle required to unload its contents. He has only to release the pin A from C which holds the coal chute B in place on the chassis. He then connects the chute with the outlet D, raises the sliding door E, and the coal is thus easily discharged in the coal hole or cellar. This body has two compartments, F and G, divided by a panel H, each containing two tons of coal. The same method is required to operate the second compartment when the driver arrives at his next destination. This body is made of sheet iron with supports I, and the floorings as indicated by dotted lines J, are of an angle of 20 degrees and 38 degrees. The sides are 80 degrees, therefore giving the proper angles to permit the coal to travel at the desired speed.

One important feature of this design of body is that it stands lengthwise with the curb, and does not interfere with traffic. It is also quickly unloaded, and the tonnage is equal to that formerly handled by four two-horse teams at less than one-half the cost of carriage. Fig. 2 shows the angle of the outlet from the floor of the body, and the 80 degree angle of the sides.

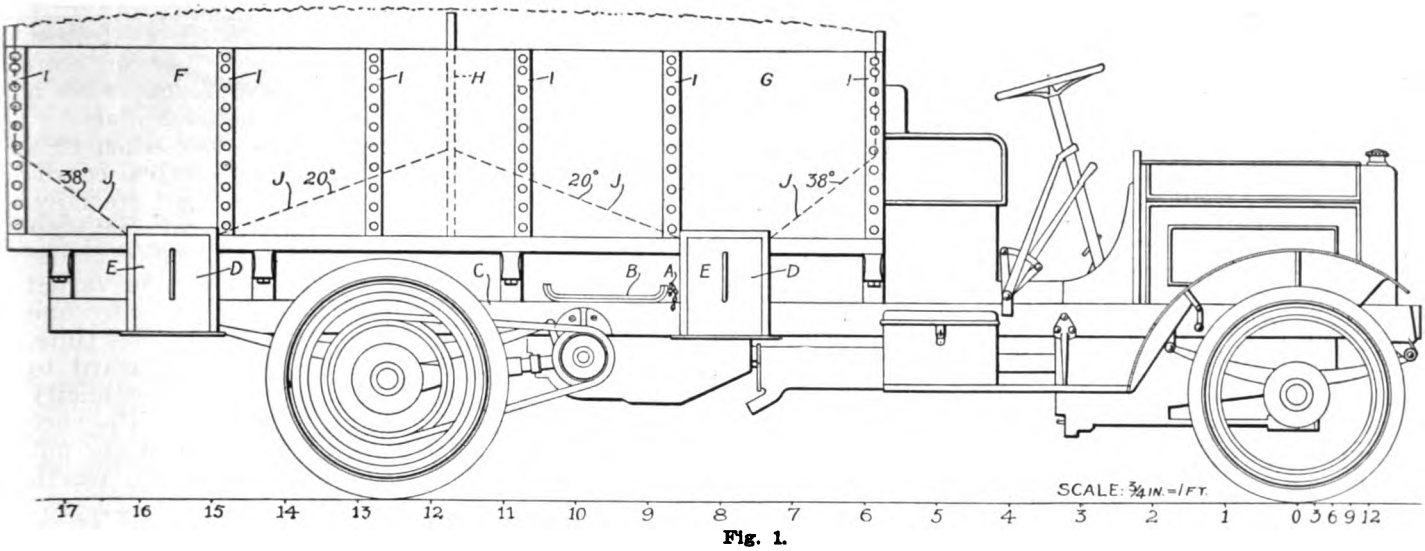


Fig. 1.

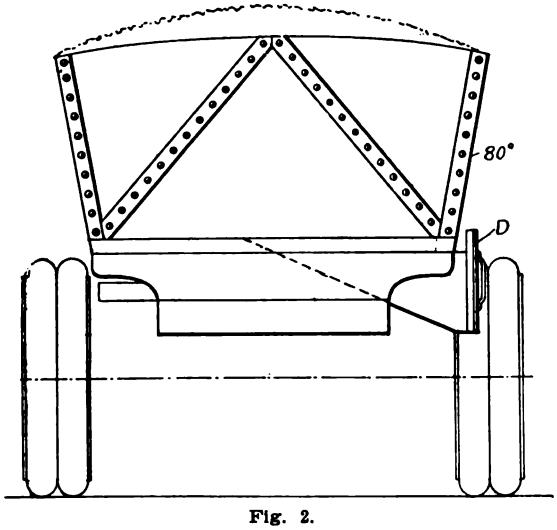


Fig. 2.

Evidence of Under-Inflation.

When new tires fail early in life and have to be sent back, either under guarantee or to be retreaded, the maker frequently puts the blame upon the user and accuses him of under-inflation. The user generally believes that the tire maker is bluffing him, and endeavoring to get out of his guarantee. He does not realize that the tire maker can tell for an absolute certainty whether a tire has been run under-inflated or not. There is no reason why the user himself should not be able to tell on inspection of his covers whether his tires have been under-inflated. It is simply a matter of feeling the cover when taken off. A new cover, or a cover which has been properly inflated and of a correct size, will always have a feeling of liveliness about the walls when it is bent or worked with the fingers. The first thing which under-inflation does to a tire is to cause the layers of the canvas in the fabric to separate or lose their adhesion to each other to a certain extent, with the result that they become "dead" and have a feeling which is quite different from that of a new cover.

Home vulcanizing is quite a nice hobby for the careful motorist to cultivate and it saves money.

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An Important Court Decision.

A new and interesting ruling has just been made in the Court of Common Pleas of Cuyahoga County, Ohio, as to the liability of a garage owner because of injury to persons while being driven in their own cars by a driver furnished such persons for hire by the garage owner.

The case was that of Jones against The Baker Motor Vehicle Company, and it appeared from the evidence that Mrs. Jones was the owner of a car which was kept by the Baker Company in its garage as a "boarder" and that upon her call the Baker Company would furnish her a driver at a fixed charge per hour, and that these drivers were instructed by the Baker Company to drive "as directed by the owner" while out with the car. It appeared further that while an employe of the Baker Company was driving Mrs. Jones one evening, about dark, and through a drizzling rain, the car ran into a dirt wagon standing by the roadside, without any lantern on it. Mrs. Jones, who had been riding backward, in the front seat of the machine, claimed to have been injured as the result of this collision. The court charged the jury that, as a matter of law, the driver of the car was, at the time of the accident, the agent and servant of the Baker Company and that if the company had not exercised due care in selecting a careful driver, or if the driver was negligent and his negligence caused the accident, the company was liable. This ruling of the court is probably the first of its particular kind and if sustained by the higher courts means, as a practical matter, that a garage owner or other person who supplies drivers to the owners of cars, in the manner above described, is absolutely liable not only to the owner of the car but to third parties as well who may be injured through the carelessness of the driver.

Tire Repair.

From C. H. Kenyon, Connecticut.—I wish to give those interested an idea of what may be done with

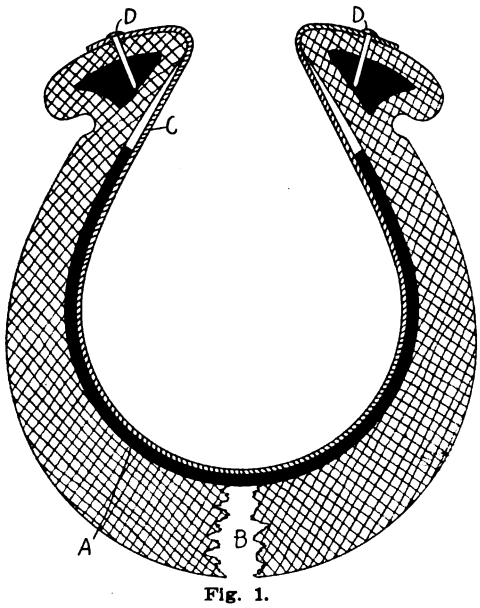


Fig. 1.

an old tire shoe, as shown in the picture. This tire was run over 1,000 miles after my patch began to touch the road. You can count the layers of fabric as seen in the snapshot and the tire is still in use. Now this is my secret—if it is one: This first layer, A, Fig. 1, is composed of an old inner tube split open and long enough to extend 5 or 6 inches each side of the blowout. Next is a piece of the heavy sail canvas or other strong fabric. Then fasten it with the aid of a few small carpet tacks, put in about 2 inches apart, to hold the fabric from being forced through the blowout hole. You will then get the

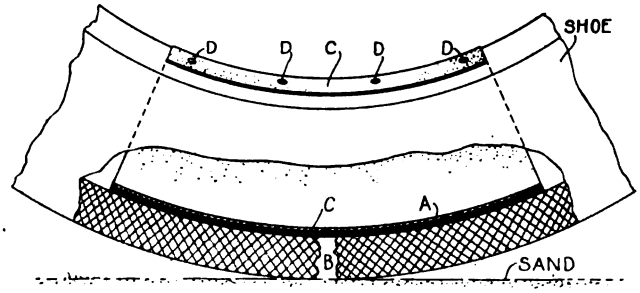


Fig. 2.

results as shown in Fig. 2. It is hoped that the drawings will indicate what may be done and the result.

Temporary Tire Repair.

The writer once found himself stranded over a hundred miles from home with the spare tire burst. No gaiter or special patch was at hand, and the expedient of folding a piece of rag four times and then placing it between the tube and the weak part of the cover was tried, merely to enable the next town to be reached. It held so well that the car was run the whole way home, but a subsequent examination of the tire and its contents showed that the repair would not have held up very much longer. Naturally, no high speeds were indulged in on the way home.

License Plate Colors.

In the March number it was stated that the license number plate for the State of New York was colored red on white. This was incorrect. This year it is black on yellow.

Due to the War.

The Paris correspondent of the New York Evening Post says that English and French army orders already placed in the United States for automobile trucks amount to upward of $30,000,000.

Protected Wiring.

The wiring of a motor car requires the best possible protection. As a rule the wires should be well insulated and be carried in copper tubes that are impervious to oil and water.

Clutch Action.

The "take-hold" of a multiple disc clutch depends largely upon the relative speed of the two surfaces. Where the difference in speed is great there is poor action and great wear. Thin oils favor quick seizure and heavy oils make action slower.

When the steering column wabbles you must not expect to get quick response to your efforts to guide the car. Some manufacturers brace the steering column to the cowl to make it firm.

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MOTOR TRUCKS.

Their Cost, Care, Maintenance, and How to Get the Most from Them.

By J. L. Black of the Motor Truck Club of New Jersey.—There has been entrusted to a committee, of which I have the honor to have been appointed chairman, the preparation of a paper upon the care and maintenance of motor trucks. These are matters of great interest and importance to all users of motor trucks, and as one having the direct care and upkeep of a fairly large fleet of various makes, I can say that while there are some few fixed rules which must be followed to secure even the semblance of results, there are individual problems to be overcome in the case of each one of us. It is probable that in the main our problems are much the same; it is also likely that that which becomes one man's big trouble is of lesser moment than something else to his neighbor. We will therefore endeavor to look at the question in the light of our own experiences. While this paper hardly begins to cover all the points we might gather under the headings of care and maintenance, still if it will start questions and action in the proper direction, the committee will feel that some good has been accomplished. We therefore cordially invite your criticism and questions.

Lubrication, possibly, is the most important point; certainly it applies to all, although some owners have been particularly fortunate in having secured a man to drive or take care of the truck who was first trustworthy, and secondly competent. Trustworthy first, because upon being instructed he could be depended upon to perform his duty thereafter. There can be no valid excuse made where any motor truck fails to perform its work through lack of proper lubrication of all its parts. There are few if any trucks now built, which, when adapted to the work and properly cared for, will not be highly efficient in results.

All motor truck builders now place particular stress upon, and direct owners' and drivers' attention to, the proper lubrication of trucks—in fact, some have very elaborate charts illustrating points to be taken care of and how. Of course, in the case of those who have purchased these particular trucks, little need be said, as these instructions are based on the experience of those who know them intimately. I might call your attention, however, to the necessity of a regular changing of the oil in the crank case of your motors. This is because all oils in use in internal combustion motors lose considerable of their lubrication qualities, and also in time become impregnated with minute particles of metal and dirt; they also become carbonized to a greater or less extent. The mere addition of fresh oil continuously will not answer; this practice but puts off the day of reckoning.

While in most instances trucks receive more or less intelligent and careful lubrication of motors because drivers quickly learn that no oil, no work from motor, it is to be regretted that such is not the case with the balance of chassis. This is due to several causes, the first and principal one being negligence; the second, ignorance; the third, indifference; the fourth, which we fear is more prevalent than is commonly known, is lack of sufficient time daily being allowed the driver to properly do so.

Taking up the first reason: The indolent driver soon finds out that his truck will stand an enormous amount of abuse, and thereupon decides that the lubricating will do some other time—or something to that effect. This man, it is to be hoped, is soon found out and excused from further troubling. The second reason, ignorance, is a condition which of course will always be more or less with us, but can be more easily overcome than any other. Third, indifference: This, like the first, will soon show for itself in more ways than one, and can be overcome in various ways. The fourth, lack of time, is, we believe, a serious one. It involves a great many phases which we have not now the time to go into in detail. I would like to say, however, that careful and systematic lubrication of all chassis parts—some of which are unfortunately quite inaccessible—will well repay any truck operator or owner in the added dependability of his truck and the decreased cost of maintenance.

As an illustration of the truth of the above, I wish to show you some interesting figures taken from our own records. They are of three cars of a well known make which have done substantially the same work and mileage:

	No. 1	No. 2	No. 3
Gas	.0463	.0527	.0367
Oil	.00248	.00373	.00231
Repairs	.0293	.0315	.01384
Tires	.0538	.0532	.0523
	.13188	.14113	.10515

In the case of the driver of the No. 3, who is a very conscientious and methodical man, you will note his running expense per mile is consistently lower for all items. And it is of great importance to emphasize the fact that when his machine was taken down for a general overhaul, it required less than half the replacement of parts due to wear than was the case with either No. 1 or No. 2.

We might divide the maintenance question into two classes: Large fleet owners and the individual owner or those who have a single truck or up to perhaps half a dozen. In the case of the large fleet, there can be no doubt that same should be put into the hands of a competent man and cared for largely upon the owner's premises. The smaller installations cannot afford the overhead expense, as a rule, involved to do this, therefore must depend upon the drivers to a very great extent, and upon such service stations as the agent of their truck maintains. This works out very well in a great many cases, but in others the combination of indifferent drivers and poor service stations has probably produced more discouraged and disgusted owners than any other cause.

I believe that the spirit of our organization is to eliminate as far as possible these conditions—in the case of the driver, to instruct, and in the service matter to have a get-together feeling and help each other in our problems.

At present it is appropriate, I think, to mention the system now in use by me, and which I believe is followed in general by a number of others. It involves a careful inspection of the truck upon its return to the garage after each day's work; also a written and signed report of driver of any deviation from the normal condition of the car as noticed by him during the day, and immediate correction of faults, if any, on the principle that "a stitch in time saves nine." The car is also washed thoroughly at

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least once a week. In addition to this, there is a thorough overhauling and painting after about 15,000 miles, this distance seeming to work out very well in a number of cases coming under my notice. I wish here to read you a clipping taken from one of the trade papers which bears upon this subject:

"Bought in 1904, seven in February and the rest the same year, a fleet of eighteen single-cylinder air-cooled Knox commercial vehicles owned and operated by the Motor Transportation Co., Chicago, Ill. Was the first to be used in the Windy City, and all are running to-day in their regular service to the complete satisfaction of their users.

"The Motor Transportation Co., as its name implies, is a concern whose business is the maintenance of motor trucks. Fifteen of the eighteen Knox trucks are used by Fuller & Fuller, wholesale druggists, one more is used by Clarence Hirschorn & Co., wholesale cigar dealers, and the other two are retained as spare vehicles by the owning comapny.

"The company states that it would not trade these veterans, old and dilapidated as they are, for as many spick-and-span 1915 models of any make. They are over ten years old, but the Motor Transportation Co. states that they are good for ten years more. The secret of durability, as this firm has learned, is constant care, not continual repairs. By taking a stitch in time, the proverbial nine saved makes the difference between high depreciation and continuous efficiency.

"The Fuller & Fuller trucks make from 40 to 60 miles a day, 6 days a week, those on suburban runs going out as far as 20 miles from the city.

"* * * * Each of these trucks, when it returns to the garage at night is given a thorough inspection, such work as is necessaary being done at night, and the bigger jobs on Sundays."

It is not amiss at this point to touch upon the matter of cost keeping or records. It is likely that a large proportion of those owning and operating motor trucks do not keep any sort of systematic records of the performance of their vehicles, as evidenced by observing the great many trucks on the road which are obviously not paying their owners because of their poor condition and also the manner in which they are being handled—or, I should say, perhaps—loaded and routed. It is probable that this matter will form the basis of some future paper in our club.

We are all of us interested, of course, in tires. I wonder how many of you, after purchasing your trucks and having worn out your first tire—usually far short of the guaranteed mileage—have had your tire man tell you that your tires would not give you mileage as they were not large enough to do so, even though they were sold to the manufacturer of your car originally to carry no more than you load upon your truck, and, after being convinced that he was right and putting on the next larger size, have found that at about the same mileage, or only slightly more, that it also was worn out. I might say this has been somewhat the experience I have been through.

I observed early some peculiar results, which have apparently attracted the attention of tire manufacturers recently, namely: In our service we had a number of different makes and styles of tires performing practically the same work and under the same conditions, the mileages, however, being at a great variance. One make was of a high, rounded section; others of flat, wide section. Our experience has been that we received always a very great many more miles for the high, rounded tire than we received for the others. Also, I noted that our maintenance expense upon such parts of truck as were subject to road vibration was very much less in case of the high, rounded tire. The above does not seem to have depended so much on the make of the tire as on the form. In the past few months we have had occasion to change the flat form as made by one company to the rounded high type manufactured by the same concern, and have been able to secure the same results as before mentioned.

In connection with the tires, I should like to call your attention to the figures before mentioned, as showing the results of careful handling of cars on the road, illustrating the advantage of having the proper man on the truck.

In conclusion, the matter of proper housing or garaging of trucks is one which is of no little concern to many owners. There can be no doubt that it deserves the careful consideration of all. The garage should, if possible, be light and provided with means of heating in Winter, these points tending to induce the driver to take better care of the machine; also in Winter a car kept in a warmed garage is much easier to start. The garage or place where the car is stored should in all cases be provided with means for washing car. It is surprising how many bolts, nuts, etc., requiring attention show up after an accumulation of dirt has been removed; besides it certainly does not detract from the appearance of the truck.

I believe that most of us realize that our trucks, aside from their utility, are one of the best advertisements we have.

A BIG SPARK.

Why an English Expert Claims Its Advantage Is a Fallacy.

From "Veritas," London.—There are some fallacies, relative to motoring topics, that are very hard to kill; perhaps it is that they always elude the knock-out blow. The season of the year may also have something to do with it, as the writer has observed that they mostly "bloom in the spring"—to quote the words of a well-known comic opera. Be this as it may, our old friend, the "Big Spark" fallacy, has just appeared above ground, and its claims are being carefully considered by an interested group of fallacy enthusiasts, armed with magnifying glasses of the "why not" type. Thus, they contend, if the size of spark now used, viz., one that jumps a 1-50 in. gap under compression, be increased so that it can jump ¼ in., this should solve starting problems and give a more rapid ignition, quicker combustion and more power—why not?

The enthusiasts further ask whether it would be beyond the range of electrical science to intensify the magneto spark. A vast amount of scientific research has actually been done on this "big," or, as some prefer to call it, "fat" spark theory, and it has been conclusively shown that increasing the amount of energy in the spark beyond a certain well-defined limit does not effect anything; hence it is that the present-day standard spark is found to fulfil all requirements. True a large engine will have or should have, a more powerful magneto than

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a small engine, though a small magneto would run it; but it would probably be difficult to start up on it. The large engine is so much more difficult to swing, and thus the small magneto would not have a chance of generating a strong enough initial spark.

If there ever had been anything in the "big" spark theory, low tension magneto would never have been discarded despite the mechanical defects of the make-and-break sparking plug necessary with that system. These would undoubtedly have been remedied if the spark itself had any particular virtue compared with the present-day high-tension or "jump" spark. The low-tension magneto spark has all the characteristics that the "big" spark enthusiasts require, such as great heat, volume and density. The maximum break is something between ⅛ in. and ¼ in., according to the size of the magneto. There is no doubt whatever that when in normally good order the old low-tension system was a very good starter, because the break of the circuit was practically constant at any speed, and this always ensured a voluminous spark.

Provided that the spark can jump the gap of the plug instantly under the full compression, it will start the ignition of the mixture. It is nevertheless often overlooked that the function of the spark is only to start the combustion. The propagation and completion of the combustion depend on factors entirely different in characteristics from the spark. Thus, there is the strength of the mixture, the degree of compression and consequent heating of the mixture (the hotter the mixture the more quickly it ignites); then of great importance is the state of turbulence of the charge. For several good, practical reasons the charge cannot be fired at the theoretically best position, viz., in the center, and thus spread the ignition uniformly through the mass, but it is ignited at the edge, and the flame has to travel from the edge right through the mass. This disadvantage can, to a large extent, be remedied by making use of more spark energy in the correct way, i. e., not as one big spark, but as two or more sparks occurring at different positions and perfectly synchronized or timed. Unless perfection in this factor is obtained, the extra sparks are wasted, because the combustion of the gas has already been accomplished by one of the sparks, but at a slower rate than would have occurred with several sparks.

It may be asked why, if two or more ignitions are an undoubted advantage from the point of view of an increase of power and ease of starting, the principle is not generally adopted? The answer is simply that it complicates the ignition system, and, furthermore, the engine must be designed to take the extra sparking plugs, and, therefore, the advantage can only be obtained at an unwarranted extra cost. It may, in some few instances, be found that double ignition can be improvised by fitting an extra "series" type of plug over the inlet valve—not over the exhaust valve—but the instances where real advantage is obtained by such improvisation can at best be very few.

Light cars will have more chassis and body vibration than heavy ones. Soft shock absorbers are therefore more important for light cars than heavy ones. Rattling loose of bolts is more frequent in light cars than in heavy ones. Greater precaution against this is needed in light cars than in heavy ones.

Hot Weather Hints.

From the Chalmers Clubman.—For comfort on long tours, leave the top up. If you would cut down tire expense, watch the inflation. Keep the pressure at the number of pounds indicated on each tire.

Inspect the amount of water in the radiator daily. Keep it filled within an inch and one-half of the bottom of the filler neck.

Lubrication reduces wear. See that all working parts are supplied with an abundance of high grade oil and greases. Hot weather shortens the life of lubricants, hence frequent attention is necessary. Use medium oil in the motor.

Watch the spring clips. They must be kept tight. A spring cannot break in the center if the clips are kept tight.

Remember that you use your car more in the summer than in the winter and all adjustments should have correspondingly more attention. The use of a wrench in time saves repair bills.

Evaporation is more rapid in summer, hence distilled water should be put in the battery at least once a week, in accordance with instructions.

Always keep tools and a jack in your car. If you do not need them yourself, you may have occasion to loan them to some friend who has forgotten his.

Think of the man behind you when driving along a dusty road. Courtesy is not misplaced in a driving code.

When meeting another car at night, dim your headlights first. The other man will follow suit. This precaution may avert a serious accident.

Do not touch any adjustments or tamper with any parts until you know exactly what caused the trouble. Otherwise you may get everything out of adjustment. When in doubt, don't do anything. Sit down and analyze the problem.

Motor Truck Hauls 375 Sheep.

One truck hauled a flock of 375 sheep five miles into Charlotte, Mich., recently. The sheep were driven into crates on the truck and on six trailers. As the sheep weighed 15 tons and each wagon 1,500 pounds, the entire weight of the haul was over 20 tons. Several hills along the road were negotiated without difficulty.

Care of Springs.

Few people realize how much improvement in riding quality may be secured by lubricating the friction surfaces of the spring leaves. At least once each season the leaves should be taken apart and polished, and lubricated with graphite grease.

Retard Your Spark.

Even though you are sure that you can start your motor with the spark advanced without breaking your arm, it is not proper to do so. The thrust backward of an advanced explosion has a tendency to injure the motor.

Balky Starter.

When the starting motor stalls easily, and fails to spin the crankshaft as it should, you may be sure that either the liquid in your storage battery does not test up to 1275, or else the contact points of the line switch are not making good contact.

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AUTOMOBILE VARNISHING.

It Brings a Good Profit When Done Properly and if Not Rushed.

From the Carriage Monthly.—Probably no class of automobile work brings a better profit than the touch-up and varnish job. There shouldn't be much unhanging; very little, in fact, beyond slipping off the wheels. Some painters do not even go to that trouble, although, for our part, we could never see any good excuse for squirming and twisting about these parts with a paint or varnish brush.

With the car jacked up sufficiently to let the wheels roll clear of the floor we are ready to begin work, which we do by removing all the loose interior furnishings, side curtains, mats, carpets, etc. Detachable lamps and a few other small fixtures may, of course, come off. Before rubbing the varnish proceed to match up a sufficient quantity of color, or colors, with that on the car. A better match can be made with the original color under gloss effect than with this same color under a dull effect. In mixing don't forget that sufficient varnish to make the color stand forth with some luster is advisable. In drying it then undergoes no change.

Rub the old finish simply enough to lay down the shimmer, and brush away whatever nibs and bits of dirt may lay embedded in the varnish. Perform a similar service for the chassis, only instead of using pumice stone flour and water rub with a handful of curled hair obtained from the trim shop. Before going over the chassis, however, these parts should be cleaned of all grease, oil, dirt and whatever other accumulations may be found. Not a pleasant job, and about the biggest one connected with this class of work.

Ordinary crude oil, one part, and turpentine, two parts, make a good softening up medium. Put the mixture on as soon as the car arrives. This will help to start the hard, adhesive grease and grit, so that by using scraping knives and wiping off often with coarse rags or burlap the work will be completed in due time.

Following the light rub all over, wash the car with clean water and dry off with the wash leather. Make use of a good wash or tooling brush to get sediment, pumice stone particles, etc., from molding crevices, doors and other parts beyond the effective reach of sponge or chamois skin.

Next proceed with the touching up. Touch only the spots in real need of color. Confine the color to the precise lines of the mar or bruise, use it sparingly, and avoid rough, thick edges. Over touching, in case the color is not a perfect match, makes a bad mess, and one impossible to remedy except by coloring the car over entirely.

After touching up, take the top in hand and apply to it any needed processes. If any dressing or renovating medium is applied use it sparingly. The good leather top will scarcely require more than a clean sponging off with tepid water with a few parings of castile soap beaten into it. Bows and joints need inspection and finishing if worn and shabby. Perhaps the lamps will need a coat of varnish-color to fetch them up to the standard of the other parts. Paint the radiator a thin coat of asphaltum or brush it over with some one of the bronze mediums. Now give the car a final wash-up with clean water and a kit of tools specially kept for this work.

This work means, in large part, success or failure for the finisher. The work cannot possibly be done too thoroughly. An hour of extra work devoted to washing and cleaning the car may mean $100 worth of advertising by a supremely satisfied customer.

First finish the upper panels, then the lower ones, then the bonnet or hood, next the chassis, which includes the fenders, etc.

During a rush of work, when demands prevail for immediate delivery, a medium hard-drying varnish capable of resisting, without spotting, the action of road accumulations is to be preferred. On the whole, it means more satisfaction to all concerned.

PRESSED STEEL WHEELS.

How They Compare With Wood or Wire for Pleasure Cars.

By O. A. Parker, Hydraulic Pressed Steel Co., Cleveland.—The idea of making an automobile wheel out of pressed steel is not new. More than ten years ago such wheels were manufactured and thousands of them were used as equipment on cars of American make. These wheels were assembled with the hub and the rim, in the same manner as an ordinary wooden wheel, each part of the wood wheel having been duplicated in the form of hollow metal, and the whole held together by riveting and brazing.

Recently the pressed steel wheel has come into considerable use abroad. Steel wheels are to be found on 26 per cent. of the models of cars on the British market, wire having 25¼ per cent. and wood 48½ per cent. In England there are being manufactured at least three well-known types of pressed steel wheel. In the first type the complete wheel is formed in halves, rim, felloe and spokes being formed together and the halves joined at the median line by oxy-acetylene welding. To form each half of the rim, felloe and spokes in one piece in this fashion requires a large number of dies. The steel is annealed many times, and in addition to dies, rolls are required to aid in forming the rim. There is about 36 linear feet of hand-welding in each wheel. With the second type of wheel ordinary tire-carrying rims are used, the felloe and spokes being formed in halves, gas welded at the middle line, and the rim secured to the wheel by means of two circumferential welds, one on either side where the hollow felloe joins the rim. This wheel requires about 43 linear feet of hand-welding. The third type of wheel is assembled in very much the same fashion as the American wheel of early manufacture. Each spoke is made separately in halves and welded down each side. The spokes are then welded to the ordinary tire-carrying rim and placed under compression by means of an expanding mandrel in the center of the wheel, while two side-plates of pressed steel are applied. These side-plates are formed so as to cover each spoke half way around and form the web between spokes at the hub. The best-known wheel of German manufacture is made in halves, without any felloe and welded at the center line. A socket is welded to the end of each spoke and the ordinary tire-carrying rim shrunk or pressed on and attached to the sockets by means of welding or riveting.

Practically all of the pressed steel wheels manufactured abroad have the tire-carrying rim made integral with the wheel, and the wheel is, therefore, made demountable at the hub. This requires special hub fittings and also necessitates carrying spare wheels.

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It is at once apparent that a pressed steel wheel can be made of almost any required degree of strength by simply varying the thickness of the steel from which the wheel is made. It has been the object to so design these wheels in all sizes that there would be a reasonable margin of strength over that of the average wood wheel of the same size. It is possible to do this and at the same time afford a considerable saving in weight.

During the last four months over sixty wheel tests—about equally divided between steel and wood—were made by the Case School of Applied Science, Cleveland, Ohio, under the personal direction of Professor R. H. Danforth. These tests resulted in such a large amount of data that only average results can be given here. The tests were chiefly of two kinds—rim pull, in which the wheel was mounted upon a rigid spindle and the load applied to the rim at one point in a direction parallel to the axis of the wheel, and center pull, in which the wheel was laid upon a rigid ring and the load applied axially at the hub. All of the steel wheels tested were selected at random from stock and all of the wood wheels were brand new.

36 x 4½ pressed steel wheels with internal clips, weighing, without hub or tire-carrying rim, on the average 21 pounds, were tested in comparison with three different types of 36 x 4½ wood wheels with demountable rims, which weighed, without hub and rim, on the average 29 pounds 7 ounces, the wood averaging 13 pounds 9 ounces, and the metal parts 15 pounds 14 ounces. Under the center pull test the ultimate strength of this size of steel wheel averaged slightly greater than that of the wood wheels of the same size. At 10,000 pounds load the average deflection of the steel wheels was .165", and the permanent set, on the average, .050". After loading to 11,000 pounds and over the average permanent set was .089". The average deflection of the wood wheels at 9,000 pounds was .557".

34 x 4 pressed steel wheels, with external clips weighing, without hub or rim, on the average 15 pounds 10 ounces, showed about the same ultimate strength as the larger 36 x 4½ wood wheels, although averaging 13 pounds 13 ounces lighter per wheel, the average deflection at 8,000 pounds being .261", and the permanent set .140".

30 x 3½ pressed steel wheels without hub or rim, averaged 9 pounds 2 ounces in weight. Three well-known makes of wood wheel, of the same size, equipped with demountable rims, weighed without hub or rim, on the average 17 pounds 1 ounce; the wood averaging 7 pounds 5 ounces and the metal parts 9 pounds 12 ounces.

Careful comparisons by both the rim and center tests were made between 30 x 3½ steel wheels and new 30 x 3½ wood wheels removed from the rear of new Ford cars, twelve Ford wheels being obtained in New York and twelve in Detroit. In the rim tests the steel wheels were slightly stronger than the wood, each averaging about 2,000 pounds, but the steel wheels, at 1,000 pounds load, deflected only 80 per cent. as much as the wood wheels. In twenty center pull tests of the same size of wheels supported slightly over 5,000 pounds, on the average; twelve wood wheels averaging about 6 per cent. less. The steel wheels at 4,000 pounds load showed an average deflection of .137", and at 4,500 pounds .180", while the wood wheels for the same loads deflected .388" and .493" respectively.

Although the wood wheels were new, with the paint and varnish fresh, and not dried out, in each test spokes broke and in most cases the felloe split. It was found that the strength of the wood wheel depended very largely upon the strength of the flanges at the hub. With ordinary flanges there was a decided dishing, which dishing continued to a lesser degree on later tests when two, three and even four flanges were placed on each side of the wheel. When cast-steel flanges were used the bolts broke and larger bolts were substituted. On the other hand, when steel wheels were tested there was very little dishing of the flanges even when only single or double flanges were used. Under extreme loads the steel wheels only bent, and all of the steel wheels tested, with two or three exceptions, were straightened and used.

In order to determine what effect bending and straightening have upon the strength of the pressed steel wheel, a 30 x 3½ wheel was given seven successive center pulls. Each time the wheel was turned over and the pull given from the opposite side. In each case the load was run up to 5,000 pounds or higher. The deflection measured under maximum load on the successive pulls were .225", .227", .724", .582", .958", .936" and .892". The deflection on the seventh pull was taken at 6,500 pounds and the load was then run up to 6,790 pounds.

A number of tests was made to determine the effect of the tightness of the rim on the lateral stability of both steel and wood wheels. These tests are not yet completed, but they seem to indicate that rim tension greater than that required for holding the joints tight is a detriment rather than an advantage, as it seems to start an incipient buckle in the spokes, which causes early serious deflection. Special fittings were made of heat-treated tool steel with knife edges. The load was applied and measured in a testing machine and the entire load then taken off by tightening the two bolts. Each test was made in duplicate up to the maximum possible with the apparatus shown which was about 9,000 pounds.

It is shown by these tests that it is possible to make a pressed steel wheel weighing only 53 per cent. as much as the usual wood wheel and its metal parts, and yet slightly stronger. This is accomplished by a design of wheel in which a large part of the metal is supplying useful strength and very little material is used inefficiently. The tests also show that a pressed steel wheel of this design weighing as much as the usual wood wheel with its metal parts, would have between two and three times the strength. Not only does this design reduce the amount of welding to about 12 feet per wheel, but it also makes possible electric welding by machine.

Other advantages of this design of wheel are the ease with which the individual spokes can be straightened in case of accident, economical and durable baked-on finish, and increased tire mileage on account of light weight and the ability of metal to radiate the heat of the tire.

The economies in manufacturing this type of pressed steel wheel are such that in quantities the prices permit of competition with wood wheels with demountable rims in the small sizes, and are lower in the larger sizes.

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NEW AND INTERESTING THINGS IN MOTORDOM

Lubrication

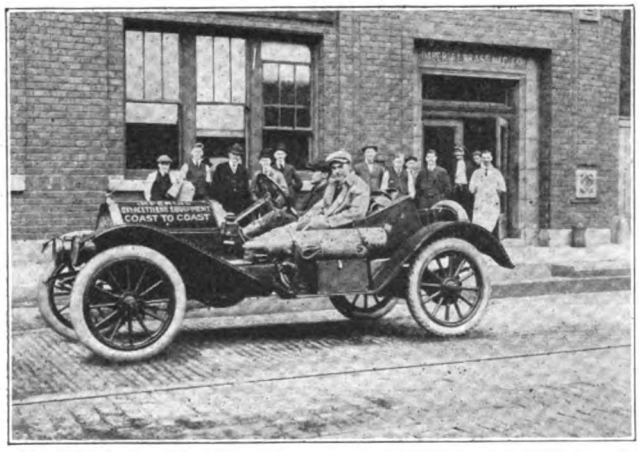
Lubrication of Driving Chains.

Experience has shown that the heavy driving chains of motor cars require internal as well as external lubrication to best withstand the peculiar conditons of exposure, pressure, stress and strain to which they are subjected. A good way to secure this thorough lubrication is to first thoroughly clean the chains with gasoline or kerosene and then boil them for about 20 minutes in a bath of Dixon's Motor Chain Compound. This gives ample time for the compound to penetrate to the pins. The chains are then dipped in cold water to set the lubricant, and allowed to dry. This procedure provides for every part of the chains a friction reducing coating. It has been found that chains so treated not only resist rust and wear, but last from two to three times the life of the ordinary chain.

Garage and Repair Shop

A Novel Trip.

Rather an unusual departure from the ordinary selling plan has been recently adopted and put into effect by The Imperial Brass Mfg. Co., Chicago. Recently two of their expert oxy-acetylene welding and cutting engineers started in an automobile on a "Coast to Coast" trip. The auto carries a complete Imperial welding and cutting equipment as well as supplies, and practical demonstrations of its safety and efficiency are being made in various garages and manufacturing plants in all cities along the route. Reports of their progress indicate that the trip is proving to be a big success from all standpoints, and that great interest is being displayed by all who witness the demonstrations. A most interesting feature of this "Coast to Coast" trip is the fact that these representatives have often dropped into a plant just at the vital moment when an important machine broke down, and in an extremely short time the incapacitated apparatus was put in perfect running order, in a number of instances saving for the manufacturer in time, labor and delay enough to pay for several Imperial outfits. Of course, no charge of any nature was made for this service, the demonstration merely serving as an illustration of the extraordinary and timely use for this equipment.



From Coast to Coast.

Saves Much Gasoline.

One owner of a Ford car recently, by using the Economy Gasoline Improver, manufactured by the Inst Lighter Company, of Columbus, Ohio, drove his Ford car 97 miles on three gallons of ordinary gasoline. This device uses waste heat from the surface of the exhaust pipe to heat the gasoline in the gasoline pipe before it enters the carburetor, greatly increasing the power, improving the running of the engine, decreasing the deposit of carbon and permitting a saving of about one-third of your gasoline. With this device on your car you can turn off the flow of gasoline to the carburetor one-third after the engine is warmed up, and still get full efficiency.

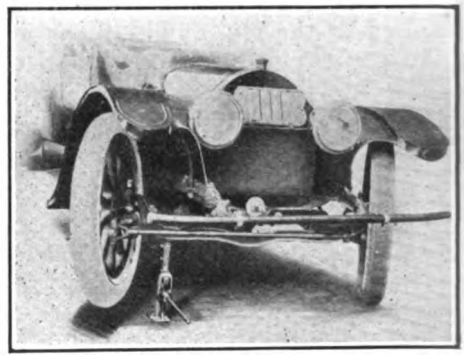
Portable Garage Pumps.

The model P4-ST is one of the latest models of portable garage pumps. The well known Lipman all metal four cylinder air pump model 44 is used, driven by General Electric Motor ¼ H. P. size. A gear drive is used. A fabroil pinion is used on the motor to make the drive noiseless. The gears are totally enclosed in an oil tight case which is partially filled with graphite grease. A seamless steel tank is furnished with this outfit. The tank is large enough to inflate five or six tires of average size from flat to full pressure. These outfits are provided with a patent pressure relief device which permits a much smaller size motor being used than would ordinarily be required. The pumping unit and tank are mounted on a substantial truck. Pressure gauge is furnished to show the pressure in the tank and there is also a pressure gauge in the hose line for reading the pressure in the tire.

Belt-driven pump model 44 comprises one of the well known Lipman all metal four-cylinder air pumps mounted on an iron sub-base. A positive clutch is placed between the other end of the shaft and the pump. By having a separate shaft mounted in substantial bearings, none of the strain from the belt drive is transmitted to the pump bearings, drive from the belt-driven shaft to the pump shaft being direct. This outfit is specially designed for small garages that are already supplied with power. Pump can be mounted on a shelf or on the floor and driven from line shaft. These pumps, which are illustrated herewith, are made by the Lipman Air Appliance Co., Beloit, Wis.

An Efficient Automobile Jack.

An automobile jack that does perfect work in any position, whether a car is stopped on a hill, in the mud, or in a rut, is usually an admirable device to carry with the car. Incidentally this jack won a gold medal from the American Museum of Safety and has a range of lifts that is all that can be desired for any occasion. It is made in four sizes and has a capacity of from ½ ton to 3 tons. It is called the Simplex jack and is manufactured by the Templeton, Kenly & Co., Ltd., 1005 South Central Ave., Chicago, Ill.



An Efficient Automobile Jack.

A Strong Accessory Line.

The sole distribution for the United States of the well known Angier's line of motor car accessories manufactured at Streator, Ill., has been taken over by a new company called the G & S Sales Company of the same city. This company is headed by H. V. Garvey, late of the Streator Motor Car Company and of the Spaulding Auto Company, of Aberdeen, S. D., and by J. E. Sweet, late of the Singer Sewing Machine Company and of The Excelsior Mfg. and Sales Company. The Angier specialties include the following accessories for the Ford car: Spare demountable wheel, spring radius rods, straight rear axles, radiator cradles, felt washers, fan belts and "Kant Kum Off" fan belt holder. The G & S Sales Company will cover the United States thoroughly with a chain of strong agencies.

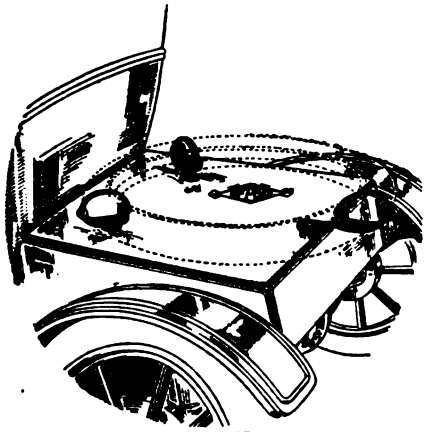
A New Valve Repair Tool.

The well known firm of A. Schrader's Sons, Inc., 783 Atlantic Avenue, Brooklyn, N. Y., are now making the Schrader's universal valve tool. It is noted for the quick and proper repair of tire valves, but is adaptable for removing valves, for rethreading damaged caps, for rethreading the inside thread and for reaming out a damaged cap seat. The price is nominal and is sold to the trade in dozen lots.

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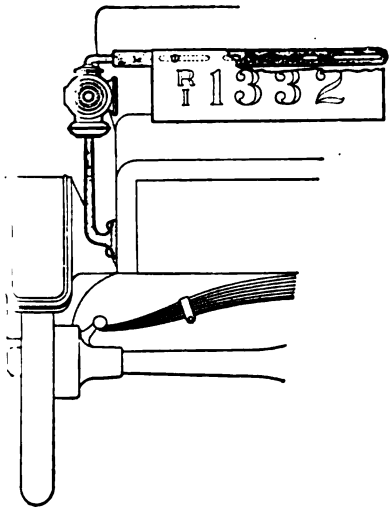
Various Automobile Accessories.

Illustrated herewith are three automobile accessories manufactured by the



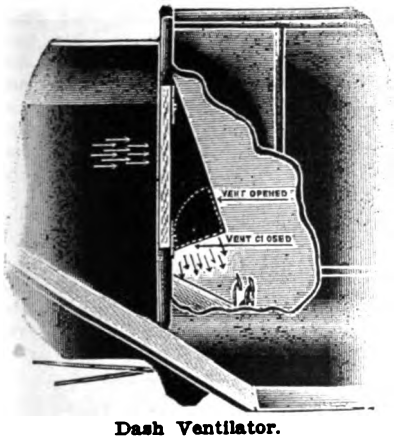
Lock Tire Holder.

Unique Findings and Supply Co., Providence, R. I. One is a lock tire holder which makes security absolute and is



Lamp and License Bracket.

guaranteed to prevent theft; another is a specially designed lamp and license plate bracket, and the last is a dash



Dash Ventilator.

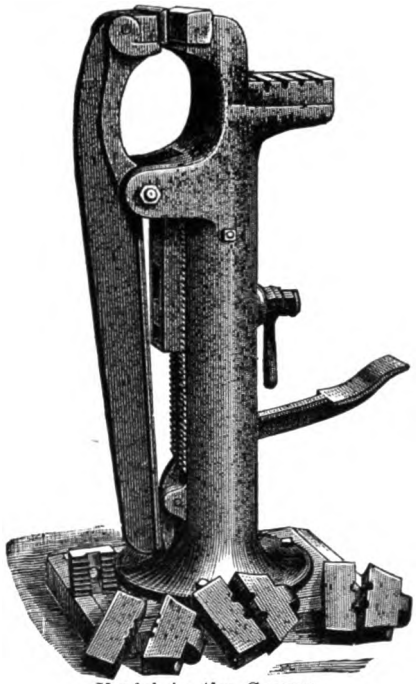
ventilator. The illustrations will give a good idea of the appearance of these devices but if further information is desired it will be cheerfully given by addressing the firm as above.

A Useful Sponge.

The old saying that there is "nothing new under the sun" will not apply in the case of a new sponge, which is made of lamb's wool, for the outer casing, and is guaranteed to give longer wear and not to scratch the surface of the car in the slightest degree. It is easy to handle and used dry it serves as an efficient polisher. It is made by the Perfolam Sponge Company, 1304 East 20th Street, Cleveland, Ohio.

A Superior Vise.

B. B. Noyes & Co., Greenfield, Mass., make a foot vise and bolt holder which



Useful in the Garage.

is conveniently adjustable, simple, strong, solid and durable. The price seems to be low considering the construction of the machine and garage owners or repairmen are advised to send to the firm at the address given to learn full particulars.

Iron Cement.

A new iron cement is on the market, which is used in combination with Portland cement, for waterproofing all kinds of brick or concrete construction. It is called Smooth-On Iron Cement. It is a hydraulic chemical iron cement and is sold in powder form. It can easily be applied by any contractor and ought to be extensively used in garage construction. It is manufactured by the Smooth-On Manufacturing Co., Jersey City, N. J.

A Powerful Air Compressor.

The Au-To Compressor Co., Dept. B, Wilmington, Ohio, make an air compressor for supplying compressed air for garages, machine shops, or any other place where such work is essential. It is small, compact and requires little power to do a good deal of work. Two styles are being made, one compresses 6½ cubic feet of air per minute and the other 13 cubic feet per minute at 300 pounds pressure.

Hammered Dies.

F. E. Wells & Son Co., Greenfield, Mass., have a high reputation for making the best of screw plates. Their adjustable die is likewise a standard device. Their product is made from flat bar steel and is known pretty much everywhere among the best of mechanics and machinists.

Hood Anti-Rattler.

The Auto Parts Company, Providence, R. I., manufacturers of the well known line of Apco specialties for the Ford car, is offering the trade a new device which is sold with the Apco unqualified guarantee of "satisfaction or your money back." The Apco hood anti-rattler prevents the hood from vibrating even when the hood fasteners are not in position. One of the desirable qualities



No More Hood Rattling.

of the device is that either or both sides of the hood may be raised at the same time and they will remain in place. It is not necessary to fold the hood back as is usually done when an adjustment is to be made. Another feature is that the maximum light is afforded. With the Apco device the hood may be raised slightly to admit currents of air when operating the car in extremely hot weather, on the low speed for example. The Apco hood anti-rattler comes finished in black enamel and retails for 10 cents.

A Security Pump.

It is claimed, and with some reason, that the ordinary running of the car with the Security pump gives a water circulation of from 10 to 15 gallons per minute. Under such conditions the overheating of the motor in hot weather at



any speed or on any kind of a road is pretty near impossible. It is easily attached, of low cost, and in the case of using alcohol as a cooling liquid in winter, one filling is sufficient to last the entire season. It is made by The Security Co., 56 Terminal Way, Pittsburgh, Pa.

More Ford Specialties.

The Unique Findings and Supply Co., Providence, R. I., make several specialties for Ford cars which will commend themselves to car users and to repairmen, who find it necessary to keep things

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of this sort in stock. These devices are all of low price, some of them costing not more than 25 cents, and none of them are without their good purpose for a Ford car.

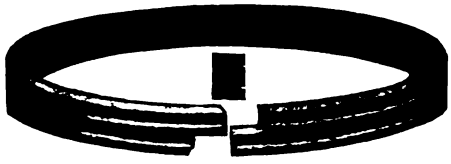
Magneto Charging.

Frequently requests are received from readers concerning the recharging of magnetos. It should be generally known that this cannot be done without some device made for that purpose. Le Munyon & Bidelman, 521 Black Building, Los Angeles, Cal., make both a charger and what is called a Magnetmeter. This last instrument shows the condition of the magnets and whether they have been properly charged. The charger itself is guaranteed to charge all magnets to the saturation point. It is rather a simple operation to charge and test magnetos with these devices and repairmen will find them useful and profitable.

For the Motor

Piston Rings That Do Not Leak.

Some have raised the question of the patentability as well as efficiency claims for "No-Leak-O" piston rings. It is a well known fact, the step-lap joint is old. The patent having run out. It is also well known that grooves have been cut in piston rings for years. Some



No-Leak-O Piston Ring.

builders are now using a diagonal cut ring with a groove in the center. The claims of the inventor of the "No-Leak-O" ring is a groove between the sliding face forming the step-lap joint, and the side of the ring. The escape of gas is cut off by the step-lap joint, the oil fills the groove which forms a seal all around the ring, making the finer fit, preventing the escape of gas anywhere. The same oil lubricates and forms a packing or seal against the oil being drawn or forced up into the firing chamber. The grooves control the oil. The cylinder walls are constantly lubricated by the oil from the grooves. The grooves take up fresh oil as fast as worn out by lubrication. Carbon and spark plug troubles are eliminated. With a good dry hot spark and clean valves you will have a smooth running motor and a saving in gasoline. "No-Leak-O" rings being made in one piece out of the old standard and tried stock, made in the best manner, hold their resiliency. They will not clog up and lose their efficiency. They are easy to install and not liable to break. Made by Automobile Accessories Company, 816 W. North Avenue, Baltimore, Md.

Burd Piston Rings.

The Burd High Compression Ring Co., Rockford, Ill., has secured the contract from the Packard Motor Car Co., of Detroit, Mich., to supply the entire 1916 requirements of the Packard Company with their patented Burd High Compression Rings. The almost instant recognition that this has received from engineers and repair men has necessitated doubling the floor space and facilities of the factory more than twice within the last six months, and the Packard Motor Car Co.'s order, together with other large orders, in addition to the increasing demand from the trade for repair and replacement rings, also stocks of rings to be carried in the thirteen branch offices have already swelled the big production until now four times the former amount of floor space and equipment is necessary to meet the business.

For Scored Cylinders.

A permanent cure for scoring cylinders has been found in the judicious use of a specially prepared flake graphite. This lubricant, known as Dixon's Motor Graphite, is unaffected by any temperature encountered in the cylinder and therefore undergoes no chemical change. By the introduction of a slight quantity of motor graphite, a velvety, protective coating is formed on the cylinder walls and piston rings. The small particles of this specially prepared flake graphite fill up the minute holes and scorings that exist. This not only lessens the friction but increases the compression. It has been found that best results are obtained by the use of this Dixon Motor Graphite by inhaling a small amount in the cylinder through the air intake of the carburetor, or mixing a small quantity with the oil in the crank case, providing the engine is lubricated by splash feed.

The Guaranteed Carbon Remover.

The Orolo carbon remover is said to remove the carbon from the cylinders of any automobile in 30 minutes and to cost but 30 cents to do it. It is not likely to injure the motor in any way and does the work thoroughly. It is a liquid but when heated is immediately converted into gases which convert the carbon into a black powder or soot which may be blown out from the exhaust. It is made by the Orolo Manufacturing Co., Louisville, Ky.

One-Piece Piston Ring.

The Inland Machine Works, 802 Mount St., St. Louis, Mo., are making a piston ring of one piece only, which it is claimed has all the virtues of rings of more than one piece and no disadvantages whatever. It uncoils in expanding, thus insuring a uniform pressure and perfect contact with the cylinder walls. The firm offer to refund the price on any ring that does not give satisfaction at the end of 90 days.

Starting and Lighting

A Grand Illumination.

A jitney driver hunted for trouble with a lighted match at 1 o'clock in the morning, when his jit stalled in Philadelphia. He found it. The flame came in contact with the carburetor, lighting the gas as it flowed from the tank. Nobody thought to turn off the flow and soon the jitney was adding to the illumination of Broad Street. A friendly cop sent in an alarm, and a chemical engine got to the fire in time to save the jitney from complete wreck. The Hawthorne Mfg. Co., 35 Spruce St., Bridgeport, Conn., with their old sol electric automobile, motorcycle and marine spot lights make such an accident impossible. Send for a catalogue and learn why.

Hartman Automatic Switch.

The Hartman Electrical Mfg. Co., Mansfield, O., announces a new type of lighting switch, which is a combination device having the functions of a lighting switch and automatic circuit breaker. When installed, it may take the place of the ordinary lighting switch and fuse block, or it can be used in conjunction with the present lighting switch. The Hartman uses a solenoid which operates a toggle arrangement, and should there be an accidental ground in the system, the circuit cannot be re-established unless the cause is removed.

Lamp Specialties.

The illustration shows an oil fount or container as used in automobile lamps on Ford and other low-priced cars. We understand that these are often lost off by motorists and replacements are required. The oil-fount shown is of an approved standard style and pattern and it was manufactured by Collins & Co., 150½ Elm Street, Amesbury, Mass.



Oil Fount for Oil Auto Lamps.

This is a new firm in the automobile field, but they may be classed as lamp specialists, and they are prepared to make or repair any kind of automobile lamps or lamp parts and fittings, including reflectors, etc., in large or small quantities. Estimates will be gladly furnished on any work where metal spinning is required. The proprietor, William A. Collins, formerly held a prominent position with the Castle Lamp Co., and is competent, by many years of experience, to handle work of the character indicated to the best possible advantage.

Old Sol Spotlights.

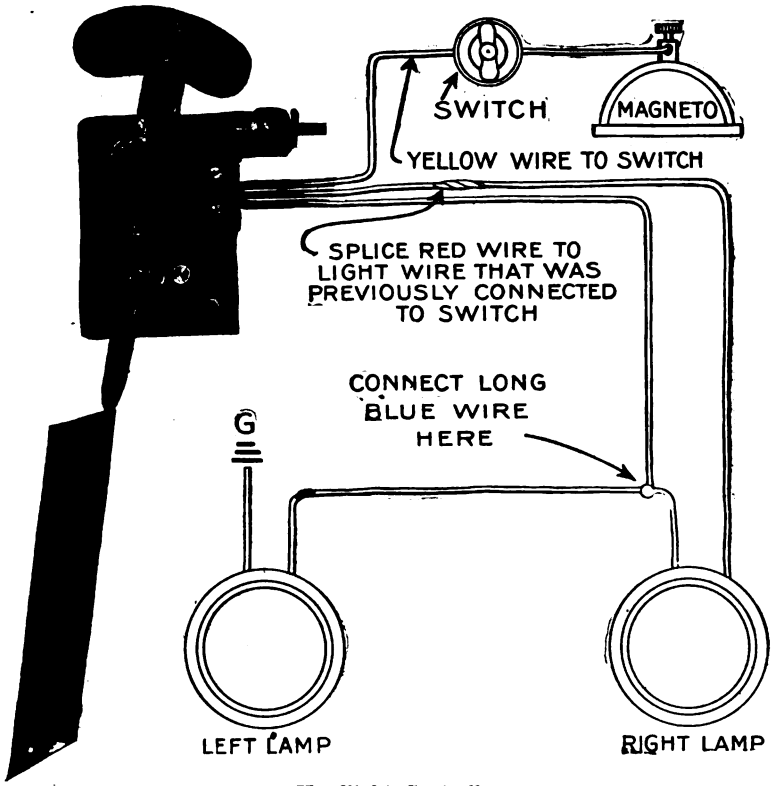
There is nothing more conducive to safety and cheerfulness than light, either artificial or natural. No matter whether you are at home or on the street, darkness is not pleasant, and if you are in an automobile a proper light is an element of safety, not only for yourself but for others. The Hawthorne Mfg. Co., of Spruce Street, Bridgeport, Conn., make what is called the Old Sol Spotlight for automobiles. It can be turned at any angle, either front, back or sidewise. It is guaranteed to be satisfactory in every way and those who do not already have satisfactory lighting arrangements for their cars might find it convenient to consult this firm and learn all about the Old Sol Spotlights.

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Ford Magnetos for Lighting.

The New York Coil Company, 338 Pearl St., New York City, N. Y., manufacturers of the New York Uni-Coil Ignition System, master vibrators, and other well known Ford accessories have recently placed on the market their New York Head Light Controller for Ford cars. This device is unusual in construction and the makers claim causes a Ford magneto to deliver a brilliant strong light when operating even at the lowest speeds at which the car can be run. The most novel feature of the device consists in the principle of utilizing the entire electrical output of the Ford magneto at all speeds below approximately fifteen miles per hour for the one headlight located on the left hand side of the car. Above this speed the two lights come into operation and at still greater speed a resistance is automatically thrown in the circuit to prevent the lamps becoming burnt out at high speeds. Every operation of the device is entirely automatic, the driver having nothing whatever to do after once installing the system. The device depends for its operation on the draft of air created by the fan, the instrument being placed about eight inches to the rear of the fan where it is secured to the top of the cylinder by means of one of the cylinder bolts.

An arm which is counter-weighted carries on one end an aluminum disc, this disc is in line with the left hand half of the fan. The air from the fan causes this disc to move away from the fan in direct proportion to the speed at which the engine is revolving. An adjustable spiral spring tends always to operating the arm and disc in the opposite direction. The arm carries a contact, which forms a sliding connection or contact on three similar contacts secured in the solid metal base. When the engine is turning at speeds below fifteen miles per hour the arm establishes connections to the one left hand lamp. As the speed increases to a point where the magneto is able to supply the two lamps with current to give the proper candle power the air draft from the fan is sufficient to move the arm to the second contact, which cuts in two lights. At still greater speed as before described the device causes the current to travel through a resistance coil, which while not diminishing the lights perceptibly introduces sufficient resistance to prevent their being burnt out. The makers advise us that they are turning out these devices in very large quantities, the purchasers of which are most enthusiastic over its operation.



Headlight Controller.

A Low Price Oxy-Acetylene Apparatus.

The Searchlight Co., 1014 Karpen Bldg., Chicago, Ill., make an oxy-acetylene welding apparatus that is easily operated, reliable and guaranteed to give complete satisfaction. The time is coming when no repairman or garage will be without an apparatus of this kind. When one can weld a broken car frame in less than an hour, it does not pay to send the work to some firm outside, or to delay in making the necessary outlay to secure such an outfit. This firm makes an apparatus which they are selling for $50. They have branches and refilling stations located conveniently at various points all over the country.

Stops Lamp Glare.

The E. G. Staude Mfg. Co., St. Paul, Minn., has for years made a successful box steeling machine. This company has a large well equipped plant and for over a year has been experimenting with the Staude Glare Stopper. The original design placed the glass in a metal ring and clamped it to the shield with two screw supports. While it does not in any way compare in quality and appearance with the present model, it became popular last summer. The amber glass used on the first model was imported from Belgium, and when this source of supply was shut off the manufacturers for a long while felt that the progress of the business was stopped. A search, however, revealed the fact that even a better quality of amber glass could be obtained in America, and when this glass was found it tested with so much strength that the manufacturers eliminated the rim, making the Staude Glare Stopper with a ground lens edge and greatly improving its efficiency.

Prest-O-Lite Batteries.

The entrance of the Prest-O-Lite Company, Inc., of Indianapolis into the electric lighting field has just been announced. The company is now manufacturing the Prest-O-Lite storage battery. Of no less interest will be the fact that The Prest-O-Lite Company, with its famous system of service, including thirty-five factory branches and more than 20,000 agencies throughout the country, aims to place behind the Prest-O-Lite battery a system of service of unusual character and scope.

The company states that its new interests will in no way interfere with the extension of its business in the well-known Prest-O-Lite acetylene system. Notwithstanding the popular impression that the widespread use of electric illumination on automobiles has adversely affected the gas-lighting industry, The Prest-O-Lite Company states that the use of gas lighting in automobile practice is to-day larger than ever before and is still growing.

However, instead of pursuing the controversy between the electric and gas factions in the automobile field, with which most motorists are familiar, it will be apparent that The Prest-O-Lite Company has placed itself in position where it can not only furnish either kind of illumination, but can also furnish the extensive Prest-O-Lite service on either kind.

The Prest-O-Lite storage battery is designed as a distinctive type in the battery field. While embodying nothing that is revolutionary, the design will include features upon which strong claims of increased current capacity, in connection with decreased weight, will be based.

As a part of its activity in its new field, The Prest-O-Lite Company on June first purchased and absorbed the entire business, assets and patents of the Pumpelly Battery Company of Indianapolis and has incorporated in the new Prest-O-Lite battery many features of the more recent Pumpelly types.

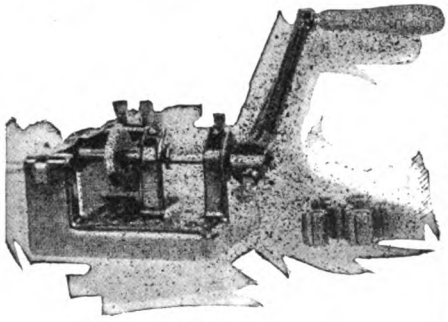
Temporarily, the Prest-O-Lite storage battery will be manufactured in the old plant of the Pumpelly Company. The present factories of The Prest-O-Lite Company are quite fully engaged under the load of the company's acetylene business, which has extended into many fields outside of the automobile industry, such as oxy-acetylene welding, house lighting, and many other new commercial applications of acetylene. New buildings will be erected shortly at the Speedway plant of The Prest-O-Lite Company in Indianapolis, in which the new Prest-O-Lite storage battery will be manufactured on a large scale. The company's battery line will include ignition, lighting and starting batteries of several types. The present output of the Prest-O-Lite storage battery is about 400 per day.

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Carburetion and Ignition

A New Valve Seat Tool.

The Adjustable Valve Seat Refacing Tool can be adjusted to any size valve seat in less than half a minute, and by a few turns will give a perfect seat. This tool is furnished with four different size pilot stems to fit the different size valve leads which makes the valve seat come positively true with the valve



For Valve Facing.

stems, as in many cases the valve seats are worn eccentric or oval causing a knock in the cylinder which cannot be overcome by grinding alone. This tool is made in two sizes to take in all valves from motorcycle size to three inches inclusive. This tool will be found very valuable in garages, repair shops, or to any one desiring to true up their valves before grinding. It is made by the American Valve Tool Co., 589 Hudson Street, New York.

Champion Spark Plugs.

In order that the dealers who have not as yet signed the profitsharing agreement of the Champion Spark Plug Company may have further time to take advantage of that opportunity, the time limit for their acceptance by the Company has been advanced from June 1st to July 1st, 1915. It is recalled that when the first announcement was made to the trade, attention was called to the dealer that all he had to do was to fill out the blank which had been mailed to him or which he could procure through his jobber's salesmen. At the end of the year the Champion Spark Plug Company would send the dealer a check representing his pro rata share of the profits which he had earned, and which would be based upon the number of Champion spark plugs he had purchased during the year. It was pointed out that it was not necessary to handle these plugs exclusively in order to participate in the profits, though he must take the number of plugs he enters on his card.

Storage Batteries.

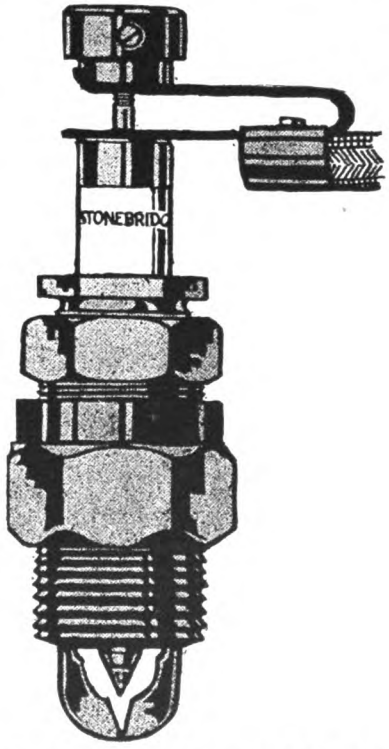
The history of storage battery engineering in America would be incomplete without mention of James K. Pumpelly. To him probably more than any other electro-chemist are due epoch making discoveries in the commercial manufacture of the lead type accumulator. Mr. Pumpelly devoted more than thirty years of his life and his own private fortune to storage battery research. Up until his death a few days ago, Mr. Pumpelly was at the factory every day supervising the manufacture of the electric storage batteries which bear his name and bringing them to their present state of perfection. But even Mr. Pumpelly's discoveries would be of little value unless they were applied in the most scientific and careful manner. To this end the Pumpelly Battery Company has installed the latest laboratory devices for testing both the finished product and the raw material. They have borne in mind the vital importance of good workmanship. To-day the Pumpelly Battery Company is making storage batteries of all types and their product has made for itself an enviable reputation for high voltage, ample capacity for cold weather service, low heat characteristics, small loss of charge on standing and a generous ampere hour rating that is very valuable in motor car lighting and starting.

A New Ford Carburetor.

The Brad-Kent carburetor, made by the Frost Mfg. Co., Kenosha, Wis., is unusually efficient in the matter of gasoline saving and it is claimed will save two gallons out of every five. So confident are the manufacturers of its superiority that they offer to send it on a thirty days' free trial. On a recent test made on country roads it consumed only one gallon of gasoline for every 33.12 miles. The firm refers to the commercial agencies as to their responsibility. It has but a single adjustment and is extremely light and simple. Like almost everything else of value the merit of the carburetor consists of the results it gives.

The Stonebridge Spark Plug.

This plug can be cleaned without removal from the car. It never needs ad-



justing. The entire porcelain can be removed and replaced, while plug proper stays in motor. It has special safety connection on the terminal. You can test out the plug without the use of any tool. The spring terminal always assures positive contact—not sometimes, but always. It is made by the C. H. Stonebridge Mfg. Co., New York City.

For Displaying Spark Plugs.

The Fulton Co., 726 National Ave., Milwaukee, Wis., is supplying an attractive spark plug display stand to dealers who purchase a stock of their Eklips spark plugs. Places are provided for six spark plugs and it may be set on show cases or in show windows. There is no



use in having goods of any kind unless they are suitably displayed and this seems to be an excellent device for this purpose.

Care of Spark Plugs.

The L. F. Benton Co., Vergennes, Vt., has issued a booklet on spark plugs and how to make them give perfect service. The booklet is copyrighted, and right here it may be stated that there is no reason whatever why this should be, since the more it is quoted the better for the Benton plug. But in point of fact the Benton plug is like truth—"it needs no ornament." It may not be the best one on the market, but that it is a mighty good one all who have used it will gladly admit. Incidentally, this booklet shows how important it is that spark plugs be kept free from soot, and why the popular test of laying a plug on the engine and watching the spark is misleading, for the reason that the voltage required to pierce the gap under compression is from 8 to 15 times that required in the open air. But it contains much other useful information, and drivers and garage men ought to read it.

The Critchley Reamer.

The Critchley Expanding Reamer is particularly adapted to the requirements of the automobile repairmen. The ordinary Expanding Reamer made by all standard manufacturers has an average expansion of .005 inches which is less than 1/64 inch. When the repairman has an oval hole to ream that measures on its largest a diameter more than .005 in excess of its nominal diameter he is absolutely "up against it." There is nothing for him to do but drill it out and then use a reamer of a larger size. In this way, he gets an exact fit, it is true, but it is more than likely that he has weakened a part that did not have any material to spare in the first place. With the Critchley Reamer he has an expansion of 1/16 inch or more to a size. It only requires a minimum investment on the part of a repairman to be ready to tackle any job that comes into the shop. This reamer is not intended to take the place of the Rose Reamer, but

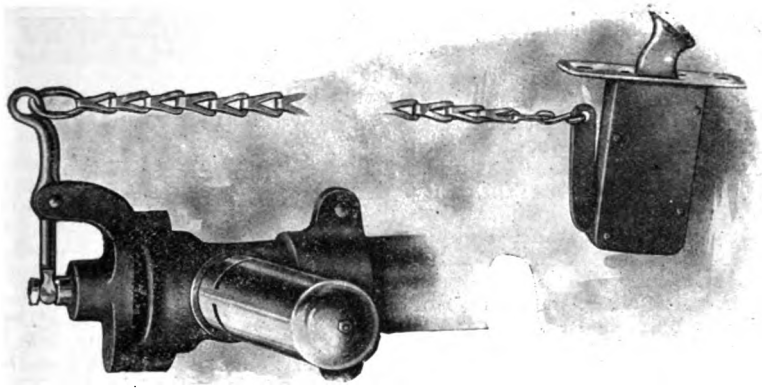
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it is adapted to take care of the numerous jobs demanded of the everyday repairman in the highways and byways of our country. In addition to all the qualities of this tool, it is carefully manufactured by high grade mechanics under the most careful inspection. The manufacturers are Chadwick & Trefethen, Portsmouth, N. H., and the Caldwell Sales Co., of San Francisco, are agents for the Pacific Coast.

Body and Top

A Warning Signal and Theft Protector.

We illustrate a novel device which serves two purposes. It is not only a loud and effective warning signal, but it also protects the car from thieves. When leaving the car, you simply take the key with you which leaves the whistle open so that your engine cannot be started without the whistle blowing loud enough to be heard blocks away, thus attracting attention to the fact that some one is running away with the car.



The American Auto Whistle.

The mechanism of this warning signal which is called the American Auto Whistle will be understood by studying the illustration. This whistle will blow for you as long as your engine goes with just a kick of your foot, thereby giving you the use of your hands and feet in case of accident. The manufacturers also claim that this is a self-cleaning whistle and it will tell you if a cylinder is leaking or skipping on your engine. This decidedly novel invention is manufactured and sold by Alfred H. Clark, 1307 Howard Ave., Bridgeport, Conn.

New Ford Body.

There is a constant demand for commodious bodies for Ford cars that will carry the number of passengers that the Ford car can easily handle. L. M. Cotton, Inc., Boston, Mass., makes a body for business or pleasure, with top that has three seats, two seats or one seat. They also make this same body without top. It will fit a Ford car or can be put on a chassis of other cars if required. It is made by a firm that has been building carriage bodies for years and years, and in construction and appearance it is difficult to see how it can be improved. The price is remarkably low considering its quality and capacity. Incidentally, this firm makes bodies for almost any purpose and it carries more than 50 models in stock.

One-Man Automobile Top.

The Hercules Rubber Co., 2 Hudson St., New York City, make an automobile top, including a dust hood, that is easily handled by one man. It is made of various material as desired, is sold at a low price and can be supplied for use upon almost any car that is manufactured. If any of our readers desire to secure one of these tops they should state the name of their car, the model and year, and also whether silk, mohair, khaki or imitation leather is desired.

New Car Fender.

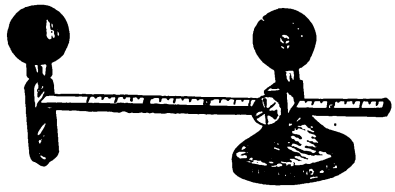
The Glasgow combination bumper and safety fender is the invention of a Philadelphian, Samuel Glasgow. The need for such an appliance was forcibly impressed upon him through a sad accident while motoring, and he determined, if possible, to atone for the mishap by producing an article which would, as nearly as possible, make repetition of his experience avoidable. He has been several years developing the device and has now succeeded in bringing it to a point of perfection warranting the placing of it upon the market. It can be readily attached to any make or style of automobile, and when not in use as a life-saving device appears simply as a high-class bumper, and as such is alone invaluable; the method of connection with the car, clamping the spring, abutting the axle, absolutely prevents contact with the chassis or spring; in this way alone saving injury to the car and consequent motor repair bills. When desired for the purpose of saving lives, the fender may be instantly released by the pressure of a button, covering the entire front of the car from the top of the wheel to within two inches of the ground with a flexible canvas pocket so cleverly arranged and adjusted that it will pick up any object in its path and carry it until the car can be brought to a full stop.

A Low Priced Signal.

A few years ago a horn that sold at $3.50 and was guaranteed for three years would have been considered a miracle. The Service Motor Supply Co., Washington Blvd. and Desplaines St., Chicago, Ill., make such a horn, and if it does not give entire satisfaction the cost will be refunded upon returning it.

Red Devil Glass Cutters.

Automobile headlights differ greatly in size. As a result, many garages and repair shops feel that they must keep on hand a good stock of headlights in a large variety of sizes. There is really no need to tie up money like this. Circular glass cutters easily cut headlights and it is inexpensive when done with a reliable tool, for example, like



Red Devil Cutter No. 263.

the Red Devil cutter No. 263 shown here. It has a genuine hand honed steel wheel, tested and inspected by an expert. It cuts circles from 2 to 22 inches in diameter. It has an all-steel base with a rubber bottom to prevent slipping. The adjustable cutting rod is highly nickel-plated. The tool works as well as it looks. It is made by Smith & Hemenway Co., Inc., 179 Chambers St. It costs more to do without this tool than to buy one and use it. The tool also makes a profitable article which garage owners and supply dealers can sell to the motorist who wants to do his own tinkering.

Turns Dust and Water.

A hard, dry wax applied to the body, hood and fenders of automobiles, electrics and limousines is now being used as a preventive of harm to car surfaces from contact with dust and water. S. C. Johnson & Son, of Racine, Wis., make an ideal wax for this purpose. It has a peculiar hard, slippery quality that prevents both dust and water from sticking—they slip right off the delicate, highly polished surfaces before any rough gray spots are formed. Johnson's Prepared Wax is really a splendid wax for car surfaces. It imparts a high



gloss which holds its luster indefinitely because of its hard, dry, impervious nature. Covers up small scratches and certainly does a great deal toward keeping the surface of cars in good condition generally, which, incidentally, saves a lot of labor for caretakers. The extraordinary protective and preservative properties are equally effective on car surfaces of either high or low degree.

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The Seiss Horn.

When one purchases a signal it is desirable to get the best, when it can be bought at a low price. The Seiss horn is double acting and it gives a loud, commanding warning signal. It is easily operated and is sure to command the attention of any one who is before it. Even women, cows and chickens are sure to get out of the road when they hear its blast. It has a ten year guarantee. The price is extremely low and the mechanical construction is of the very best. It is made by the Seiss Mfg. Co., 443 Dorr St., Toledo, O.

To Hold the Stars and Stripes.

M & M Bracket, 29 East Third St., Cincinnati, O., make a flag holder, which will probably be popular just at the present time. A good many car owners like to show their colors in driving and this device for carrying a flag on the front of the car is simple and of low price. The same firm likewise makes a bracket for carrying the license.

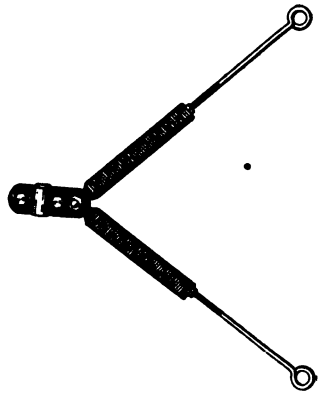
The Running Gear

New Automobile Tires.

The Northland Rubber Company, 703 Northland Ave., Buffalo, N. Y., is prepared to give an exclusive agency for the Northland tires. Only one dealer in each town will be given this agency and only responsible dealers need apply. But the firm that gets this franchise will find that it is a paying proposition.

A New Ford Steerer.

A new steerer for Ford cars, that it is claimed prevents side sway, and makes steering very much easier, is on the market. It is made of the best material, and is adjustable according to the



Makes Steering Easy.

condition of each car and to suit the owner's idea or requirements. The illustration gives an idea of its construction. It is made by Chas. Friedlander & Co., 58 Warren St., New York.

A Useful Steering Device.

The Savidge steering device for Ford cars is simple, easily attached and makes driving easy, and it likewise acts as a shock absorber. It is made by the Savidge Steering Device Co., 508 Murphy Bldg., Indianapolis, Ind.

The Temco Shock Absorber.

One model of this shock absorber is especially made for Ford cars. They take the rebound from the springs gradually and thus prevent sudden or violent jars or jolts. An unlimited guarantee is given with these shock absorbers that they must fully, thoroughly and completely satisfy the purchasers, or money will be returned. The firm likewise makes a Universal shock absorber for all cars, an improved master vibrator and a portable electric drill. For full information address the Temco Electric Motor Co., 2115 Sugar Street, Leipsic, Ohio.

New Non-Skid Tread.

The Marathon Tire & Rubber Company announce the perfection of a new type Non-Skid Tire Tread. The innovation does not pertain to the anti-skidding qualities of the tread but has to do with the wearing qualities. It is the general custom of tire manufacturers to build the non-skid tread far down on the sides of the tires where it does not come in contact with the road—in consequence when the tire is worn out a considerable portion of the tread remained unworn. The New Marathon Tread is trade named the "Concentrated" and is exactly what the name implies. All the material is heaped up in center where it will come in contact with the road. It is estimated that this new type tread will increase the mileage 25 per cent. A patent has been applied for.

A Great Record.

On May 18th, E. G. Baker of Indianapolis, driving a Stutz Bearcat Roadster, established a new ocean to ocean record when he completed his trip of 3,728 miles from San Diego, Cal., to New York City in 11 days, 7 hours and 15 minutes. Mr. Baker drove the entire distance himself, this being the first time a record transcontinental trip has been made by a single driver. Mr. W. F. Strum also of Indianapolis, accompanied Mr. Baker and checked the car at all night stops on an official book which he had stamped by different post office and city officials. On his trip Mr. Baker used Easyon Tire Chains made by the Leather Tire Goods Company of Niagara Falls, N. Y. Mr. Baker states that on account of the ease and quickness with which he applied these chains he was able to save considerable time whenever it became necessary to use chains to drive through mud holes or other places where he could not obtain traction with bare tires. Mr. Baker carried no other chains on the trip and states he found Easyon Chains absolutely fulfilled his every requirement. The previous record from Atlantic to Pacific was 15 days, 2 hours and 15 minutes so the new record cuts off nearly four days from the previous time.

A New Inner Tube Plug.

The Sampson feather-edge inner tube tire plug is for punctures and small blow-outs. It is claimed that repairing a tube with this plug is easier and quicker than it can be done by any other method. This plug is made of pure soft rubber and is naturally extremely elastic and thus easy to insert. It is guaranteed never to leak, nor to affect the shoe in any way. The manufacturers are supplying dealers as rapidly as possible but they prefer that the plug should be bought of the local merchant if possible. If it is impossible to do this, however, they will sell an outfit direct and prepay cartage charges. It is made by Stevens & Co., 375 Broadway, New York City.

Bailey Gearless Differential.

The New Process Gear Corporation of Syracuse, N. Y., has entered into a contract with the Gearless Differential Company of Detroit to manufacture the Bailey Gearless Differential for the general automobile trade. The arrangement was made after the most thorough and exhaustive tests by the New Process people, and after their engineers had reported it to be "the first important improvement in the standard type of differential in 15 years." The New Process Corporation will immediately inaugurate a thorough campaign to interest manufacturers, a number of whom have already arranged for tests. The parent company will continue its present policy of going after the replacement business on cars already in service. This has already reached large proportions, especially among Ford owners.

A Tire Repair School.

Eight years ago the Clouse Tire Repair School was started in a little building 30x30 feet, in Cleveland, O. To-day they are occupying a building 50x190 feet, two stories in height. This could not have been accomplished unless they were proving the value of the school. No text books are used. They teach by practical demonstration with proper equipment and by lectures. The reliance the student places upon text books would be such as to have him overlook real practical facts, while the practical demonstration was being made. The equipment is so complete, covering every phase of the tire repair business, and the course of lectures so thorough that the impression is made so forcible, that the use of text books would only tend to confuse the student's mind. It is simply necessary for the student to apply himself to his work and listen to the lectures to become fully acquainted with every phase of the tire repair business. There is but one real tire repair school in the country and that is the Clouse school at Euclid Avenue and 90th Street, Cleveland, O.

A New Tire.

The plant of the Century Tire & Rubber Co., of Plainfield, N. J., has been purchased by Leon Jaffess, of New York City, who owns a tire factory in Harrison, N. J., in addition to his salesroom in New York. Mr. Jaffess paid $29,000 for the Plainfield plant and will utilize its 60,000 square feet of floor space for the manufacture of a new tire.

A Unique Car Bumper.

The Concrete Bumper Company, 214 West 50th Street, New York City, make car bumpers in all sizes of round and square type. They are filled with concrete and reinforced with a steel rod running through the center. They furnish absolute protection for car radiators and lamps and are said to give the best of satisfaction in every way. The firm likewise makes rear bumpers and bumpers for ambulances and trucks.

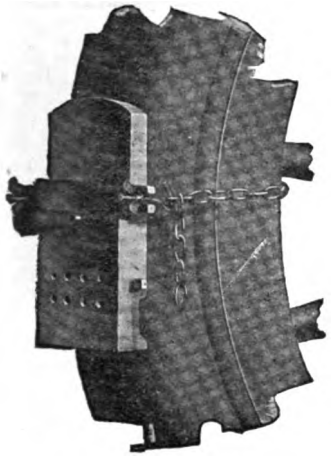
A Safety Steering Gear.

Occasionally complaints have been received that the Ford car is rather hard to steer on rough roads. With this in view C. C. Rounds & Co., of Dows, Ia., have brought out a steering gear that is said to make the Ford steer just like a big, heavy car. It is especially desired if a woman is driving.

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WIZARD AUTOMATIC STEAM VULCANIZER

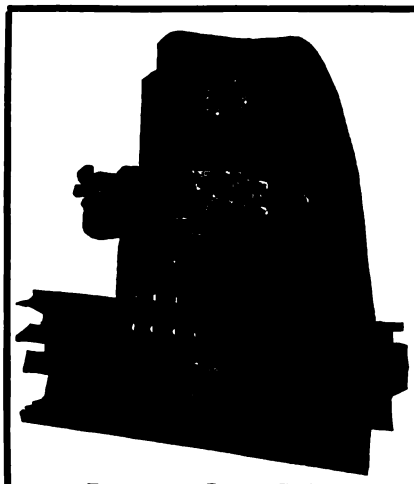
NEW PRICE ONLY $3.50, BY MAIL PREPAID



Repairing Casing

By manufacturing these vulcanizers in such mammoth quantities we are now able to sell them at only $3.50—you can save this amount in repairing just a few tires.

Don't ruin your casings by neglecting those small cuts—they mean the loss of real dollars to you. Vulcanize them full of new rubber, and MAKE THEM LAST TWICE AS LONG. Ask any tire manufacturer if this is not so. The small cuts admit water and sand to the fabric and the tire soon blows out at this weakened spot.



Repairing Inner Tube

10 DAYS' FREE TRIAL We will ship this vulcanizer by mail prepaid. Try it for ten days and if you are not entirely satisfied, return it, and we will refund your money.

The WIZARD AUTOMATIC STEAM VULCANIZER is adapted for BOTH TUBES AND CASINGS OF ANY SIZE. It is a metal body filled with water at factory and never needs refilling. Steam generated by a small flame which is entirely enclosed. Burns gasoline with a blue flame and no smoke. Heat is automatically controlled. Requires no watching. Vulcanizing face (curved to fit casing) 3 x 6 inches. The Wizard is highly polished and nickel plated. Can be used on the road or anywhere. Pays for itself in a short time and will never wear out. Thousands in use. ANY BOY CAN EASILY OPERATE THE WIZARD. Sent by mail prepaid, upon receipt of the price. Full instructions, rubber, shears, cement, etc., furnished with each outfit. Remember, money back if not entirely satisfied.

PRICE COMPLETE, PREPAID, $3.50

Manufactured by

The National Motor Supply Co.

5636 Euclid Avenue CLEVELAND, OHIO

Branch Office, 2204 Michigan Avenue, Chicago, Ill.

Enclosed find money order for $3.50. Send me by mail prepaid a Wizard Steam Vulcanizer. You agree to refund my money if I am not satisfied after ten days' trial. (Write plainly.)

Name.....

Address .....

.....

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Two New Tire Tools.

The Racine Tire Tool Co., Superior and Prospect Streets, Racine, Wis., announces two tools for use especially in tire repair shops, but also of value to the car owner who has much tire repair work to do. One of these tools is in the form of a small portable electric motor with a grinder attached, the latter being used for preparing a cut before repairing it. The wheel for grinding is about the size of a 50-cent piece and makes a neat job of the cut, doing away with much sandpapering, etc.

Frictionless Shock Absorbers.

A frictionless shock absorber naturally has a longer life than one that is actuated by friction only. The Halladay frictionless shock absorbers are guaranteed, and they are made by a reliable firm which backs its claims with confidence. They are well made and suited for all types of automobiles. It is worth something to ride in an automobile and not have the nerves and bones shook up to such an extent that riding is a discomfort. They are made by the L. P. Halladay Company, Streator, Ill.

New Rim Contracters.

A new rim contracter, for the straight sided split rims of the Kelsey and Stanweld types, is now ready for market. It is strong and adaptable for all sizes of these rims. This tool is low priced and those interested would do well to write to the manufacturers for full information.

New Tire Boots.

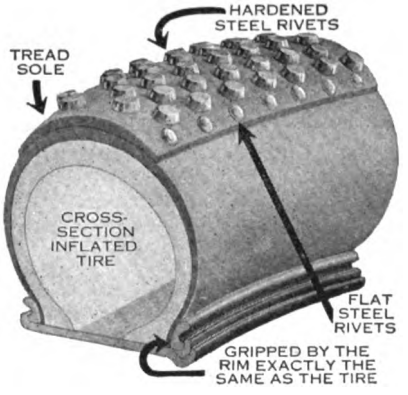
In view of the growing demand for tire boots the Leather Products Company, of Denver, Colo., has recently added four new tire boots to their line—one of them is illustrated herewith. They are made of the best selection of "Elk" tanned leather, treated and waterproofed by a secret method. The body is cut from finished stock and is reinforced on the tread porton with an extra wearing sole of "Elk" leather, which is closely studded with flat head steel rivets to take the wear. This boot is guaranteed not to creep or slip on the tire and will stand hundreds of miles of road wear. It is made in both hook-on and strap styles. All inquiries should be addressed to the manufacturers, who will gladly send complete details and prices.



The Peerless Boot.

New Durable Tread.

The Colorado Tire and Leather Co., of Denver, Colo., has recently perfected a new Durable Tread—this tread, while built along the lines of previous Durable Treads, is in many respects entirely new. The cross section illustrates the principle of their construction. The tread consists mainly of one continuous band built up of several layers of rubberized fabric, extending entirely over the tire from bead to bead and fitting as tightly as a glove—thus preventing slipping—or sand and moisture from working in. On the outer surface of these layers of fabric is riveted the tread strip, or wearing sole; that is the part of the tread that comes in direct contact with the ground and takes all of the road wear. This wearing sole is built of a layer of extra chrome leather especially tanned and waterproofed so that it will withstand the most severe conditions of service. The wearing surface is studded with sharp edged hardened steel rivets, the entire protector making a covering of only one-half inch in thickness.



A New Inner Tube.

A new pneumatic tire which seems to be both desirable in saving time in making repairs and economical, has been invented and patented. It is called the Anti-Pneu-Matic inner tube, and G. V. Baillard is the inventor. Instead of one continuous inner tube, from 12 to 20 small sacks or inner tubes are used, each 4 inches long, making a continuous inner tube around the wheel, and all are contained within the tire shoe. Each section is secured to a valve every four inches on the wheel, each of which is mechanically opened by turning a control stem. Then the air is pumped through the main valve, as is used at present, until the sections are filled to the air pressure required. If a puncture is received one of these little sections collapses but the adjoining sections expand lengthwise 2 inches, and thus take the place of the 2 inch section which has collapsed. Of course this somewhat reduces the tire pressure, but it is stated not to be noticeable, and claims are made that six of these sections may be punctured before it is necessary to stop the car and put in others. By using these tire sections one is pretty sure to arrive at his destination without having to stop for tire repairs, no matter how severe the puncture may be. After one has arrived at home he can put in new ones in about five minutes, and of course the new section does not cost anywhere near the price of an ordinary inner tube. It is likewise claimed that if a blowout occurs with these inner tube sections, although the section underneath may explode, the others will not, but will merely fill up the aperture caused by the one that has exploded. The device is rather interesting, and although, as we understand it, the manufacture h not yet begun, it is expected that th will soon be for sale on the mark For full information address G. V. B lard, 251 East 31st St., New York.

Tire Carriers.

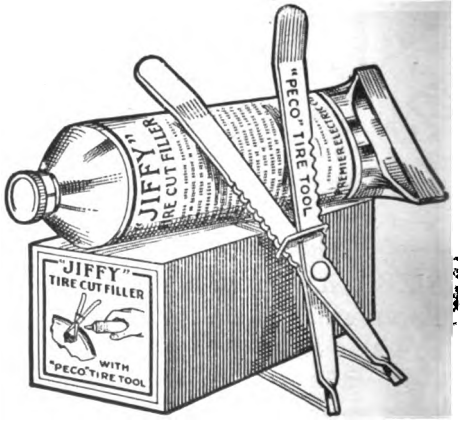
The International Stamping Co., 18 Austin Ave., Chicago, Ill., make thr different styles of tire carriers, any o of which can be attached to a car in half an hour or less. There is a rig way and a wrong way to carry ext tires and these carriers exemplify clear to any one that they are using the rig way. They seem to be well finished a they are made in so many different siz and styles that one is sure to fit an car that is made.

Wheels for Ford Cars.

It is claimed that pressed steel wheels are stronger than either wood or wire. As far as we know no one has yet attempted to deny this statement. It is also stated that they are lighter than ordinary wheels and consequently require less power to propel and that they have a better appearance than other wheels. They can easily be installed on a Ford car and in case of a change of tires can be made in two or three minutes. They are manufactured by the Hydraulic Pressed Steel Co., Cleveland, Ohio.

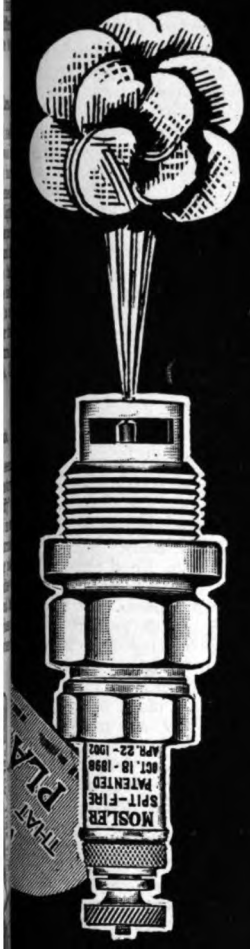
Fills Up Tire Cuts.

The "Jiffy-Peco" outfit seems to fill a long-felt want of the motorist as it consists of a tube of "Jiffy" tire cut-filler and a "Peco" tire tool in one outfit. The large tube of filler furnished with this outfit is a quick-curing plastic gum compound that quickly unites with the rubber, making a tough and lasting repair and if used to fill glass cuts and nail punctures in casings when these are fresh it means more miles to the tire-life and consequent saving to the motorist. The "Peco" tire tool, as furnished with this tire cut filler completes the outfit and enables the motorist to open up and properly clean the cut before applying the filler, for it is essential in making casing repairs to see that they are properly cleaned of all dirt and grease and this can only be done properly when one has the use of a tire tool designed especially for this purpose. This outfit is manufactured by the Premier Electric Company, 4038 Ravenswood Ave., Chicago, Ill., who have an attractive proposition to offer dealers.



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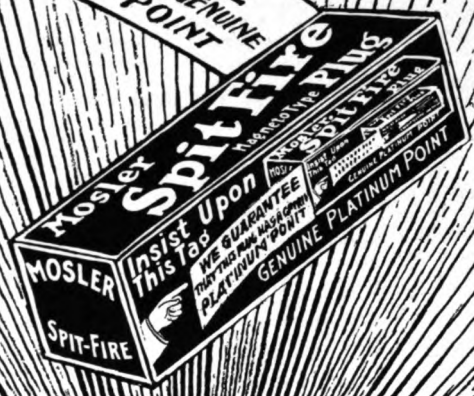
MOSLER INSIST ON THE RED TAG





SpitFire

WE GUARANTEE THAT THIS PLUG HAS A GENUINE PLATINUM POINT



$1.25

$1.00

A. R. MOSLER & CO. Mt. Vernon, N. Y.

THE GREATEST PLUG THE SUN E'ER SHONE ON

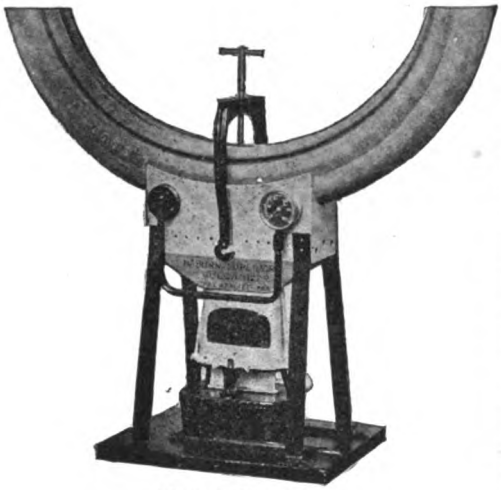
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Tire Tubes and Casings.

The Norwalk Tire and Rubber Co., Norwalk, Conn., are looking for dealers to take the exclusive sale in their own localities of their tire tubes and casings. These tires have a good reputation.

A New Vulcanizer.

Lee C. Mapes, 16 Fulton Ave., Rochester, N. Y., is putting on the market a new vulcanizer, which is the outcome of much study and experimenting. It is large enough to repair anything in a tire, low in price and is designed for the car owner as well as the repairmen. It is made in varying sizes and styles and in quite a wide range of prices, thus being suited for large repair places as



Mapes Vulcanizer.

well as those owning but one car. According to reports from users it has given the best of satisfaction. With these vulcanizers is sent a catalogue or circular that those using them or doing vulcanizing of any sort will find instructive and useful. Each machine is guaranteed for six months, and if repairs are necessary they will be made at reasonable prices, and new parts are always furnished at a low cost.

Business Notes

Colorado Road Guide.

The Colorado Automobile Directory contains 144 pages of corrected road logs and touring information which will be much sought after by the traveling motorist. The book is published by The List Publishing Co., 615 Denham Bldg., Denver, Colo.

Eight-Cylinder Oldsmobiles.

The Olds Motor Works announces for the 1916 season two lightweight cars, an Eight and a Four, both weighing well under 3,000 pounds, the former listing at $1,295 and the latter at $1,095. The new Eight was designed primarily to satisfy the market hitherto supplied by the big Olds and also with a view to creating a new market for a machine selling under $1,500 with quality as its chief attraction. With these objects in view the company decided to introduce a car of high power and smoothness of operation—qualities which were found to be best secured in an eight cylinder car.

The Argo Car at $385.

Marketing and use of the 44-inch tread Argo having proved the worth of the design, the Argo Motor Co., Inc., of Jackson, Mich., is now offering a new machine built along much similar lines, but with a standard 56-inch tread. This is known as the Argo "Standard," and may be had in a five-passenger touring car at $435, and a roadster at $385, both fully equipped save for an electric starting and lighting system, which may be had for $60 extra. Production of the car for the 1915-16 season has been set at 20,000 cars.

Ford Rebate Checks.

If 30 men worked 30 days, giving away money at the rate of $50 a minute, at the end of the time they would have disposed of $15,000,000. That is the calculation of the Ford Motor Co., which has set 30 men making out the rebate checks that are to go to Ford owners who bought their cars after August 1 last.

Duryea Trucks.

Charles E. Duryea, the dean of automobile manufacturing and engineering, is making an automobile truck which has only about half the parts usually employed in these vehicles. Mr. Duryea's character is well known wherever automobiles are made or used, and purchasers or inquirers are sure to receive only the honest facts and to get whatever value Mr. Duryea says they will get. For informaton address the Duryea Laboratories, Philadelphia, Pa.

Nothing But Buick Sixes.

Two six-cylinder chassis, a small one and a large one, will constitute the line produced by the Buick Motor Co., Flint, Mich., for the coming season. The fours have been dropped. The small six will sell for $950 as a roadster; $985 as a five-passenger touring car; $1,350 as a three-passenger coupe, and $1,875 as a sedan. The larger chassis lists at $1,450 as a roadster, and $1,485 as a five or seven-passenger touring car. The smaller models are equipped with 3½x5 motors and 32x4-inch tires and the larger with 3¾x5 motor and 36x4½ tires.

Packard Much Reduced.

The prices of the 1916 Packard cars have been made public and show a reduction of from $1,150 to $1,800, as compared with the prices of the 1915 models. All open bodies of model I-25, or the small twelve, are listed at $2,600, which is the lowest price at which a Packard ever listed, and is $1,150 lower than the price of the 1915 3-38 runabout. Model I-35, which is the big twelve, is listed at $2,950 for all open bodies. This is $1,800 less than the price of the 1915 model 5-48 runabout, or big six.

Low Price New Era Cars.

The New Era Engineering Co., Joliet, sell a roadster at $600. The car has a 104-inch wheelbase and is fitted with a unit power plant consisting of a four-cylinder, L-head, block motor, four-speed gearset and dry-plate disk clutch. The axle is three-quarters floating. The motor is 3⅛x4½ and is said to develop 27 horsepower at 2,000 r. p. m. An Allis-Chalmers single unit cranking and lighting system is installed. Ignition is by the Atwater-Kent system.

Electrics Consolidate.

The Baker Motor Vehicle Co. and the Rauch & Lang Carriage Co. have merged into one company styled Baker R. & L. Co. For the purpose of merging the stock of the two companies the Rauch & Lang Co. will increase its present capital stock from $1,000,000 to $2,500,000, of which $750,000 will be 7 per cent. cumulative preferred and the remainder common.

Free Chalmers Service.

The Chalmers Motor Co., Detroit, has made public the first details of what it styles a universal service plan which shortly is to be put in operation. The company will issue to each purchaser of a new car a book of labor coupons which will be negotiable, without cost to the owner, at any one of some 800 Chalmers service stations. The possession of a coupon book will entitle the holder to 100 hours of free service.

Suit Against Auto Parts Co.

Thomas F. Wilson, of Providence, R. I., doing business as the Auto Parts Company, has been made a defendant in an equity suit entered by the Ford Motor Company, in United States District Court. The defendant is charged with the unlawful and fraudulent use of the word "Ford" in the automobile business. A motion for a preliminary injunction restraining the defendant from using the word "Ford" was set down for a hearing on June 9, and an order issued to show cause why the prayer should not be granted. The declaration sets forth that the defendant conducts business in other States under the name of "The Illinois Ford Shop" in Illinois and the "The Wilson Ford Shop" in Pennsylvania; that they are not corporations, but mere trade names. It is further set forth that the defendant is engaged in the manufacture and sale of automobile parts in which the name of "Ford" is used unlawfully. The plaintiff asks "that the defendant be required to account to him for all profits and gains realized by him through his unlawful acts, and that the defendant, his agents and employes be restrained and enjoined from using the word 'Ford.'"

An Automobile College.

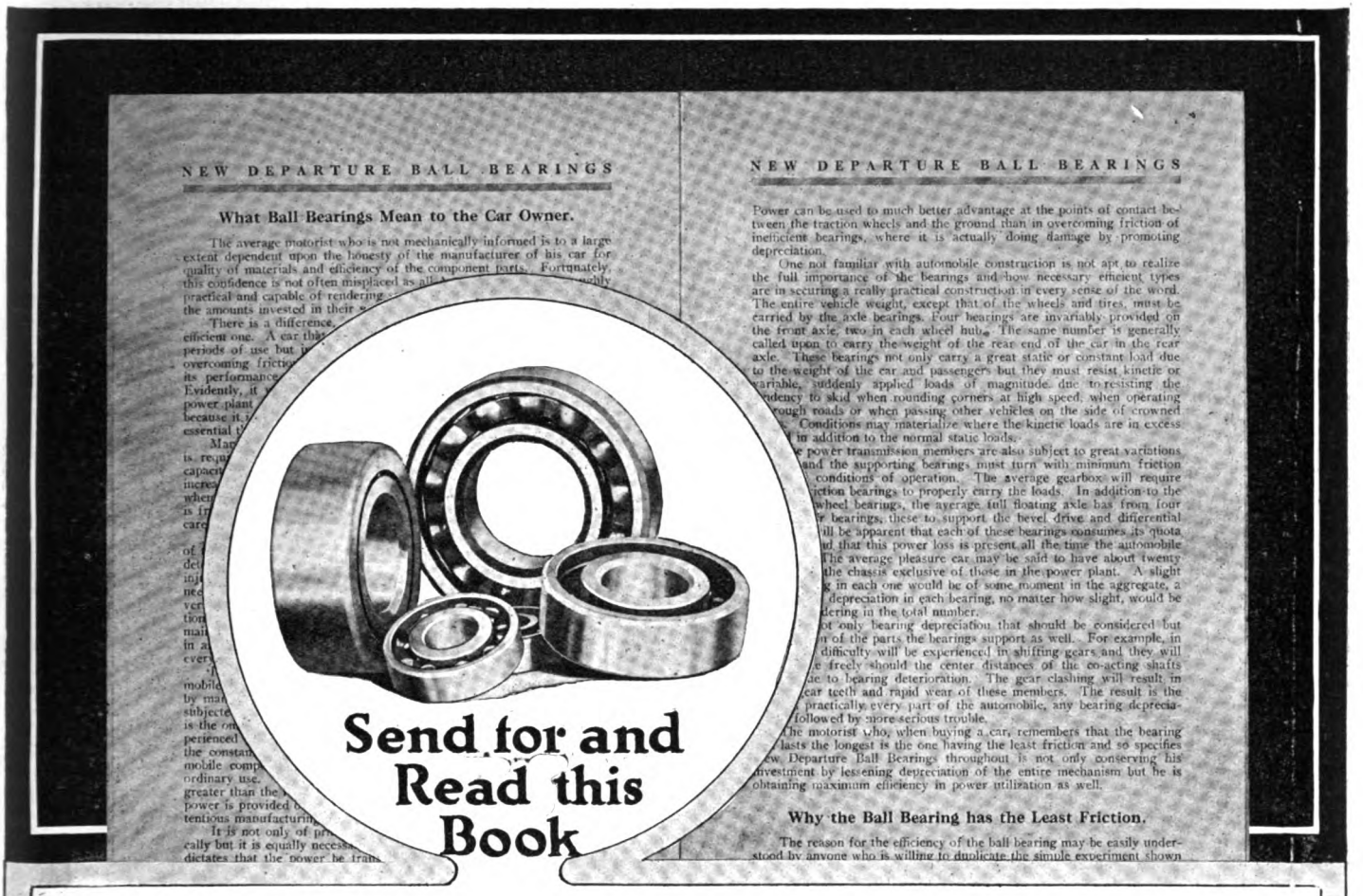
At 1519 Wabash Ave., Chicago, Ill., there is an automobile college which teaches the construction, repairing and driving of automobiles. It is stated that the graduates of this college are always in demand. It is called the Greer College of Motoring.

Trade Press Convention.

The tenth annual convention of the trade press of the country will be held at the Bellevue-Stratford Hotel, Philadelphia, September 7, 8 and 9, 1915. One of the purposes of this convention is to strike a keynote of co-operation in the interest of higher ethics, greater efficiency and larger growth. The Federation of Trade Press Associations is composed of 250 leading trade and technical journals and the attendance of this convention will no doubt be large. The chairman of the committee on arrangements is Bartley J. Doyle, and his address is 512 Race Street, Philadelphia, Pa.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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NEW DEPARTURE BALL BEARINGS

American Made for American Trade

EXEMPLIFY true rolling motion—They are *not* point contact bearings.

In practical ball bearings there is no such thing as point contact.

In New Departure Ball Bearings there is always a well defined area of the balls under load, in contact with the raceways upon which they roll.

In rolling, the balls constantly present new areas of contact to the load. It is impossible therefore, for wear to concentrate upon any given area, as is always the case with all bearings other than the ball type.

THE NEW DEPARTURE MANUFACTURING CO.

Distributors in Trade Centers Throughout the United States.

BRISTOL, CONN., U. S. A.

Western Branch: 1016-17 Ford Bldg., Detroit, Mich.

Sole British Agents: Brown Brothers, Limited London and Manchester.

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National Spark Plugs

—The result of long and searching experiments to produce a plug of unprecedented quality, design and efficiency.

Indestructible stone core TEMPERED STEEL body, NICKEL alloy electrodes practically soot proof. Core design THAT can't crack.

Crimped core easily cleanable

GUARANTEED

Special DEALERS' Proposition
Liberal Discounts

National Spark Plug Co.,
Sedalia, Mo., U. S. A.



A Genius and a Woman Suffragist.

Thomas A. Edison is one of the best friends the woman suffrage cause has. He not only advocates it by spoken and written testimony, but has declared his desire and intention to lend his genius to forwarding the cause in some concrete way a little later in the campaign.

Warm Gasoline.

Of course, warm gasoline will evaporate into a good explosive mixture quicker and better than cold gasoline. It is a good plan to run the feed pipe which goes to the carburetor alongside of the exhaust pipe, fastening it there with wire.

Circuit-Breaking.

In the make and break of current of a magneto the space between the contact points is very important. If the space is too wide the engine will tend to miss at slow speed, and if too close it will miss at high speed.

Speed on Low Gear.

Anxiety to go faster when running on low gear is responsible for very many of the breaks in transmission, universal joints, differential and driving axles.

When the grease works endways through the axle housing and comes out in the brake drum it is because the big felt washer has become inefficient. A new one may be easily made from the felt collar pads to be found in any harness shop.

HOW TO BUY ADVERTISING

Buy it exactly as you would dry goods or groceries.

Be sure you get the quantity and quality you bargain for and at a fair market price.

To determine the good weight or measure, see that the publisher belongs to THE AUDIT BUREAU OF CIRCULATIONS. This ensures the quantity.

To determine the quality, find out who are the readers. If you want to reach automobile owners, garages or repairmen, do not advertise in mediums of general circulation, for this will be a shoddy quality—possibly 10 or 15 per cent. good. To be certain the medium is "all wool and a yard wide," choose one that reaches no other readers except those you want to reach; this means 100 per cent. good.

Finally, find out the market rates for advertising of the quality and quantity you are about to purchase—and pay no more.

If you purchase your advertising in this practical, business-like and fair way, you may be sure it will pay you, provided you have something to sell that those want to whom you appeal.

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Another New Car.

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Firm Changes Name.

The Garage Equipment Manufacturing have changed the firm name to the Gemco Manufacturing Company, of Milwaukee. Its well established trade mark distinctly identifies the firm and what it stands for. Service, co-operation and quality of merchandise have been the main factors in the success of this company. To-day the Gemco Manufacturing Company have the distinction of being the largest general manufacturers of automobile accessories in the world. There are at the present time considerably over two hundred articles in the extensive line consisting of standard automobile accessories and Ford specialties.

The New Gasoline Process.

Secretary Lane has announced that excellent progress was being made in the development of the gasoline and benzol processes designed by Dr. W. F. Rittman, of the Bureau of Mines, to increase the output of gasoline by refiners and to make possible the production from crude petroleum of toluol and benzol, which are the bases for dyes and high explosives. The gasoline process is now ready for large-scale industrial application. The benzol process is being developed in co-operation with the Aetna Chemical Co., of New York, which company has entered into an agreement whereby all patentable equipment, processes and ideas available will be turned over to the department to be dedicated to the public. The department stands ready to enter into similar agreements with other companies.

Ford Parts Prices.

The Ford Motor Co. has revised the prices of all parts for Ford cars. Practically all of the 600 items on the parts lists shows a reduction of from 10 to 25 per cent. There are, however, a few parts which now cost more, the manufacturing cost at present being higher than formerly. For instance, front axle assembly now is listed at $24, instead of $22; rear axle assembly at $55, instead of $60; fenders, at $2.50, instead of $3; coils, now $16.50 instead of $18; radiators, now $15 instead of $20.

Convict Labor for Massachusetts Roads.

Massachusetts has just passed an act providing for the improvement and repair of highways by convict labor. The act provides in addition that convicts may be used by owners of waste land for its improvement. The national committee on prisons and prison labor, while sanctioning the road work section of the act, condemns the part relating to contract labor being done by convicts. It is expected that at the next session of the legislature contract convict labor will be abolished in that State.

For the Water Jackets.

Young's radiator compound is said to be an excellent one for cleaning water jackets. It is guaranteed to be harmless and is said to absolve all scale, rust and metal deposits. It is made by H. E. Ketchum, 11 Thirteenth St., Whitestone, N. Y.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete
$25.00 Models
Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00.
Odometers reset to zero, 25c.
All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.

51 West 63rd Street **New York, N. Y.**

A. H. KASNER

Formerly 20 years on Chambers St., N. Y., now located at

1254 Bedford Avenue **BROOKLYN, N. Y.**

Tires and Supplies, inside prices.
Our only store. Low Expenses, Low Prices.
Mr. Manufacturer, anything you have, let me know.
SPOT CASH PAID.

Fore Doors for Open Front Cars

Prices right. A postal will bring particulars. ECONOMY SERVICE CO., 2714 Boulevard Place, Indianapolis, Ind.

WRITE for our great bargain sheet showing auto axles, steering devices, forgings, transmissions, etc. Borbein Auto Co., 2109 N. 9th St., St. Louis.

Auto Accessories

TIMES SQUARE AUTO CO.

World's Largest Dealers in **AUTOMOBILES & ACCESSORIES**

We sell more Supplies and Accessories than any other two concerns in world combined—at prices 25 to 50% Lower. Look these over and you will see for yourself.

Standard speedometers, all sizes, $6.50; E. Presto tanks, $10; tool boxes, $1.25 up; tire trunks, $4; Brown, Jr., spark plug pumps, $4.10; swivel searchlight, $5.50; racing seats, $18 per pair; summer lap robes, $1.25; steamer rugs, $2.25; dusters, $1 up; electric headlights, $4.50 per pair; side lamps, $3 per pair; tail lamps, 85c.; mechanical hand horns, $2.45; summer gloves, 75c. per pair; tire pumps, 75c.; magneto, complete dual systems, $17.

We have a special department devoted to parts not carried by any other supply store, such as gasolene tanks for roadsters, $4.25; carburetors, all kinds, sizes and styles; radiators, all kinds, $15 up; transmissions, $40 and $45; steering wheels, $1.50 up; spark plugs, 20c. each up, standard make; cushions for all cars, $2.50 to $5.

Bearings at ridiculously low prices; send in your old bearing and we will match it and save you 50 to 75 per cent. Our line of tools contains the best quality.

FORD SPECIALTIES:—Brown sub-base oiler; Breeze carburetors, $6.50; seat covers complete, $7.50; tire covers, 75c.; shock absorbers, $3.50 set; combination windshield and cowl, $12; one-man tops, $25; Ford radiators, $16.75; stream line hoods, $8; demountable wheels and rims complete, $16.95.

Tires and tubes—guaranteed quality.

Size.	Plain.	Non-skid.	Grey tube	Red tube.
30x3	$6.90	$7.50	$1.80	$2.00
30x3½	8.60	9.35	2.15	2.40

Jacks, 50c.; channel bumpers, $4; complete speedometer with all fittings, Stewart make, $6.65.

Thousands of other bargains in supplies, bodies, tops, windshields, motors, axles; complete cars, etc.

Send for the latest edition of our "Price Wrecker," containing over 3000 money saving items for the automobile.

TIMES SQUARE AUTO CO.

WORLD'S LARGEST DEALERS
S. W. Corner 56th Street and Broadway, New York
1208-1210 Michigan Avenue, Chicago

SNAPS.

Rayfield 1¼" and 1½" Carburetors	$15.00
Stromberg Carburetors, G No. 2 Dbl. Jet 1¼"	11.00
Stromberg Carburetors, A No. 2 Water Jacket 1¼"	12.50
Schebler, Model R 1¼"	11.50
Schebler, Model L 1¼"	8.00
Marvel, Kingston or Holley Carburetors 1½", choice	3.00
Prest-O-Lite tanks, Model B, Filled	11.50
Gas Generators	.90
Stewart Speedometer, Model B, $50.00 list	12.50
Stewart Speedometer Clock & Elec. light comb., $85.00 list	20.50
Magnetos, 6 cylinder K. W. high tension	20.00
Combination tool box and running boards, 60" long	2.50
Plain metal running boards with wood underneath	1.75
Aluminum binding, per foot	.06
4 cylinder Rambler Motor, Model 83, new	175.00
Thermoid Brake Lining, 1¼x3, per foot	.40

Other parts and accessories at equally low figures.

AUTOMOBILE APPLIANCE CO.,
1436-38 So. Michigan Ave., Chicago, Illinois.

The New Departure Service Station

THE GWILLIAM COMPANY

ENGINEERS SPECIALISTS IN BEARINGS

NEW YORK, 253 West 58th Street, (at Broadway)
Telephone Columbus 8356
PHILADELPHIA, 1314 Arch Street, (near Broad St).
Telephone 3497 Walnut

Auto Accessories

BUY WRITE

Get Our New Catalog before placing your orders.

New York & Brooklyn Auto Supply Co.

1717-1719 Broadway New York
Established 1905

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

AUTO DEALERS, AND REPAIR AND GARAGE MEN

New Catalog and Lists ready June 15th.
Send for copy. Wholesale only.
Special prices on Piston Rings, Brake Lining, Grease Cups, etc. Send us your list of wants for special quotations.

WESTCHESTER ACCESSORIES COMPANY
1777 Broadway, New York City

DEALERS—GARAGE MEN and AUTOMOBILE Agents

To make money nowadays you MUST buy cheap. We sell Automobile Supplies and Accessories cheaper than any concern in the world.

Send for our Latest Bargain Bulletin

MECCA MFG. & SPECIALTY CO.
1743 BROADWAY NEW YORK **1208 MICHIGAN AVE. CHICAGO**

Miracle Tire Repair Shop

All Makes Tires Vulcanized, Auto Casings, Inner Tube and Bicycle Tires. Auto Accessories, Non Skid Repairs, Curing Promptly Done. Workmanship Guaranteed.

310 West 47th Street
Near Eighth Avenue **NEW YORK**

For Sale

FOR SALE.—25 Lincoln milling machines; $35 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

FOUR Tire Saving Jacks for Ford cars sent prepaid $1.00. Raise whole car at once. Car can be run without removing jacks. Agents' prices with first order from each town. Particulars for stamp. Andrew Frederick, Harmony, Pa.

MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

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For Sale

FOR BARGAINS in Screw Cutting Engine Lathes write South Bend Lathe Works, 625 E. Madison St., South Bend, Ind.

PISTON RINGS

Ues Peerless Positive leak proof when overhauling your motor, more power on less fuel guaranteed. **Write for circulars and net prices.**

PEERLESS PISTON RING CO.

99 Lafayette Street **NEWARK, N. J.**

LIGHT CAR PARTS—Motors, Transmissions, Rims, Wheels, Steering Gears, Front and Rear Axles. Catalogue free. Palmer Brothers, Coscob, Connecticut.

U-KAN-PLATE—The polish that silver plates. Easily demonstrated on your car; unusual side-line opportunity. Infico Company, 431 Presser Bldg., Philadelphia, Pa.

FOR SALE—Garage and Repair Shop, good territory, A-1 location, small, clean stock of accessories. Sell with or without tools. Address, H. S. Swenson, Sanborn, N. D.

FOR SALE—White Steam Car, five passenger, 30 H. P. in first-class condition, fully equipped. For further particulars and price address M. F. Haines, Box 96, South Brownsville, Pa.

Tires

TIRES TIRES

Reclaimed

GUARANTEED 3500 MILES

40% Off U. S. Price List

We carry all sizes in stock

FEW OF OUR PRICES

Size	Plain Tread	Non Skid	Reclaim Tube	Reliners
30x3	$5.40	$6.42	$1.50	$1.00
30x3½	6.96	8.40	2.00	1.50
32x3½	8.01	9.60	2.00	1.50
34x4	11.64	14.37	2.25	2.00
36x4½	16.41	19.71	2.50	2.50
37x5	19.38	23.34	3.00	2.50

All tires which bear Leon Jaffess name on, will be sold at above prices and adjusted according to U. S. price list.

Terms, C.O.D., 1% cash allowed with order. We do not keep double tread tires in stock.

We advise the use of our New Reclaimed Tires.

LEON JAFFESS

252 W. 55th St. **5019 Euclid Ave.**

NEW YORK CITY **CLEVELAND, OHIO**

FACTORY

400 North 5th Street **HARRISON, N. J.**

Special 2% Discount if purchased at factory for June.

Tires

AGENTS WANTED

For Reclaim or Double Tread Tires

♦ ♦ ♦

Have Your Own Tires RECLAIMED

For $2.50 to $4.50

According to Size

♦ ♦ ♦

We Keep a Stock of RECLAIMED TIRES

PRICE RANGING FROM

$5.50 to $12.50

♦ ♦ ♦

Deal with the Originators

COWANS BROTHERS

150 West 55th Street **New York City**

BRANCH

815 North Broad Street, Philadelphia

TIRES GUARANTEED

We have at last perfected the Double Tread. It is practically blow-out and puncture proof. **Our Tires Are Not Sewed On,** there are no stitches to cut your inner tubes. Let us send one to you to-day for trial. Money back if not satisfactory.

These Tires Average About 5,000 Miles.

Size	Tires	Tubes	Size	Tires	Tubes
30x3	$5.00	$1.93	33x4	$9.00	$3.25
30x3½	7.50	2.42	34x4	9.75	3.35
32x3½	8.00	2.55	36x4	10.00	3.58
34x3½	8.50	3.00	34x4½	11.50	4.24
30x4	8.00	2.97	36x4½	12.50	4.55
32x4	8.50	3.17	37x5	14.75	5.30

Tires are sent subject to examination, C. O. D., 10% deposit required. **Tubes are guaranteed.**

TUXEDO AUTO TIRE EXCHANGE

896A Eighth Avenue **NEW YORK CITY**

GERMANIA RUBBER WORKS

AUTO-TIRE REPAIRING

Tube Vulcanizing, 15c.

Use Roll-in-White, it Preserves your Tires, 25c. per pint.

1092 Bedford Avenue **BROOKLYN, N. Y.**

TIRES TIRES TIRES

Automobile Dealers Take Notice.

We now offer for sale our Henschel Special tires in al sizes and types. **Write for our special dealers' proposition**

HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

Tires

SAVE 75%

ON YOUR

TIRE BILLS

BY USING OUR

DOUBLE TREAD TIRES

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS

MAIN STORE

1319A Fifth Avenue, New York

BRANCH AT

282A Halsey Street, Newark, N. J.

DOUBLE TREAD TIRES

All sizes up to 38x5½
Guaranteed for 3500 Miles

Size	Plain	Non Skid	Pure Gum Tubes	Red
30x3	5.00	5.50	2.04	2.64
30x3½	6.00	7.00	2.55	3.20
32x3½	7.00	8.00	2.70	3.44
32x4	8.00	9.00	3.35	4.14
33x4	9.00	10.00	3.46	4.14
34x4	9.00	10.00	3.58	4.36
35x4	9.00	10.00	3.68	4.56

These tires are Absolutely Puncture Proof.
Be sure to state whether regular Q. D. or straight bead.

WHY PAY MORE?

Will outwear any make of tire at a saving of 75% of your tire bills. **Send us a trial order today.**

THE DOUBLE TREAD TIRE CO., Inc.

'Phone, Col. 8681 **116D W. 52d St., New York City**

Double Tread Tires

AT 75% SAVING

GUARANTEED

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.50	$9.50
30x3	$5.00	$5.25	36x4	8.75	9.50
30x3½	5.75	6.25	34x4½	9.50	10.50
32x3½	6.50	7.00	35x4½	9.50	10.50
32x4	8.00	8.50	36x4½	9.50	10.50
33x4	8.00	8.75	37x4½	9.50	10.50
34x4	8.00	8.75	37x5	11.00	12.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER

243a West 56th Street **NEW YORK**

AGENTS and DEALERS Wanted for ***STAR SOUND TIRES.*** Guaranteed 4000 miles. Good proposition for live agents, and dealers.
STAR RUBBER CO., 1781 Broadway, New York, N. Y.

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Tires

OWNERS

CUT YOUR TIRE BILLS

BY USING

Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

We pay express charges on receiving your old tires and return C. O. D. subject to inspection.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

For all other sizes write for prices,

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN

27A East 110th St. NEW YORK CITY

Branch: 205 W. 48th St., New York City

DOUBLE TREAD

Points the way to tire satisfaction and will surely save you 75% of your tire expense

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Terms C. O. D. 10% deposit.

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SEE OUR ADVERTISEMENT on page 121 regarding cylinder regrinding and welding broken cylinders or crankcases. Waterbury Welding Co., Waterbury, Conn.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WE DO WELDING others cannot do. Send your worst smashed crank cases, transmission housings and broken cylinders made of aluminum or cast iron. Jobs finished up so do not show repair, and painted. Finest equipped plant west of Chicago. Hobbie Welding Plant, Hampton, Iowa.

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Crankshafts, crankcases, connecting rods, pistons.

SCORED CYLINDERS

made equal to new with our new silver iron process—USE THE SAME PISTON AND RINGS.

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Dart truck pressed steel frames 36" wide, 6 cross members 9 ft. 2" long, 3½" deep		5.00
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Krit Truck springs, ½ elliptic, 2" wide, 40" long, 8 leaves	Each	2.50
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McCue 34x4½ wheels	Each	5.00
36x4½	Each	7.00
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Ford Racing Seats, painted and upholstered in mohair	Per pair	15.00
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42" long	Each	.20
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CAN now be made with assurance that your customer does not invite a repetition of the trouble if you buy

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Radiator specialists. All makes repaired on short notice. Manufacturers of fenders, all styles and shapes. Lamps that will stay lit. Over 1,000 pairs to select from. Plating and polishing, silver, nickel and brass enameling, sprayed or baked. The oldest and most up-to-date metal workers. 243-245 W. 47th St., New York City. Telephone Bryant 4266.

WE Repair Lamps, Radiators, Windshields, of every description. Also Repair, Rebuild and adjust Carburetors. Special attention given to enameling and nickel plating.
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RADIATOR BARGAINS.

Ford Model T Honeycomb V-shaped	$25.00
Buick 16 and 17	33.50
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Hudson 20, 32 and 33	28.50
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Cutting Models A and B 40 and T 35	20.00
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Write for prices on other makes.
AUTOMOBILE APPLIANCE CO.,
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Telephone 6597 Bryant M. Drimmer, Pres.
German-American Auto Radiators & Lamp Co.
Radiators, Mud-Guards, Tanks and Fancy Brass and Copper work. New and Repaired. Also Nickel Plating. Glasses and Wind Shields a Specialty. Open Day, Night and Sundays. 258 W. 47th St., New York City

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CYLINDERS REBORED AND REGROUND and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.
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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

TOPS BUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

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and fitted with new pistons and rings for $5 to $11 per cylinder. We do this class of work exclusively and give you the highest quality of work at these prices. Ford cylinders reground and fitted with pistons, rings and wrist-pins for $20, discount to dealers.
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We fill your scores with a silver composition by patent electric process. No heating to warp cylinders. Welding in all its branches. L. Lawrence & Co., Newark, N. J.

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NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order. Prompt and reasonable.
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CYLINDERS REBORED
Best quality piston and rings fitted, any make and size. $3.00 and up.
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NEW SUBSTITUTE FOR WELDING ALUMINUM
by our **aluminum solder** (German process) at only **fractional cost** of **welding**, as evidenced by favorable notices in Automobile Magazines. Territorial Rights negotiated. Big money for repair shops.
German-American Aluminum Co.
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WE SPECIALIZE IN CYLINDER GRINDing, pistons and rings. First class equipment, 20 years' experience make low prices possible. Ford and Metz cylinders reground, new pistons and rings, $20. Bridgeport Piston Ring Co., 346 Connecticut Ave., Bridgeport, Conn.

PAINT YOUR OWN CAR
FOR $4.00. Write for interestiug booklet and color card. We can save you money.
ECONOMY SERVICE COMPANY
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CYLINDERS REBORED & REGROUND
Fitted with my heat treated light weight pistons and patented three section rings. From $6 to $15 per cylinder. Ford cylinders reground, fitted with new pistons, rings, bushings and wrist pins, $20.00.
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MANUFACTURERS' OPPORTUNITY.
$10,000 TO BE GIVEN AWAY by the City of Cadillac, Mich. Cadillac makes this liberal offer in order to secure new manufacturing concerns and will actually give this amount to an individual or company locating here with an automobile or accessory factory. We have a low rate of taxation, good shipping facilities, and within 48 hours' ride of 40 million people, and also have a cheap electric power. Nothing too large or too small for our careful consideration. If you are interested, communicate at once with T. R. Graham, Cadillac, Mich.

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Save $25 to $75 by doing the work at home with the Arsenal System. Our big free booklet, "The Car Beautiful," tells how. Send for it today.
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1915 Automobile Registrations
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supplied on sheets or cards. Addressing, folding and mailing to auto owners. Special lists promptly compiled such as Ford, Overland or Electric owners, dealers, chauffeurs, etc.
List Ten States, 1915 Complete, $20.00
Write for Details
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ALBANY, N. Y.

200,000 1915 N. E. REGISTRATIONS $13.00
During 1915 from January 1st we shall publish in weekly installments and numerical order, all the motor registrations of New England as filed. Sub. $13.00. AUTO LIST PUB. COMPANY, 138 Pearl Street, Boston

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SOLE REPRESENTATIVES
Wanted in each County to sell
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Whittelsey Carburetor Adjuster
which enables
FORDS
To Run 31 Miles per Gallon of Gasoline
Splendid proposition for any live man with a knowledge of the FORD Car.
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We manufacture parts for all types of
Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos
Liberal discount to the trade.
Illustrated Catalogue on request.
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If interested in agency write for particulars.

Wanted

WANTED—Salesmen calling on the Ford trade to handle new line of Ford specialties as a side line. Goods guaranteed. Liberal commission. W. S. Graffam & Co., Northampton, Mass.

WANTED—Practical salesmen traveling by car, calling on garages and accessory trade. A correct demonstration of the Healy Valve Reseater invariably means a sale, and we pay big commissions. Healy Tool Company, Buffalo, New York.

WANTED—Single cylinder bevel gear drive DeDion or Ward Leonard cars of 1900 or 1901 model regardless of mechanical condition. Address, B, c/o Automobile Dealer and Repairer, P. O. Box 654, N. Y. City.

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USE AN AIR-FRICTION CARBURETOR 1915 Improved Model C or G. Increases power and economy of motor one-half. Absolutely impossible to load or choke. Starts easy warm or cold weather. Uses either high or low grade fuels with finest results. We fit all motors and guarantee definite results or refund money if returned within thirty days. Liberal exchange allowance on other carburetors or old model Air-Frictions. We also make and absolutely guarantee the Air-Friction Spark Plug. Sold in sets of five only at $3.00 per set. The Air-Friction Carburetor Co., Dayton, Ohio.

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VULCANIZERS—Shop and individual use. A slightly used shop vulcanizer; A1 condition. Write at once. Vanderpool, Springfield, Ohio.

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REBUILT CARS, $200–$500
Limousine, Laudaulet, Cab, Sedan Bodies, $100 to $600. Tops, $10. Envelopes, $1. Touring Bodies, $50.
20th CENTURY CO., 1694 Broadway near 53d St., New York

Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

Chevrolet Prices Reduced.

The Chevrolet Motor Co. has made a material reduction in the prices of the Baby Grand, which is a five-passenger car, and the Royal Mail, a roadster. The touring car has been reduced from $985 with full electrical equipment to $750, a difference of $235, and the roadster from $860 to $720, a difference of $140, also including electrical equipment. The five-passenger 4-90 sells at $490 without electric lighting and starting and $550 with it.

Ford Reduces Prices of Parts.

The Ford Motor Co. has made a reduction on most of its parts, ranging from 10 to 25 per cent. A few parts, however, which it was found cost more to manufacture now than heretofore, were increased in price. For instance, the front axle assembly now costs $24 instead of $22. On the other hand the rear axle assembly, which formerly listed at $60 now costs $55. Radiators have been reduced from $20 to $15; fenders from $3 to $2.50.

Money in Racing.

The opening of the new two-mile Sheepshead Bay Speedway, New York, will without doubt take place Saturday, October 2. Instead of ten money prizes, as given at Indianapolis, there will be twelve, with $20,000 to the winner, $10,000 to second, $6,000 to third, $3,000 to fourth and $2,500 to fifth. The last seven prizes are $1,600, $1,400, $1,300, $1,200, $1,100, $1,000 and $900. Entries will close September 1 the fee being $200 per car, which is returned if the car starts.

White Tank Trucks for Russia.

The White Co., of Cleveland, Ohio, has received an order for 300 tank motor trucks for the Russian army to be used as tenders for the thousands of motor cars and trucks at the front. The order will amount to about $1,000,000. The White Co. recently completed a large order of similar trucks for the French army. The plant is now being operated with three shifts.

Sheldon Increases Output of Gears.

An increase of 43 per cent. during the fiscal year ending September, as compared with the previous period, was shown in the worm gear truck axle department of the Sheldon Axle and Spring Co., Wilkes-Barre, Pa. Since that time production in this department has continued to increase, the seven months of the current fiscal year showing an increase of 42 per cent. over the corresponding period of the previous fiscal year.

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LIVINGSTON PRODUCTS FOR FORD CARS

FORD OWNERS

Increase Efficiency—Improve Appearance
WITH
LIVINGSTON
Honeycomb Radiators and Sloping Hood



Front of Livingstonized Ford Car

In Death Valley, California, where the heat is almost unbearable—in India where the thermometer often registers 150 degrees

Livingston Radiators Keep Ford Motors Cool

They are sold under a guarantee to give this kind of service.

A Livingston Sloping Hood will give your Ford car that long streamline effect.

Insist upon the name Livingston There is no "Just-as-Good"

Pointed Front Radiator . . .	$40.00
Straight Front Radiator . . .	35.00
German Silver Finish, extra .	5.00
Streamline Hood	8.00

Ask your Ford dealer, hardware dealer, or supply house, or write us for full details.

Livingston Radiator & Mfg. Co.,
303 West 75th Street New York City

Saturday Eve. Post	2,093,395
Literary Digest	346,417
Farm & Ranch	90,000
Nebraska Farmer	51,139
Iowa Homestead	140,000
Circulation	2,720,951
Readers, about	13,604,755

Dealer Bulletin No. 1

We are taking it for granted that somewhere you have read about the construction of Livingston Radiators and Streamline Hoods in your favorite trade paper.

We are now going to talk to you about profits.

On the left hand side of this page we are reproducing An "AD" on Livingston products, which is being read by over thirteen million people this month.

Many of them own Ford Cars.

Many of them will buy Livingston products this year Many of them are your customers.

These advertisements are in addition to our present big trade paper campaign.

Profits are made in turn-overs and not left-overs.

If you have not already investigated the Livingston line, don't you think it would pay you to do so now?

We are originators of the Pointed Front Radiators and Streamline Hoods for Ford cars.

Livingston Radiator & Mfg. Co.

303 W. 75th Street, New York, N. Y.

All types of Radiators built and repaired

BUILT UP TO A STANDARD NOT DOWN TO A PRICE

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FOR FORDS

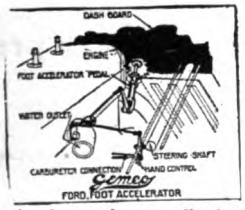
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MILWAUKEE
TRADE MARK
"THE SIGN OF SATISFACTION"

FOR FORDS

The Big Line of
POPULAR FORD SPECIALTIES
For the Jobber---Dealer and Ford Owner



Combination Rear End Tire Holder.
Complete with Straps.....$3.95
Without Lamp and License Bracket..... 3.20



The simplest and most effective Foot Accelerator on the market. It is positive action, easy to attach and is proving a tremendous seller. Directions for attaching furnished with each Accelerator.

Price, Complete.....$1.50



Pneumatic-Springs are real Shock Absorbers that belong on every Ford car. Mechanically perfect and thoroughly guaranteed.
Price, Per Set of Four.....$15.00

Illustration at right shows the Gemco Mechanical Starter—Shock Absorbers and F-10 License Clamp and Bar. These are three important Ford Accessories.
Starters.....$15.00
F-10, Complete..... 1.00

GEMCO OFFERS YOU

The most complete line of high-grade Ford Specialties to be had.

More than fifty different articles, including:

Starters	Radiator Caps
Shock Absorbers	Spark Plugs
Tire Holders	Anti-Rattlers
Bumpers	Truss Rods
Steering Wheels	Wheel Pullers
Brake Bands	Robe and Foot Rails
Brake Shoes	Chain Grips
License Brackets	Mud Hooks
Wind Shields	Foot Accelerators
Lamps	Cutout and Horn Outfits
Radius Rods	Standard Bolts and Nuts
Radiator Cradles	Tools, Etc.

The best proposition offered the live dealer this season—Quick Sales, Good Profits and Satisfied Customers. Sold by leading supply houses throughout the country.

Send for Ford catalog today.

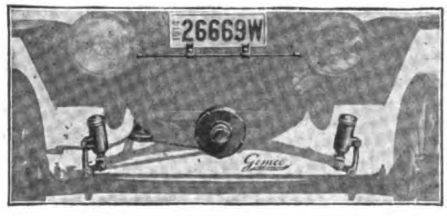
The Latest and One of the Most Important Ford Parts

The Gemco Quick Detachable Transmission Bands

20 Minutes to Attach the New Band.
(See Illustration and Description.)

THE OLD WAY	THE NEW WAY
Means Tearing Down Transmission Case — Three or Four Hours' Time and Several Dollars Expense.	Open Case Cover—Insert Gemco Quick Detachable Band (See Illustration). 20 Minutes' Time. Practically **No Expense.**

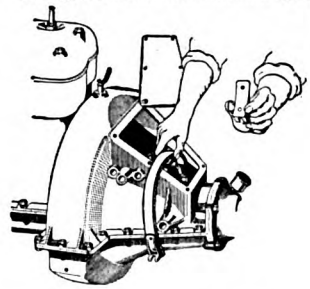
Gemco Manufacturing Company,
Formerly Garage Equipment Mfg. Company
756 So. Pierce Street, Milwaukee, Wis.

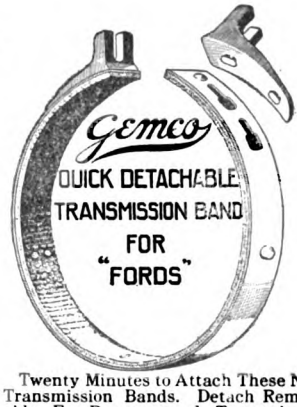


17" Tilting Steering Wheel for Ford Cars



Easier Steering—Greater Leverage—More Room.
17 in. Stationary, Plain.....$3.60
Corrugated..... 4.50
17 in. Tilting, Plain..... 4.50
Corrugated..... 5.50





Twenty Minutes to Attach These New Transmission Bands. Detach Removable Ear-Pass around Transmission and Lock (See Illustration).

The initial expense of this new Band is about one-third of the cost to install the old Band These Bands can be relined at a small expense and will last the life of the car. Prices:
Gemco Quick Detachable Bands, Lined.....each, $1.50
Lining Only, Three in a Box, with Rivets..... 1.00

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MORE COMFORT GREATER SAFETY LESS EXPENSE

WHEN YOU USE STANDARD Hartford EQUIPMENT FOR Ford CARS

Standard Hartford Equipment increases the pleasure of Ford ownership by contributing to more comfort, greater safety, less expense.

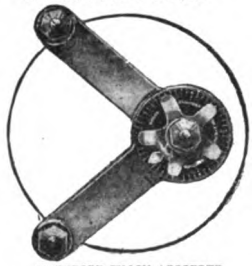
Here is a Comfort Combination

that will make a Ford ride with marvelous smoothness over **all** roads, and incidentally cut upkeep expense. It is the result of long, careful study of Ford requirements, supplemented by severe road tests. Here it is:—

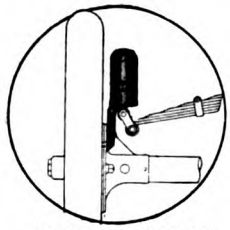
FAMOUS *Hartford SHOCK ABSORBER
On the front of a Ford

AND

FAMOUS Hartford CUSHION SPRING
On the rear of a Ford



HARTFORD SHOCK ABSORBER



HARTFORD CUSHION SPRING

You have noticed that it is more comfortable to ride in the front seat of a Ford; this because the weight of the engine has a steadying influence on the front part of the car. The presence of a Hartford Shock Absorber, here, has the effect of accentuating this steadiness when rough roads are encountered, preventing, as it does, the violent spring action which would otherwise occur because of the extra weight at this point.

Since there is less weight at the rear, there is necessarily limited spring action. Greater resiliency is desirable here. Two Ford type Hartford Cushion Springs supply it.

This Hartford combination solves the problem of solid auto comfort for Ford owners. You can test it and satisfy yourself of its effectiveness, with the guarantee—"Money Back if Not Satisfactory."

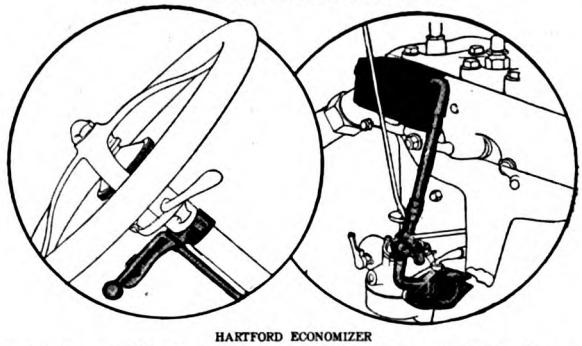
PRICE One Hartford Shock Absorber, Ford Type / Two Hartford Cushion Springs, Ford Type **$12.00**

Get 35% More Mileage

Every gallon of gasoline can carry a Ford over one-third farther than it now does. While doing this, its owner can enjoy more power and a smoother running engine. Can decrease carbon deposits. These advantages are positively realized as soon as a Ford is equipped with the

* Formerly Truffault-Hartford.

Hartford ECONOMIZER



HARTFORD ECONOMIZER

designed especially for Ford cars. It furnishes an ideal mixture. Utilizes more air and less "gas." Feeds the engine the most effective kind of fuel. Try it. You will quickly recognize its great economic value. It must make good—"Money Back if not Satisfactory." Easy to put on by anybody.

PRICE, with fittings complete, $6.00

Gives a Ford a "Classy" Look

while protecting its fore parts from collisions—a

Hartford Bumper



HARTFORD BUMPER

Ordinary collisions then prove harmless to lamps, radiator and mud-guards; severe collisions cannot damage the car itself, because the two arms of the Hartford Bumper are real shock absorbers. They dissipate the force of heavy blows, thus protecting **all** the car. Light in weight; trim in design; tremendous in strength; practically indestructible. Gives the effect of longer lines to frame and car; adds greatly to its appearance. Designed especially for the Ford. Easily put on in 15 minutes. Saves its purchase price many times over during the car's life.

PRICE COMPLETE, $10.00

Complete descriptive matter on all Standard Hartford Equipment for the Ford, on request. A Liberal Sales Proposition for Dealers. GET IT.

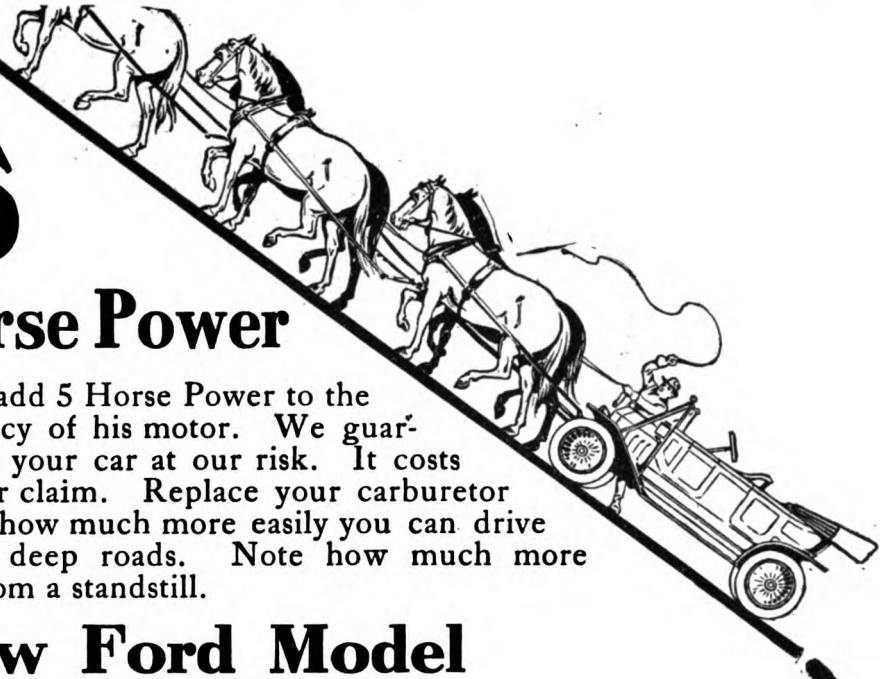
HARTFORD SUSPENSION CO., E. V. HARTFORD President **141 Morgan St., Jersey City**

Makers of the Hartford Shock Absorber, Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper

BRANCHES: BOSTON, 319-325 Columbus Avenue; CHICAGO, 2637 Michigan Avenue; NEW YORK, 1846 Broadway and 212-214 West 88th Street. NEWARK, N. J., 273 Halsey Street; INDIANAPOLIS, 425 North Capital Boulevard.

Distributors: Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; L. Mastrangel & Co., 117 South Beatty Street, Pittsburgh Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc.; Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Charles Rubel & Co., 1312 Fourteenth Street, N. W., Washington, D. C.

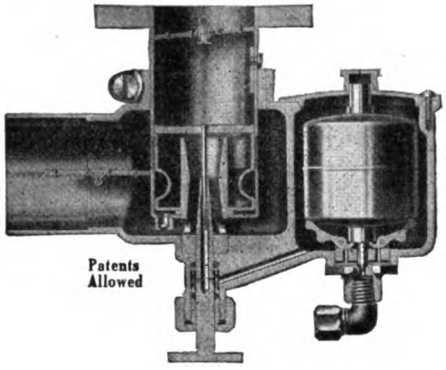
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5
Extra Horse Power

Every Ford owner can add 5 Horse Power to the actual working efficiency of his motor. We guarantee it and prove it on your car at our risk. It costs you nothing to prove our claim. Replace your carburetor with a *Brad-Kent* and see how much more easily you can drive up steep hills or through deep roads. Note how much more quickly you can get away from a standstill.

New Ford Model

Brad-Kent  Carburetor

Patents Allowed

The *Brad-Kent* carburetor is constructed upon a new scientific principle. It is the only efficient carburetor with but a single adjustment. Mixture is always the same, regardless of speed. Works as smoothly at 4 miles per hour as at 35 miles.
Lighter, simpler and more easily handled than other types. Easiest to start in cold weather. No water jacket to freeze. Gas and air both regulated by speed of the motor. Cylinders fill better and the perfect mixture will not deposit carbon. The price for the complete Ford outfit is $15.00—money back if not satisfied in 30 days. Try it on your own car. Make us prove our startling claims.

10 Miles Extra Speed

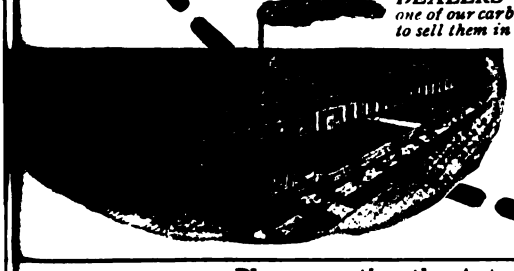
Put a *Brad-Kent* on your car today. And tomorrow you can drive 10 miles faster—on less gasoline consumption. We guarantee to beat other carburetors by at least 10 miles. Make us prove it.

Saves 2 Gallons Out of 5

The *Brad-Kent* will carry you 32 miles on the same amount of gasoline you now require for 20 miles. We have proved this many times. We are so sure of this that we guarantee to drive your car as far and as fast on 3 gallons of gasoline as you can now travel on 5 gallons. In a recent official test conducted by F. E. Edwards, Official Observer for the Chicago Automobile Club, a Model "T" Ford was driven at an average of 33.12 miles per gallon. This record was made in a run of 102.1 miles between Chicago and Milwaukee. You want this extra horsepower. You will enjoy this extra flexibility and speed. You need this marked saving in gasoline consumption. And we positively guarantee to you *all these things*. Our responsibility is well known. Make us show you.

30 DAYS' FREE TRIAL Mail the attached coupon with Check or Money Order for $15.00. We will promptly send you a *Brad-Kent* Carburetor, manifold, hot air tube and stove. Install it on your Ford. It can be done in a few minutes without special tools. Then try it for 30 days at our risk. If you are not satisfied in every way just send the outfit back to us and we will promptly refund your $15.00 in full. No questions asked. Your money back, regardless of the reason why. You are the sole judge.

DEALERS—Be sure to write for our attractive dealer proposition. Try one of our carburetors and see how much better it is. We will help you to sell them in your neighborhood. Write today.



The Frost Mfg. Co.
670 Fremont Avenue
Kenosha, Wisconsin

(3)

MAIL IT

30-Day Approval Blank

The Frost Mfg. Co., 670 Fremont Ave., Kenosha, Wisconsin

Enclosed find Personal Check or Money Order for $15.00, for which please ship me a *Brad-Kent* Carburetor and complete outfit for a Ford car. My repair dealer is .....

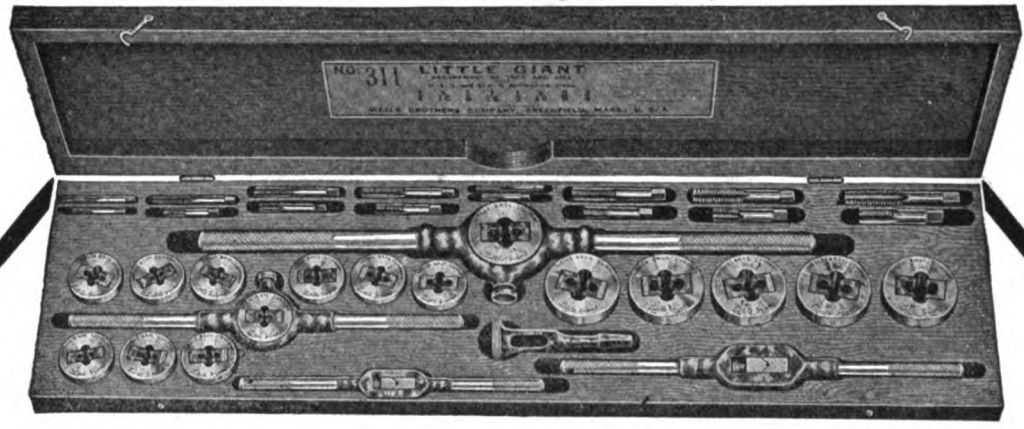
Ship to.....

Address.....

I understand that I may return these goods to you within 30 days, at your expense, and get my money back if I wish to do so.

(3)

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Little Giant AUTOMOBILE SCREW PLATES

GOOD WORK REQUIRES GOOD TOOLS

Now that the overhauling season is at full blast repairmen and garage owners need tools for cutting screw threads by hand and should have the best. Out of our large and varied list of assortments of taps and dies we want particularly to call your attention to the screw plates, one of which is illustrated above, called

Little Giant COMBINATION ASSORTMENTS (Containing both S. A. E. and United States Standard Threads.)

These assortments avoid the expense of buying a separate outfit for each thread standard and the expense of duplication of stocks and tap wrenches.

Little Giant DIES CUT EASIER **Little Giant DIES ARE MORE DURABLE**

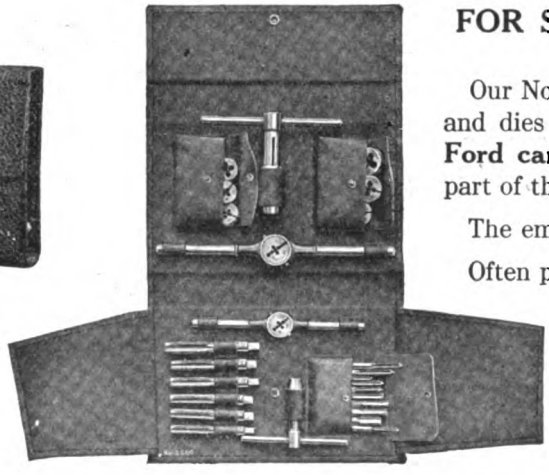
Impossible for them to tilt or get out of alignment. Increasing the working strain only tightens the grip of the collect upon the working parts of the dies. Send for circular, "Tools for the Automobile." A postal brings it.

WELLS BROTHERS COMPANY DIVISION

LIGHTNING EMERGENCY REPAIR KIT

FOR SCREW THREADS





Our No. 2500 assortment of taps and dies is designed especially for **Ford cars,** is equally useful as a part of the equipment of any car.

The embodiment of utility.

Often pays for itself on one job.

Genuine Goat Skin
Leather, Canvas Lined
Hardwood Case
if desired

LIGHT, COMPACT
DURABLE
CONVENIENT

Has 16 taps, 16 dies, 2 stocks and 2 tap wrenches

Dealers will find a great demand for these sets and we are looking for live agents in every territory to handle them. Write for proposition today.

WILEY & RUSSELL MFG. COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

WELLS BROS. CO. DIVISION **WILEY & RUSSELL MFG. CO. DIVISION** **A. J. SMART MFG. CO. DIVISION**

SCREW CUTTING TOOLS AND MACHINERY

GREENFIELD, MASS.

New York
28 Warren St.

Philadelphia—38 No. 6th St.

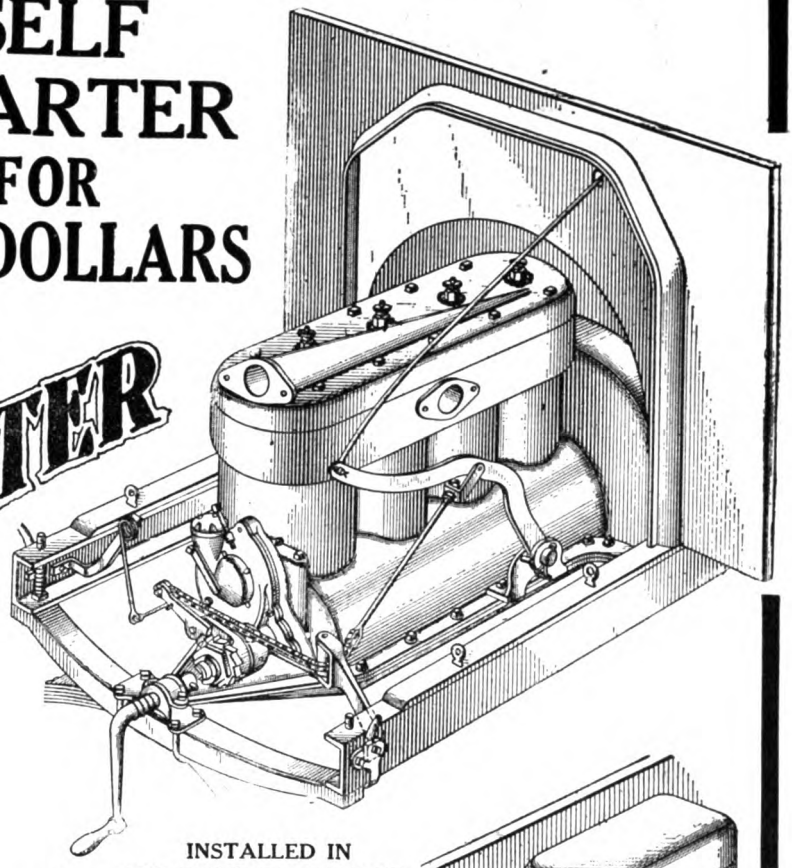
Chicago
13 So. Clinton St.

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$10

Think of it!

A SELF STARTER FOR 10 DOLLARS



The HUNTER

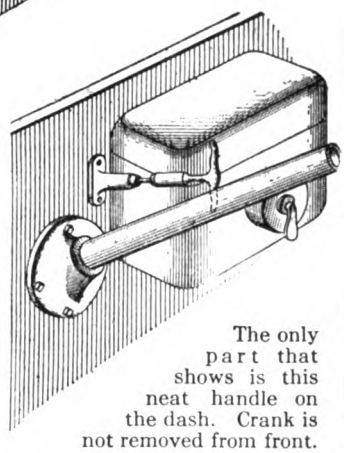
Complete with all attachments and instructions

JUST WHAT THE FORD OWNER HAS BEEN LOOKING FOR

At Last Mr. Ford Owner!

Your wish has come true. The best starter for a Ford car ever devised and costs less money. It gives you every convenience of the bigger, costlier cars (as you can use electric headlights on your magneto current).

INSTALLED IN ONE HOUR BY ANYONE



The only part that shows is this neat handle on the dash. Crank is not removed from front.

INCREASES THE VALUE OF A FORD THREE TIMES

Note the Advantages

Powerful—The straight pull and powerful leverage enable a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

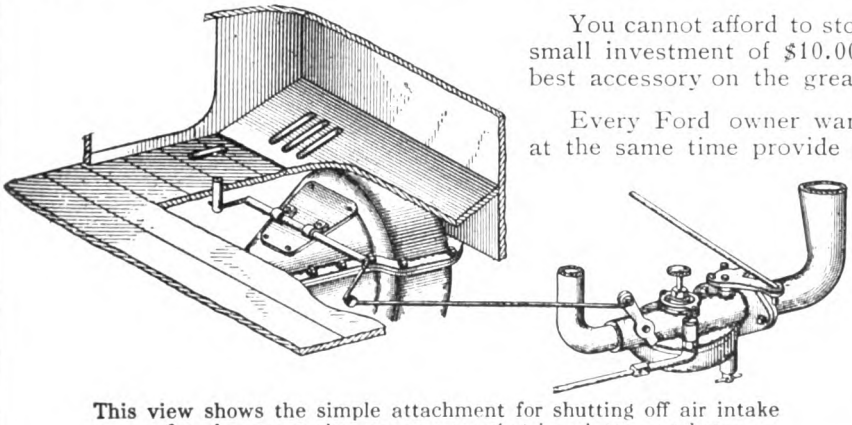
Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

You cannot afford to stop at the small investment of $10.00 for the best accessory on the greatest automobile on the market.

Every Ford owner wants to make his car up-to-date and at the same time provide for comfort.



This view shows the simple attachment for shutting off air intake of carburetor to insure easy starting in winter weather.

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS for FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. Price, $1.00. Quickly installed. Sold by leading dealers.

THE HUNTER AUTO SUPPLY CO.

4101-5 EAST RAVENSWOOD AVENUE CHICAGO, ILL.

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UTILITY



PRICE $10.00
Complete with
Pneu-Meter

THE ONLY TRULY AUTOMATIC TIRE PUMP ON THE MARKET

The Pneu-Meter installed on the hose line prevents over inflation as well as under inflation. Connect your pump, set your Pneu-Meter at the right pressure, start your engine and forget it.

You don't have to watch your pump—the Pneu-Meter does it for you—when your tire is properly inflated, it becomes a **Safety** blow-off valve, using excess pressure to sound a continuous signal. **So simple a woman can work it.**

PRICE $2.00

UTILITY Jr.



PRICE $6.00
Complete with
Pneu-Meter



WHISTLING PNEU-METER

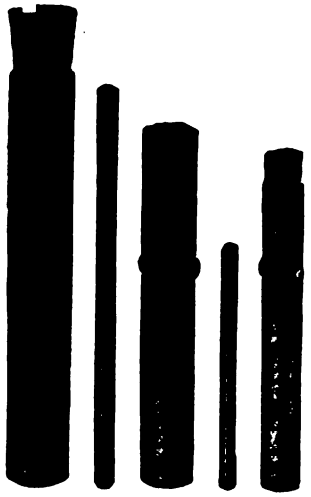
Sold separately and can be installed on the hose line of any other spark plug or gear driven pumps, garage air tanks, etc.

Absolutely accurate and cannot get out of order. Whistles loudly and can be heard fully a block away, and will continue until the engine stops.

Over and under inflation decreases the life of your tires. This is due to the use of tire pumps which are equipped with ordinary dial gauges and which at the best are inaccurate. This trouble and expense can be absolutely avoided by using **Utility Pumps equipped with Whistling Pneu-Meters.**

Smallest and fastest—simplest and best constructed pumps ever made—**absolutely safe.**

Built of rust-proof bronze, brass and nickeled steel. **LASTS A LIFETIME.**



7', 6' and 5' Long Respectively

The UTILITY Socket Wrench Set

A New Principle With Many Advantages

Has all the advantages of socket wrench sets consisting of fourteen wrenches, with none of their faults. Instant in adjustment. No screws to manipulate, or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench.

SOME NEW FEATURES

Will grasp any nut instantly and requires no further effort to hold wrench in place. In removing, the jaws hold nut firmly at all times, so it cannot fall or become lost. On the other hand, nut can be placed in jaws and applied to bolt or screw when same is inaccessible to the hands.

Unequalled for use in Garages and Machine Shops, in fact, wherever nuts and bolts are used.

Will take all nuts from ⅛ to ½ inch, inclusive.

Will take all nuts used in auto work.

Will take hexagon nuts, square nuts, wing nuts, cock nuts, and nuts rounded or distorted by use of other wrenches.

Cannot slip and bruise fingers of workmen, as jaws have rigid bearing on four sides—the harder you pull, the harder the jaws grab the nut.

Look at its wonderful advantages and then look at the price.

Utility Wrench Set Complete, $2.50

Packed in neat canvas bag.

Write for Our Dealers' Proposition.

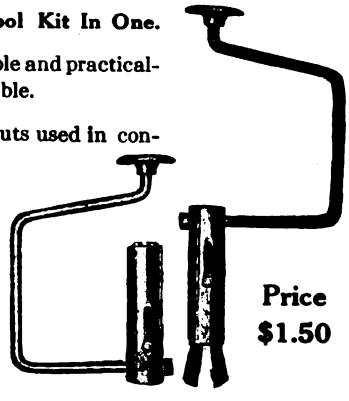
THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

Small, simple and practically indestructible.

Takes all nuts used in connection with demountable rims.

Wrench can be folded when not in use.



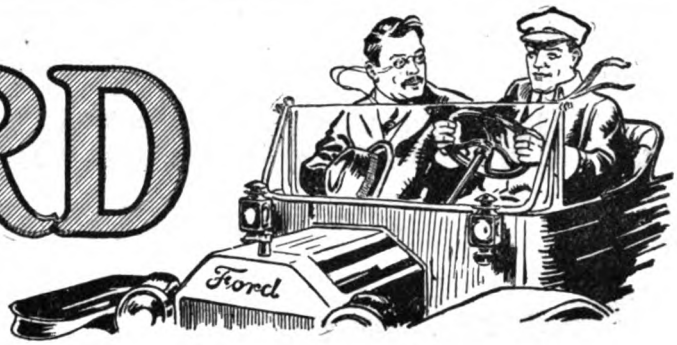
Price $1.50

THE HILL PUMP VALVE CO.

18-22 EAST KINZIE STREET CHICAGO, ILLINOIS

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For your **FORD**



Atwater Kent Ignition

Your first ride in an Atwater Kent-equipped Ford will surprise you—you will see for yourself the wonderful performance of this remarkable motor when equipped with the same modern high-grade ignition system which has displaced the magneto on thirty representative American cars.

Imagine running through a crowded street at three or four miles per hour on high, and, at the first break in traffic, accelerating with all the smoothness and rapidity of a "light six" up to the limit of your speed, without changing gears or touching the spark lever.

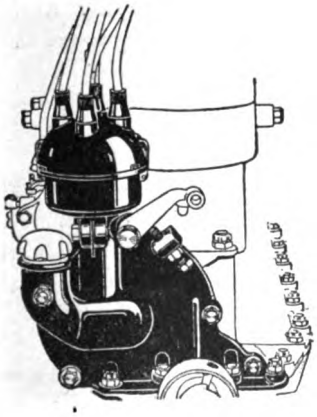
Just think of a scientific ignition system which gives you a single hot spark, uniformly hot and exactly alike in each cylinder, no matter whether the motor is being cranked slowly or is running at forty-five miles an hour—and at the same time ridding your dash of the noisy vibrating coils with their fussy and delicate adjustments.

The wonderful automatic spark advance which is only one feature of the Atwater Kent System, makes the motor self-regulating. The spark is always safely retarded for easy starting, automatically advanced for high speeds and automatically retarded for low speeds and hill climbing. The driver can forget the spark lever and control his car by means of the throttle alone, leaving both mind and hands free.

In installing Atwater Kent Ignition you join a mighty army of two hundred thousand owners, ten thousand dealers, two hundred jobbers, and thirty manufacturers, all of whom can certify to its success. More than one-quarter of all the cars made this year, exclusive of Fords, are Atwater Kent-equipped.

MAGNETO REPLACEMENT — For cars of all makes we furnish the Atwater Kent System, mounted on a universal base so that it may be easily installed in place of any standard magneto at reasonable cost.

The car owner who has put up with the limitation of magneto ignition can not only improve the starting and slow speed qualities of his car, but can enjoy all the advantages of automatic spark control, flexibility and better acceleration, now being experienced by thousands of other enthusiastic Atwater Kent users.



When your car is Atwater Kent-equipped you have the satisfaction of knowing that money can buy no better ignition equipment and that your judgment is upheld by a large number of the foremost automobile engineers in the country.

DEALERS, GARAGE AND REPAIRMEN

Thousands of them recommend Atwater Kent Ignition because it "stays sold"—there is no question of a come-back. The user is enthusiastic and brings them other customers.

Write for dealer's data.

FREE: **Write your name and address NOW on the margin of this advertisement, or send a postal for an interesting Ford story, "Why Smith Kept His Ford," together with complete descriptive matter relative to this famous ignition system.**



Atwater Kent Mfg. Works

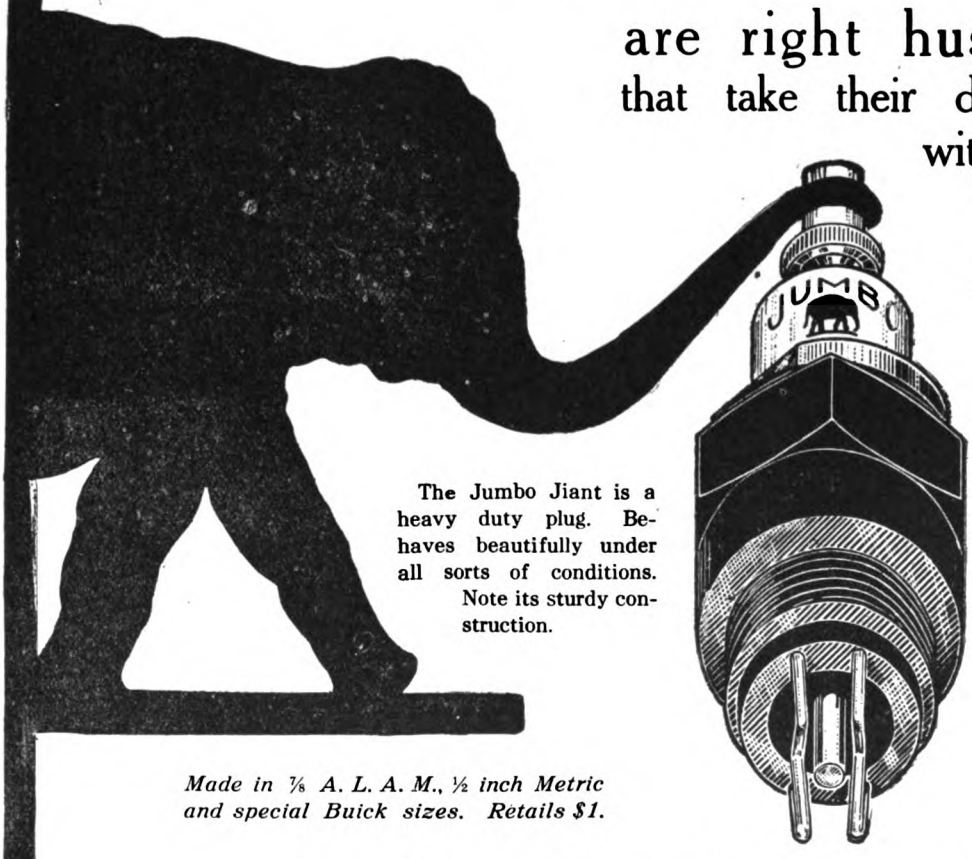
4933 Stenton Ave., Philadelphia

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Jumbo Spark Plugs

(Red Elefant Brand)

are right husky fellows
that take their daily punishment
without a whimper.



The Jumbo Jiant is a heavy duty plug. Behaves beautifully under all sorts of conditions. Note its sturdy construction.

Guaranteed for One Year

You will make a hit with your trade by stocking Jumbo Plugs. Your customers will say: "Bully good plugs; give me a spare set."

Made in ⅞ A. L. A. M., ½ inch Metric and special Buick sizes. Retails $1.

—no other plug will satisfy your customers like the Jumbo. Here are a few reasons why—

Steel Shells

The shells of Jumbo plugs are cold rolled steel. Better than brass—greater tensile strength. And practically no expansion under heat.

Won't Rust

To overcome rusting, we employ a new metal finish which is an absolute preventative of rust. It withstands 1,200 degrees F.

Extra Strong Porcelain

Practically impossible to break or crack the porcelain except by a hard blow. By building the porcelain on the top instead of the lower shoulder, it gives twice the distance for expansion and contraction. Thus it reduces the danger of cracking or breaking as a result of heat.

Scat to Soot!

The porcelain skirt is so arranged that each explosion blows the end free from soot. And notice how the shell electrodes are bent in the middle. They lead the oil ***away*** from the firing points.

GIBSON-HOLLISTER COMPANY

3389 Washington Street, BOSTON, MASS.

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LIST PRICE ONLY

$125.00 COMPLETE

Dealers, send for Discount

For Business and Pleasure
Body and Top—3 seats, 2 seats, 1 seat. Without Top - 3 seats, 2 seats, 1 seat
List prices range from $125 to $75. Fits Ford or other chassis

Ford Dealers—Here's the New Beverly-Cotton Body

Isn't it a beauty? Ever seen anything half as classy? It's a real aristocrat. Style sticks out in every line of it.

Sells At Sight

Man alive, how this Beverly-Cotton body will sell! Right now while you're reading this you can think of at least half a dozen Ford owners you can land. They'll jump at it. Just show them the illustration. And then hear them say: "Get me one—quick!"

Big Profit For You

And listen—Every Beverly-Cotton body you sell means a nice, juicy profit. The finest way of fattening your bank account just now is to sell Beverly-Cotton bodies. Just like picking cherries.

Cotton Is King

of the automobile body business to-day. You've heard of Cotton. He's had the most phenomenal success of any man in the automobile business of New England. He's *Ford* when it comes to automobile bodies—don't mistake that. You're a Ford agent—be a Cotton agent also. You'll make oodles and oodles of coin—as Cotton has.

You just "cotton up to Cotton" and you'll be a winner.

An Every-Purpose Body

This Beverly-Cotton model is an every-purpose body—that's the beauty of it. Makes a fine club or private omnibus for theatre or station use. Take out rear seat and you have a dandy delivery body.

Honest All Through

Wish you could see this Beverly-Cotton body without paint or varnish. We wouldn't need, then, to say another word. You'd see for yourself the quality materials, the quality workmanship—and that would settle it. You'd buy nothing but Cotton-built bodies ever after.

The Inside Story

But since you can't come to the Cotton factory, let's give you the inside information here. First of all, the Beverly-Cotton is built by carriage builders at Amesbury, Mass. The town's known the world over as carriage center.

Well matured oak and ash—nothing else is used, except in the top, which is of whitewood to make it light. We use the most expensive roofing material. Storm curtains are the best oiled duck. Cushions are of box construction with curled hair and steel springs. Cheaper stuff would look just as well, you know. We have crowded 100% more quality into this body than anybody else would dare to do. And in spite of that, the price is mighty low. You'll never hear of anybody else building a body like this for anywhere near the price.

ASK YOURSELF THIS:

Are you taking big losses on your "swap" stuff—or scrapping your old chasses? Here's what you do—put Cotton-built bodies on them and your hard-to-sell cars. You'll get good prices and make big profits. We carry more than 50 models in stock, most of them our own make. Anywhere from 350 to 400 bodies—all colors—always on hand. And cheap! cheap! Quick shipments. Write today—now—while it's fresh in your mind.

(Highest Quality
Lowest Prices
Ample Resources)

L. M. COTTON, Inc., Boston

The Body Specialists :: Jobbers and Manufacturers

(Anything You Want
Ask For It)

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Come to the

TENTH ANNUAL CONVENTION

of the Federation of

TRADE PRESS ASSOCIATIONS

THE BELLEVUE-STRATFORD HOTEL

PHILADELPHIA

Sept. 7-8-9, 1915

Come to *give* and to *get.* Come in confidence that the experience will prove of daily benefit in your business, whether you are a

Manufacturer Sales Manager Executive
Advertiser, Advertising Manager, Editor or Publisher

AT this convention you will discover a keynote of co-operation in the interest of higher ethics, greater efficiency, bigger growth. The reports, speeches and discussions will all pulsate with a big purpose that leads toward the development of bigger men as well as bigger business.

THE FEDERATION OF TRADE PRESS ASSOCIATIONS

—comprises 250 leading trade and technical journals—exists for the purpose of developing and encouraging higher and still higher ethical standards in publishing, advertising and general business practice — represents over $40,000,000 invested capital.

—reaches through its consistent publication, millions of business men!



—includes in its membership publishers expending over $37,000,000 in salaries and wages.

—desires the individual interest and co-operation of every reader and advertiser.

—wants you to attend its annual gathering.

THE time you spend in attending the Convention will pay large dividends in broader perspective, increased enthusiasm, higher efficiency, fresh inspiration. For additional information write to

Bartley J. Doyle, Chairman Committee on Arrangements
512 Race Street, Philadelphia

THE FEDERATION OF TRADE PRESS ASSOCIATIONS

John Clyde Oswald, President
New York

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Chicago

Grant Wright, Sec'y-Treasurer
Philadelphia

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ROMORT GUARANTEED SPECIALTIES

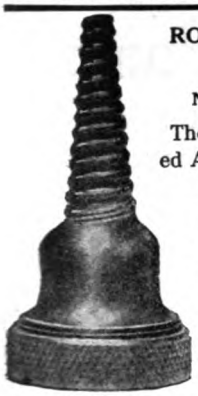
MR. JOBBER
MR. DEALER
MR. VULCANIZER
MR. TIRE MAN
MR. GARAGE
MR. MOTOR CYCLE
MR. CAR OWNER

ROMORT GUARANTEED SPECIALTIES ARE FOR YOU. MR. JOBBER, if your 1915 Catalogue don't list ROMORT GOODS, we invite you to write us. MR. DEALER, if your Jobber can't supply you, ORDER FROM US DIRECT. MR. GARAGE, VULCANIZER, MOTOR CYCLE, CAR OWNER—ROMORT SPECIALTIES will interest you. Each article is built for severe service, and sold only under a POSITIVE SATISFACTION GUARANTEE, or MONEY REFUNDED. There is nothing on the market "JUST AS GOOD," INSIST ON ROMORT GOODS. If your Dealer don't carry THE ROMORT LINE, DON'T WAIT—MAIL US THE COUPON BELOW—WE WILL PROMPTLY FILL YOUR ORDER DIRECT.

ROMORT STRAIGHT PUMP CONNECTION.

Price 25 Cents Each.

Not Automatic. **Patented.**



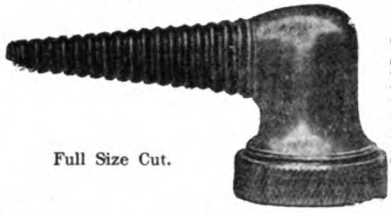
Full Size Cut.

The ideal Air Connection for use on direct Connected Air Pumps, hand and foot pumps, Spark-plug and Power Tire pumps. Solid Casting with Center pin. REPLACES THE AWKWARD AND INCONVENIENT SCREW CONNECTION. Has threaded taper stem to fit ⅛ to ⅜ inch tubing. Will not leak OR BLOW OFF, when connected to tire valve. If your Dealer is up-to-date he has them in stock, if not—Fill out the Coupon below—INSIST ON "THE ROMORT."

ROMORT ANGLE PUMP CONNECTION.

Price 40 Cents Each.

Not Automatic. **Patented.**



Full Size Cut.

Extra heavy solid bronze one-piece casting, with center pin. Designed for Direct Connected air compressors of all types. ESPECIALLY RECOMMENDED FOR POWER TIRE AND SPARK PLUG PUMPS ATTACHED TO AUTOMOBILES. Threaded taper stem to fit ⅛ to ⅜ inch tubing. HOLDS FAST TO TIRE VALVE WHEN ATTACHED. Your Dealer should have them, if not, order direct—See Coupon below. DON'T TAKE A SUBSTITUTE—GET A "ROMORT."

ROMORT AUTOMATIC AIR VALVE, STYLE "A."

Price $3.00 Each. **Patented.**



The Master Valve for Use of Free Air Stations. Stands the Hard, Rough Usage and Abuse.

Full Size Cut

PUBLIC AIR STATIONS, GARAGES, VULCANIZERS, TIRE SHOPS, all use it. IT WON'T WEAR OUT. ABSOLUTELY AUTOMATIC AND FOOL PROOF. AIR CANNOT BE WASTED. Attach it to the hose, kick it around on the cement walks and forget it. Always in order and ready. First Cost is years' total cost. NOTE THE TAPER SCREW STEM TO FIT ANY COMMON SIZE TUBING. Special Stem to fit extra large or small tubing, at no additional cost. ALL

PRICE LIST OF PARTS
See Letter On Cut

a—Body	- -	$1.50 each
b—Nut	- - -	.40 "
c—Spring	- -	.05 "
d—Plunger	- -	.50 "
e—Gasket	- -	.05 "
f—Cap	- - -	.50 "

LEADING JOBBERS AND DEALERS CARRY THIS VALVE IN STOCK—if yours does not, fill in Coupon below. GET THE BEST—GET A ROMORT, STYLE "A."

ROMORT AUTOMATIC AIR VALVE, STYLE "B."

Price $1.00 Each.

Patent Pending.

A High Grade Automatic Air Valve Designed to Meet the Popular Demand for a Small and Inexpensive Air Device.



Half Size Cut.

PRICE LIST OF PARTS.

Body - -	$ .50	Cap - -	$ .25
Plunger -	.30	Gasket - -	.05

Solid Bronze, one-piece casting, taper screw stem to fit any size air tubing. AUTOMATIC IN OPENING AND CLOSING AND POSITIVELY AIR TIGHT. We highly recommend this valve for use of private or public Garages, Vulcanizers, Tire Repair Shops, where the service does not require the use of a heavy valve. Ask your Dealer for a ROMORT, STYLE "B," or fill out Coupon below.

ROMORT AIR NOZZLE---CUSHION CLEANER

Price 25 Cents Each



The handiest little device ever invented for the purpose of **blowing the dirt and dust off cushion tops, foot mats, machinery, etc.** When attached to a Romort Automatic Air Valve, or Pump Connection, air flows out of the needle point **with terrific force**, forming a perfect and effective Air Cleaner. Ask your Dealer, or order direct.

ROMORT PUMP CONNECTION RUBBER---or ROMORT RUBBER WASHER

FITS ALL VALVES AND PUMP CONNECTIONS

One Dozen Rubbers to a Carton **Price 25 Cents per Carton**

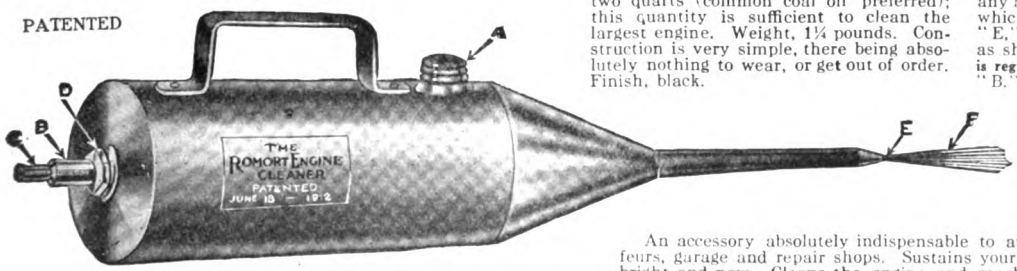


A scientific Romort design, made of a Special Compound of Rubber (not dope), has the best wearing qualities. Easily slips on the tire valve, **Will hold fast and will not turn inside out. Don't be misled by cheap inferior washers similar to Romort design—Genuine Romort Rubbers are stamped "Romort."** Leading Jobbers and dealers carry **Romort Rubbers** in stock—if yours don't, fill out Coupon below.

The Romort Engine Cleaner

PRICE $3.00 Each

PATENTED



DESCRIPTION

The Romort Engine Cleaner is 20½ inches long by 4 inches in diameter, a convenient size for carrying in a car. Fluid capacity, two quarts (common coal oil preferred); this quantity is sufficient to clean the largest engine. Weight, 1¼ pounds. Construction is very simple, there being absolutely nothing to wear, or get out of order. Finish, black.

HOW TO OPERATE

Fill the tank as shown in the cut at letter "A," attach the cleaner to hose or air supply at letter "C," (standard connection will fit any air hose). Turn knurled rod at letter "B," which opens valve and lets fluid out at letter "E," fluid is forced out in a very strong spray, as shown by letter "F." **Light or heavy spray is regulated** by a slight turning of knurled rod "B." The packing nut, as designated by letter "D," may be easily detached and repacked if found necessary.

NO DANGER OF EXPLODING

As the air does not enter the tank, but passes right through, picking up the fluid at letter "E," there is absolutely no danger of the tank blowing up—this being impossible.

An accessory absolutely indispensable to automobile and motorcycle owners, chauffeurs, garage and repair shops. Sustains your car efficiency by keeping the machinery bright and new. Cleans the engine and machinery perfectly without the use of rags, **waste or brush. Designed for the special purpose of cleaning automobile and motorcycle engines and machinery, it is constructed with a long spout or point, so the operator may easily reach every nook and part of the machinery, an impossibility with the old method of rags and waste. The dirt and grease readily disappear before a strong spray, which works under a very low air pressure. Use an engine-driven or spark plug pump, garage storage systems or in fact any air pressure system from 10 pounds to 200 pounds. It cleans the machinery of your automobile or motorcycle just as readily and with the same result as one would hose off the outside of the car. The Romort Engine Cleaner, one quart of coal oil and five minutes of your time will do the work.**

For sale by all up to the minute Dealers or order direct - See Coupon attached.

ROMORT MANUFACTURING CO., Mfrs. of Romort Guaranteed Specialties, **1322-1326 Michigan Ave., Chicago, Ill., and 1810 Westlake Ave., Seattle, Wash.**

Fill in and mail this Coupon to our Chicago or Seattle address, your order will have our prompt attention.

JOBBERS and DEALERS

Let us have your initial order for one dozen each of our line. We refund you if not satisfactory. You don't have to carry any Romort dead stock.

ROMORT MANUFACTURING COMPANY

1322-1326 Michigan Ave., Chicago, Ill. 1810 Westlake Ave., Seattle, Wash.

GENTLEMEN:—Enclosed find.....Dollars, for which please send me via post, mail or express, Prepaid.....

.....

NAME..... ADDRESS.....

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"Never Again"

Every Car in Your Locality Needs a Good Engine-Driven Tire Pump

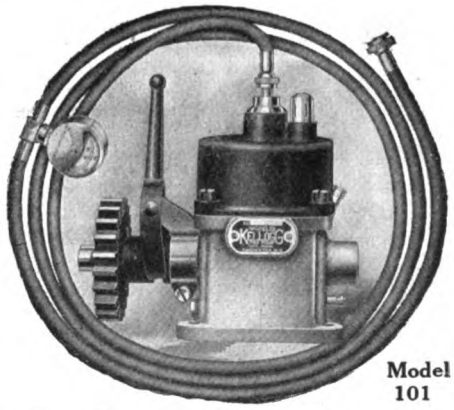
Do you appreciate the profit you could make by selling the Kellogg?

Not one model pump for all cars because that is impossible. We have six years' experience making pumps **with carefully designed attachments** so that in spite of cheap competition there are more Kellogg pumps in use today than all other makes combined.

Engine Driven KELLOGG Tire Pump

Study this list of cars—make the most of your opportunity. The Kellogg pump will be furnished for 1916 as follows:

For 1916 Cars Kellogg Pumps are		Thousands sold with attachments to dealers for
Regular Equipment on	Special Equipment on	
Franklin	Buick	Buick
King	Chalmers	Dodge
Lexington	Chandler	Ford
Peerless	Fiat	Hudson
Premier	Hupp	Overland
Simplex	King	Reo
Stewart	Mitchell	Studebaker
Velie	Stearns	and many others
	Westcott	



Model 101

The Perfect Pump With Perfect Attachments

"Guaranteed not to spray oil with the air."

There is no need for you to furnish makeshift outfits made to meet a demand when Kellogg Tire Pumps are made in different models to meet special requirements of different cars.

Model 101 With Complete Attachments $15 Special Dodge Outfit $10 Special Ford Outfit $9.50

All Kellogg pumps are made with metal piston rings—grey iron cylinders and air supplied with poppet valves, both intake and exhaust (ball check valves always leak and heat the air), as well as other features which make for its superiority.

Attachments Designed for Each Car make Installations Easy—Without Machine Work.

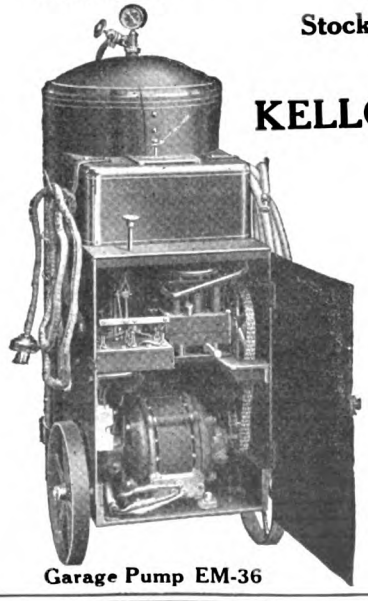
Prompt Delivery from Stock Carried by Distributors and Service Stations as follows:

R. W. Norris & Sons, Baltimore, Md.
W. J. Connell Co., Boston, Mass.
Kellogg Mfg. Co., Chicago, Ill.
Ohio Rubber Co., Cincinnati, Ohio.
Penn. Rubber & Supply Co., Cleveland, Ohio.
Ferris-Dunlap Auto. Supply Co., Dallas, Texas.
G. W. Shroyer & Co., Dayton, Ohio.
Kellogg Mfg. Co., Detroit, Mich.
S. C. Bohannon, Indianapolis, Ind.
Reinhard Brothers Co., Minneapolis, Minn.
Interstate Electric Co., New Orleans, La.
Motor Car Equipment Co., New York City
Powell Supply Co., Omaha, Neb.
J. H. McCullough & Son, Philadelphia, Pa.
Dyke Motor Supply Co., Pittsburgh, Pa.
A. H. Coates, San Francisco, Cal.
Phoenix Auto. Supply Co., St. Louis, Mo.
American Supply Co., Tampa, Fla.
Chas. Rubel & Co., Washington, D. C.

Stock carried by other leading Distributors and Dealers everywhere.

Descriptive matter free.

KELLOGG MFG. CO., 266 Circle St., ROCHESTER, N. Y.



Garage Pump EM-36

For Your Own Garage Use

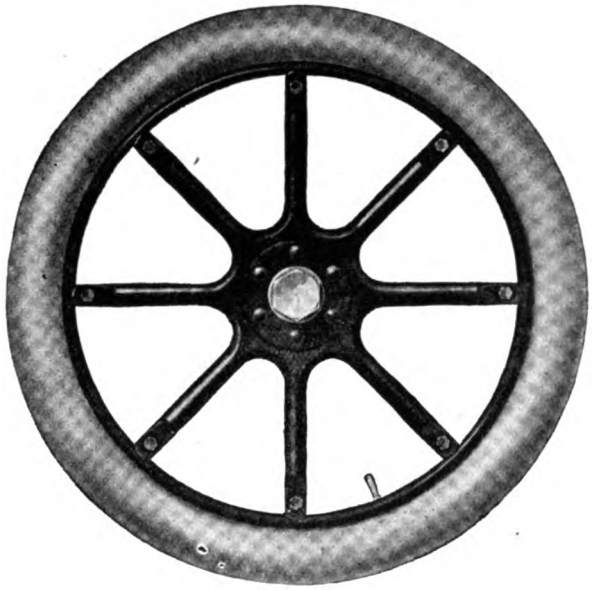
We make several different styles of portable and stationary outfits. The one illustrated takes air to the cars. Saves one-third to one-half on power bills.

Just as car manufacturers found that we could make a better engine-driven tire pump than they could make themselves or buy anywhere, so you will find that we can furnish you with a garage pump outfit better than any makeshift device you can secure. Our whole business energy is given to making tire pumps.

Ask your nearest distributor or write us direct in regard to your requirements.

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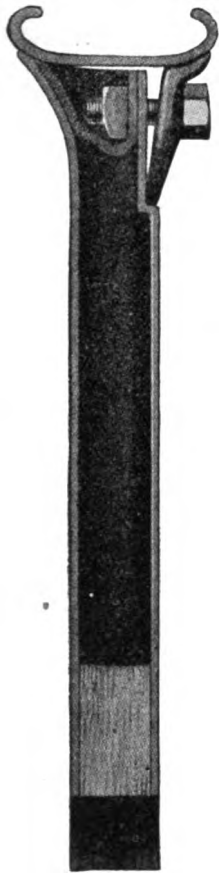
PARKER-HYDRAULIC
PRESSED STEEL WHEELS For Ford Cars



STRONGER than WOOD or WIRE WHEELS

CHANGE TIRES and be running again IN TWO MINUTES

Forty pounds lighter per set than wood wheels with demountable rims
Carry your spare tire inflated on extra rim which we furnish



Note these facts: You get—

1. More mileage due to less weight and ability of steel to conduct heat from tires.
2. Quicker acceleration on account of the lighter unspring weight.
3. Greater mileage per gallon of gasoline.
4. Greater durability. Steel will not dry out like wood or break like wire.
5. Better appearance. Enamel is baked. It retains its lustre and does not crack off like paint.
6. Prompt service in mounting Parker-Hydraulic wheels. They can be put on at your garage in two hours.
7. Every advantage of wood and wire wheels with all disadvantages eliminated.

OPERATION

To remove the rim: unscrew each bolt about three turns. The loosened clips may then be turned to release the rim. To put on new rim with tire: set rim on spokes having the upper position with valve stem between any two spokes and the rim will swing into position.

Write for prices and full particulars

MANUFACTURED BY

THE HYDRAULIC PRESSED STEEL CO.
CLEVELAND, OHIO

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TEMCO Automobile and Garage Necessities



TEMCO Shock Absorber For FORD Cars



They take **all the** slight jars which your big springs would pass along to you.

They catch the first shock of all big jars and hand the load to the springs gradually.

They take the rebound from the springs gradually—and you are saved from all sudden or violent jars and jounces.

3 Big Features

Combined In No Other Ford Shock Absorber

1 Telescoping Dust Cap

The fender rods on Ford cars would ordinarily strike the top of a shock absorber as tall as the Temco. But Temcos **telescope** and "duck" the blow.

So we don't have to make them lean over to avoid the fender rod.

Temcos stand erect as sentries and add to the appearance of your car. They are absolutely vertical.

2 Longer Springs Stronger Springs

Even when telescoped, Temcos are as tall as others. When normal, they are the **tallest.** This is a big advantage.

It lets us use **longer** springs.

And we make them **stronger** and more **flexible** too. We use **two** Genuine, Crucible, **Vanadium,** Helical Steel Springs in each shock absorber.

They **couldn't** be longer — they **couldn't** be stronger.

3 Radius Links To Prevent side-Sway

Temco Shock Absorbers never lean one way or the other. They stand uncompromisingly erect—always absolutely vertical—giving full spring action.

Radius Links **hold** them straight.

This prevents that tiring side-sway.

And side-sway is the beginning of the dangerous skid.

By preventing side-sway, Temcos minimize skidding.

$15 Complete Set of 4

Unlimited Guarantee

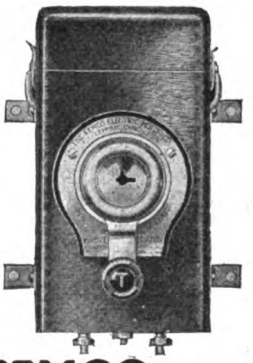
Temco Shock Absorbers must fully, thoroughly and completely satisfy you in every way, or you may return them and get your money back.

To Dealers We were the first to make shock absorbers for Ford Cars and we've made and sold thousands more than anyone else. We are right behind them as we have been for years. We've a valuable reputation to defend. When you stock Temcos you stock the shock absorber which already stands highest in the confidence of most Ford owners and the one which will make a trade-boosting friend every time. Write for any information you desire.

THE TEMCO ELECTRIC MOTOR COMPANY
2115 Sugar Street, LEIPSIC, OHIO



TEMCO-ALTA Universal Shock Absorber For All Cars
Complete Rear Set $12



TEMCO Improved Master Vibrator For FORD Cars $12.50



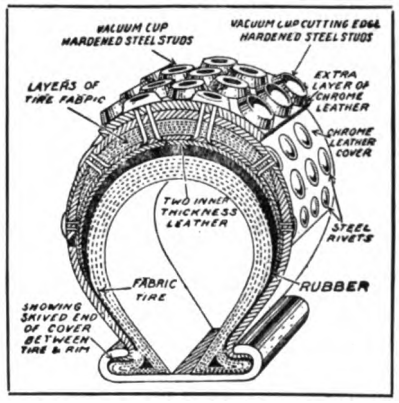
Write for full Information about TEMCO Portable Electric Drill

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10,000 MILES GUARANTEE BACKS THIS TIRE



TRY Brictson Pneumatic Tires at our expense. Don't pay until you are satisfied. At our risk find out for yourself what wonderful service Brictson Tires give—how resilient and easy riding they are. Get rid of punctures, blowouts and rim cuts. Brictson Tires are rut proof, oil proof and gasoline proof. They are sold under a specific 10,000 mile written service guarantee.



Read What One User Says

"Several months before beginning my trip from Detroit, Mich., to Detroit, Fla., I thoroughly investigated tires of several well advertised kinds. I finally decided for my trip that the Brictson was the most economical and durable tire that I could find.

I am daily asked if I have many punctures. I reply that I do not know what a puncture is. I am driving on all kinds of roads under all kinds of conditions and never have a thing to worry about.

I have been on the road since the 8th day of last October, and if all goes well will begin my Florida trip again about October 1st next. I consider the tires worth almost their weight in gold. I would not do without them at twice the price.

W. J. BREWSTER,
August 10, 1914. 236 Jefferson Avenue, Detroit, Mich."

Your Tires Rebuilt the Brictson Way

If the fabric in the tires you are now using is in good condition, we can take them, make them proof against rim-cutting, punctures, blowouts, side-wall breaks, skidding, ruts, oil, and give thousands of miles of additional service.

Sign and send back coupon for full information and details of our liberal Free Trial Plan.

THE BRICTSON MFG. CO.

165 BRICTSON BLDG., BROOKINGS, SO. DAKOTA

Mail Back This Coupon

Brictson Mfg. Co.,
165 Brictson Bldg.,
Brookings, So. Dak.

Please send me full particulars about Brictson Tires, explain your free trial plan, also explain how my own tires can be rebuilt the Brictson Way.

Size of Tires..... .....

Name..... .....

Address..... .....

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"Of Course A Tire-Doh Repair Is Permanent, Dad— It's Tougher Than the Tube Itself."

There is no use trying to make puncture or blow-out repairs that are likely to burn up the tube, or come loose under extreme temperature.

If you want to take all the after-worries out of your tire repairing, use

TIRE-DOH

Anyone who can drive a car can make a repair with Tire-Doh and do it easily, whether the hole is a pin-point puncture, or a tear a yard long. And when you have made a repair with Tire-Doh, you can be sure it will last, for

Tire-Doh Repairs Are Permanent Repairs

Tire-Doh is made by a secret process of the best rubber, and after it sets is tougher and more elastic than the tube itself.

No heat—no tools necessary to make a repair with Tire-Doh. You can use it anywhere—on the road, in the garage, and 2 cents worth of Tire-Doh will repair the average puncture.

Because of its plasticity, Tire-Doh can be used to make repairs such as reseating valve stems on inner-tubes that are impossible to other methods.

Tire-Doh seals cuts and sand blisters in casings and doubles your mileage by keeping out the dirt and water which would otherwise reach and rot the fabric.

WE MANUFACTURE
18 Other Tire-Doh Products
All As Good As TIRE-DOH

Silver Quick
Stop That Radiator Leaking
Day Tire Valve
Nomore Rust Rim Paint
Blac-Namel
Sunshine Metal Polish
Everwear Nickel Polish
Metal-Lac
Renew-O Leather Dressing
No-Leak Top Dressing
X-Ray Top Dressing
Nu-Stain Top Lining Dye
Preserv-O Tire Paint
Destroy-O Carbon Remover
Sta-On Engine Paint
See-Kleer
Chemico Blowout Patch
Body Gloss

Six years on the market and the fact that Tire-Doh is repairing millions of punctures and blow-outs a year, is your best guarantee.

Tire-Doh is also effective for mending other articles of rubber—rubber boots, gloves, hot water bags, etc.

AT YO"R DEALER'S OR DIRECT FROM US $1.00

DEALERS—Tire-Doh is the standard tire repair. It is a good seller—it repeats—it is advertised. All jobbers who handle automobile supplies sell Tire-Doh.

ATLAS AUTO SUPPLY CO.
3206 W. Lake St. Chicago

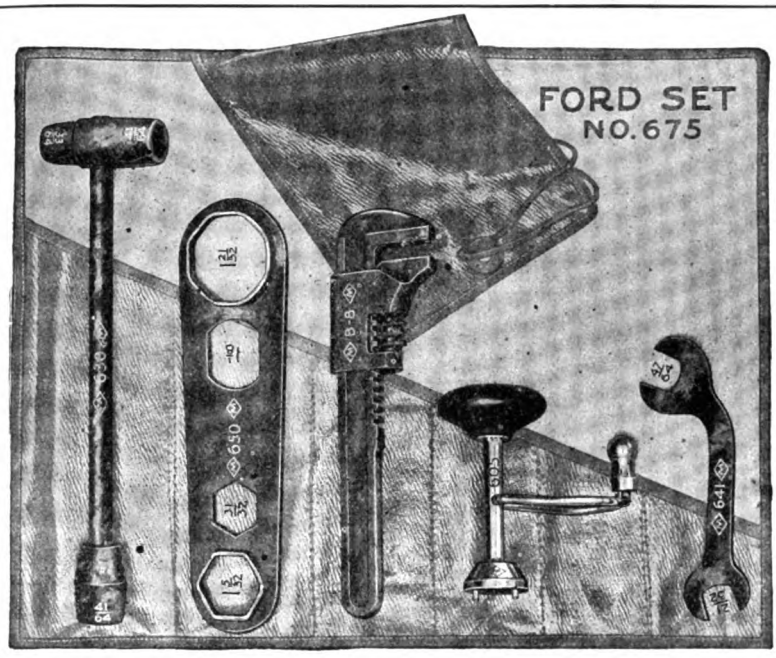


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NEW FORD TOOLS

An Arrangement of Tools That Just Meets Your Needs

Every Tool Guaranteed



This Trade Mark Means Something

It Guarantees
—Quality
—Price
—Service

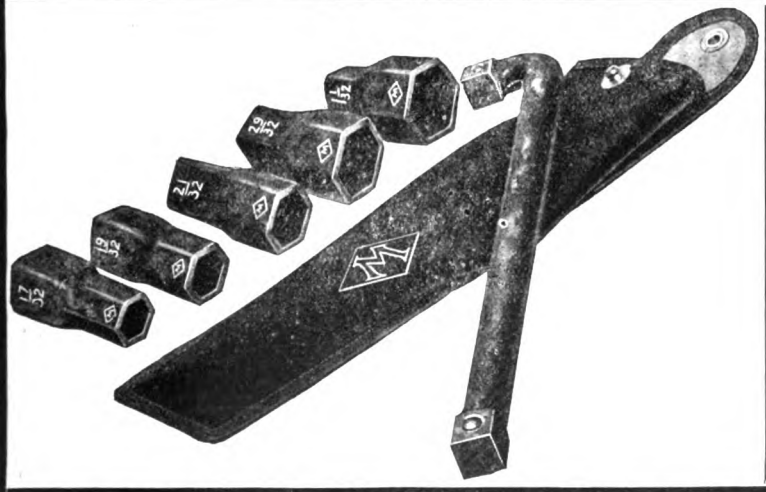
Send for FORD Tool Book No. 171-B

If your jobber cannot supply you—we will ship prepaid on receipt of price.

"Repairkit" for FORD No. 675

Contains: One Cylinder Head and Rear Axle Housing Nut Wrench No. 630
One Hub Cap Wrench, No. 650 (4 openings)
One Double End Kit Wrench (Reverse and Brake Pedal Openings)
One Perfect Valve Grinder
One Drop Forged Auto Wrench, No. B-19

PRICE (packed in enameled duck case) **$1.00**



Socket Wrench Set No. 33

For FORD Road Work

The five most important sizes needed:

Hex.

15/32", 17/32" tapered to fit rear axle housing nuts, 21/32" tapered to fit cylinder head nuts, 25/32".

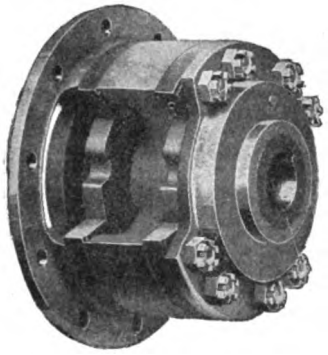
Oval socket to fit main bearing socket.

PRICE (packed in enameled case) **$1.10**

FRANK MOSSBERG CO.
ATTLEBORO, MASS.

BRANCH OFFICES:
Chicago, Ill., 180 North Market Street
San Francisco, Cal., 324 Underwood Building
Los Angeles, Cal., 503 Equitable Building
Seattle, Wash., 214 Maritime Building
Dallas, Texas, Box 927
Waynesville, N. C.

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FORD Owners!

Make Rear Axle Trouble A Thing Of The Past

Your car will hold the road in any kind of going—

You can drive with perfect freedom from side-sway and with skidding absolutely minimized—

You can pull through mud or sand where you would be hopelessly stalled with the old-fashioned differential gear—

You will save on both gasoline and tire-wear—

If you equip your car with the

Bailey Gearless Differential

These are not mere claims, but facts proven by the experience of Ford owners the country over.

The Bailey Gearless Differential gives you a positive drive on both rear wheels. The power is delivered to the wheel with positive road traction, so that one wheel cannot spin while the other is standing still.

Safety, comfort and economy—from every standpoint you need the Gearless Differential on your car. Sent complete, ready to install. Write for circular.

More Dealers Wanted

We want a dealer wherever there are Fords, to fill the demand for the Bailey Gearless Differential—a demand that is increasing rapidly, not only through our advertising, but by the word-of-mouth recommendation of users. Invariably, one in a locality means fifty more.

Write for interesting no-risk proposition.

Gearless Differential Company
866 Woodward Avenue Detroit, Michigan

Jobbers Carrying Stock:

Chanslor & Lyon Co., San Francisco and Branches
The Post & Lester Co., Hartford, Conn., and Branches
Irvin T. Honohoe, Washington, D. C.
Seminole Sales Co., Tampa, Fla.
Bertram Motor Supply Co., Salt Lake City, Utah, and Branches
Motor Electrical Equipment Co., Chicago, Ill.
Times Square Automobile Co., New York and Chicago
Jones Auto Exchange, Wichita, Kansas
Henderson's Garage, Shreveport, La.
Auto Supply Co., Baltimore, Md.
Automobile Supply Co., Detroit, Mich.
W. S. Nott Co., Minneapolis, Minn.
Kansas City Automobile Supply Co., Kansas City, Mo.
Jaynes Auto Supply Co., Buffalo, N. Y.
General Automobile Supply Co., New York City
United Auto Supply Co., New York City
Ford Specialty Co., Philadelphia, Pa.
Consumers' Auto Supply Co., Pittsburgh, Pa.
The L. & L. Motor Supply Co., Sioux Falls, S. D.
Chemi Company, Richmond, Va., and Branches
Walkerville Hardware Co., Limited, Walkerville, Ontario
John Millen & Son, Limited, Montreal, Que., and Branches

MARATHON TIRES

Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

SPEED MARATHON ENDURANCE

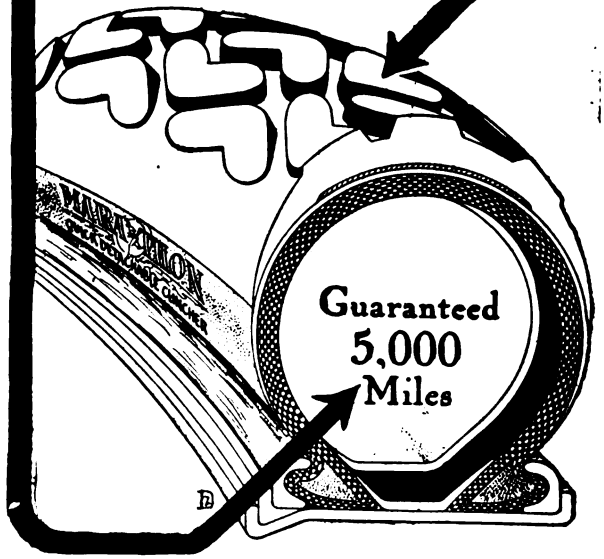
TIRES

Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

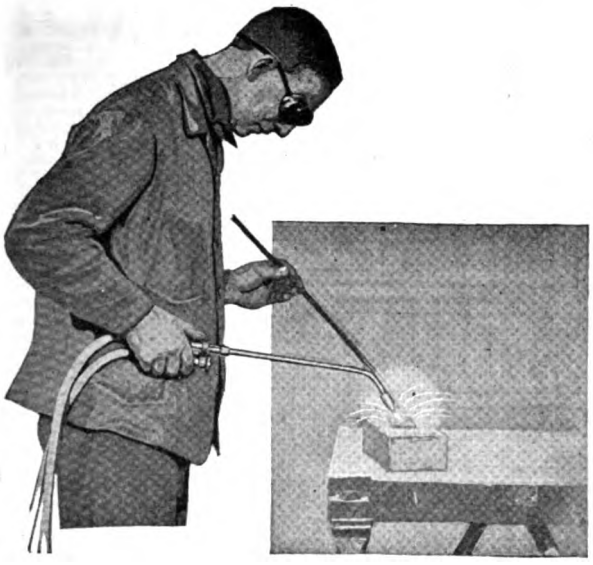
Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS, OHIO



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The Most Profitable Equipment in Your Garage

Excerpt from a letter by J. A. Snyder, San Antonio, Tex.

"I think we now have had our Prest-O-Welding outfit for about 3 months, and I keep a record of all welding done, and in looking over my book I find that out of the 3 months' time I have had the outfit, can find only 7 days in which I have not had a welding job of some kind, and the boss told me only yesterday that he did not see how we ever did without it, as we could not do without it now."

PREST-O-LITE

Dissolved Acetylene

(Ready-Made Carbide Gas)

Puts the process in easy reach

Even with the most moderate charges for doing oxy-acetylene repair work, the profits are too big to be neglected.

The all-round utility of any good make oxy-acetylene welding or cutting equipment is greatly enhanced by Prest-O-Lite Dissolved Acetylene. Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

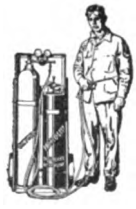
Operation Simple—Easy to Learn

Any intelligent mechanic can master the process. We furnish full directions.

Good equipment is necessary to obtain the best results. But good equipment is not costly. It soon pays for itself. We furnish a thoroughly high-grade welding apparatus for $60. The average user will also need gas cylinders, which are extra, and about $10 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

This welding outfit is widely useful—operation extremely simple. Being portable, it can be taken to the job, thus caring for work that it would be impossible to handle otherwise.

A Highly Profitable Business for You



A wide and growing demand makes Oxy-Acetylene repair work highly profitable. Send for literature showing how you can make big money for yourself, and large savings for your customers. Necessary equipment soon pays for itself. You are losing money if you can't care for this class of work.

If you use Acetylene for ANY purpose, you should have details of the Prest-O-Lite Service Plan.

THE PREST-O-LITE CO., Inc.

820 SPEEDWAY INDIANAPOLIS, IND.

The World's Largest Makers of Dissolved Acetylene

53 direct factory branches and charging plants in principal industrial centers



How to Keep Out of Trouble

Getting out of trouble is a matter of wits —Keeping out of it, a matter of wisdom

When your Ford gets cranky and hard to start—loses its power and flexibility, its coils need adjustment. With nothing to go by that you can see or hear, getting a set of Ford coils in good adjustment is a harder thing to do than to regulate four clocks so they will tick in unison and keep exactly the same time.

The best adjustment possible gives relief only for the time being—the trouble will come back.

—— *The* ——

CONNECTICUT MASTER VIBRATOR

FOR FORD CARS

will not only eliminate Ford ignition troubles, but will give your motor more power, greater flexibility and marked economy in fuel. Once installed, nothing can disturb the uniformity with which it delivers a hot, fat spark accurately timed for each explosion. It is a specially designed instrument—one master coil with a single set of vibrator points to time the sparks for all four cylinders.

Easily installed on either old or new models—the only Master Vibrator on the market which affords a workmanlike installation on the new Fords now coming through.

PRICE, $9.00

CONNECTICUT TELEPHONE & ELECTRIC COMPANY

MERIDEN - - CONNECTICUT

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ADDRESSING
To Automobile Owners,
Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

100% POSTAGE GUARANTEED
ALL DUPLICATES CUT OUT

We Have the Largest Addressograph Plant in the World for Public Business

List of Fords, Overland, and All Makes At Rock Bottom Prices

Card Systems any Make, any State or Section Thereof

PROMPT SERVICE

AUTO LIST & ADDRESSING CO.

Telephone, 6600 Columbus

1735 BROADWAY NEW YORK CITY



STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY
Specialists in Piston Rings
MUSKEGON - MICHIGAN

Much of the money you spend for gasoline and repairs *can be saved by the use of*

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE

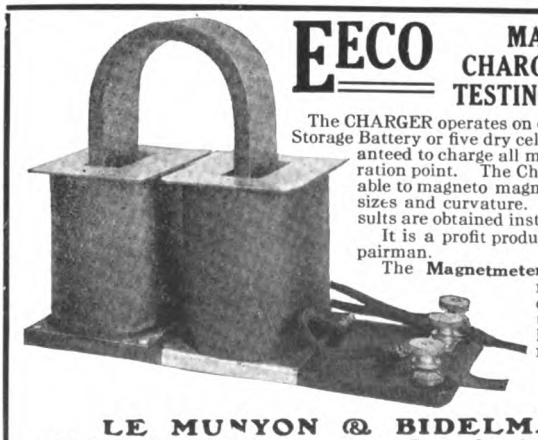


Because of NON-FLUID OIL'S superiority in overcoming friction, you require less gasoline for transmitting power to your gears and bearings. NON-FLUID OIL provides a durable, pressure-resisting cushion between all contact surfaces, thereby reducing wear and repair to a minimum. We can prove this to any motorist who cares enough about his car's economical up-keep to make a comparative test. Get a can today and try it!

"K. No. 00 Special" grade for sliding gear transmission.
"K. No. 000" for differential, compression cups and all bearings.
Reduced prices for 1915. Ask your dealer.

Avoid substitutes. Look for the orange-colored can with above trademark.

New York & New Jersey Lubricant Co.
165 Broadway, New York 1430 Michigan Ave., Chicago, Ill.



EECO MAGNET CHARGING AND TESTING OUTFIT

The CHARGER operates on either a six volt Storage Battery or five dry cells, and is Guaranteed to charge all magnets to saturation point. The Charger is adjustable to magneto magnets of different sizes and curvature. Maximum results are obtained instantly.

It is a profit producer for any Repairman.

The Magnetmeter corrects and repairs difficult cases of ignition trouble resulting from weak magnets

Write for prices and booklets on both instruments

LE MUNYON & BIDELMAN
521 Black Building Los Angeles, Cal.

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Coverall SUITS

This garment is made of close woven material, absolutely oil, dust and grease proof: will protect the clothes entirely when working around the car, garage or machinery.

Invaluable to Autoist and Machinist.

The only kind of garment that will keep the clothes entirely clean while working around a car. Made all in one piece. Easy to take off and put on. Comfortable and practical. Made of strong washable material.



Dark Tan Khaki	$2.00 each
Medium Weight Tan Khaki	2.50 each
Very Fine Weight Tan Khaki	3.00 each

Sent Parcel Post, Free. Remit with Order.

State size of chest when ordering.

Duster Coats at Special Prices

Tan Lineene	$1.25 per Coat
Tan or Slate Herringbone Stripe	2.00 per Coat
Gray Mohair	3.00 per Coat

DEALERS—Write for Trade Discounts.

AUTOMOBILE APPAREL CO.,
P. O. BOX 466 PORT CHESTER, N. Y.

DEALERS—
The 1916 Mecca $695

Fully equipped, offers amazing possibilities to live, wide-awake dealers throughout the country. This car of cars with its beauty, grace, power, speed, comfort and individuality is a sensation at the price. It is a 4 cylinder high power, light weight car, and the demand is created by extensive advertising.

Write now for special dealer's proposition while territory is still open.

TIMES SQUARE AUTO CO.
World's Largest Dealers
S. W. Cor. 56th St. & Broadway, New York
1210 Michigan Avenue, Chicago

BUY *BETTER* SPRINGS



GUARANTEED even at the bolt hole—NO restrictions. Graphited (for 2 years' lubrication) between all leaves. At better price than car factories.
Get complete 1915 list of 250 numbers and address of nearest Supply Jobber carrying stock, or wire us for any stock number listed.

Try *Better* Springs.

NEW ERA SPRING & SPECIALTY COMPANY
864-78 Woodward Ave., Detroit, Mich.
69-73 No. Washington St., Boston, Mass.

Ask for circulars of other low price Ford Specialties

Why?

No Chemical or Acid Used
ALWAYS READY

One turn of the Petcock while engine is running and carbon is removed in less than 15 minutes.



AGENTS WANTED

ATTRACTIVE SELLING SYSTEM

CARBON REMOVER
HAS REAL MERIT

Dealers: Get Offer and Booklet

UTILITY PRODUCTS CO.
TIMES BUILDING NEW YORK

THE HART-BELL METHOD

conveys water from the outlet water pipe to the intake manifold, and converts it into steam. The action of the usual chemical carbon remover is to soak into and under the carbon, as the fact seems to be pretty well established that carbon cannot be dissolved, only loosened. Super-heated steam will do likewise without any possible injury to the metal parts, and with less cost and trouble.

GUARANTEE

The Hart-Bell Carbon Remover Company of New York, hereby unreservedly guarantees that the Hart-Bell Carbon Remover will do all that is claimed for it (as per pamphlet issued), and if found unsatisfactory the full purchase price will be refunded upon return of same to agent from whom purchased.

ORMOND GARAGE & MACHINE WORKS
A. Morch, Proprietor
Tel. 8-24 Prospect
10 ORMOND PLACE
Brooklyn, N. Y., May 25, 1915

UTILITY PRODUCTS Co., Inc.
1412 Times Bldg., N. Y. City.

Dear Sirs—Having installed six (6) Hart-Bell Carbon Removers on various makes of cars, I wish to state that I have found same to give perfect satisfaction, and consider this device one of the best means of removing carbon brought to my notice in all of my twelve years' experience.

Wishing you the best o success, I remain,
Very truly yours
ANTHONY MORCH



THE CARVER
{COMPOUND
{DOUBLE-ACTING
PUMP

When a Carver Pump is once Tried we don't hear---

Why the price? We have others.
All pumps are alike, etc.

Because---

In principle it's different. It's made different. It pumps different. It lasts different

The result is different, and worth more than $6.00.

The Osborne & Stephenson Mfg. Co.
M and C Streets, PLAINVILLE, CONN.

MARVELOUS REMARKABLE
Four to one in our favor



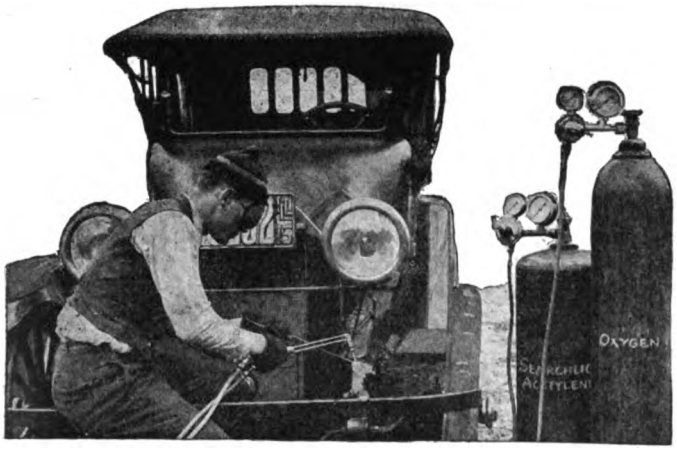
The Jensen Lever Pump inflates four tires with less effort than a compound hand pump inflates one tire, It is absolutely the easiest working pump on the market regardless of price. Send for one. Only about half the price of other lever pumps.

We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

Dealers, write for proposition.

W. H. HOWELL CO., - - Geneva, Illinois

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Welding a broken frame in less than one hour with the Searchlight Welder

An oxy-acetylene welding apparatus in a garage

can be a great profit maker or—a troublesome expense. Make sure in advance that the outfit you buy has a record behind it for

—easy operation
—dependability
—economy

and you may be sure that profits will follow.

The Searchlight Instruction Book will give you some very valuable information. It covers every phase of this process as applied to your business.

It also contains a description of the

Searchlight Welder

—the apparatus which garage men all over the country have adopted.

You could not buy its superior in design or construction at any price; and we are offering this outfit to you for

$50

in order that you may become one of the large Searchlight family who use

SEARCHLIGHT ACETYLENE

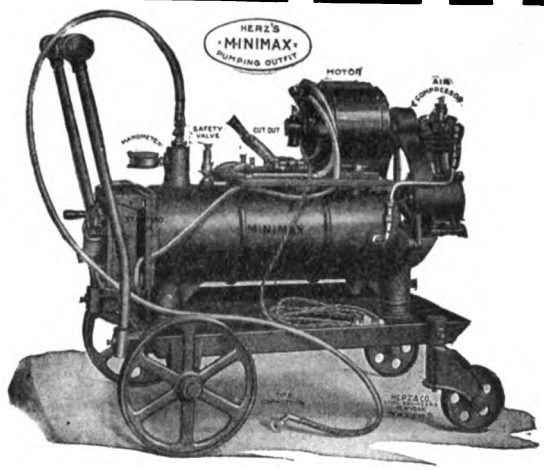
Send for a complimentary copy of the Instruction Book. You will find it very interesting.

The Searchlight Co.
1014 Karpen Building Chicago, Ill.

Branches and Refilling Stations:

Atlanta, Ga.
Boston, Mass.
Buffalo, N. Y.
Camden, N. J.
Chicago, Ill.
Cleveland, Ohio
Dallas, Texas
Detroit, Mich.
Kansas City, Mo.
Minneapolis, Minn.
New York City, N. Y.
San Antonio, Texas
Toronto, Ont.
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Quick Air--And Plenty Of It!



The Famous "Minimax" of Europe.

Herz Garage Pump

Inexpensive in both first price and cost of operation. Highly efficient—holds enough air, at 200 pounds compression, to inflate four tires after the power has been cut off. No losses by leakage. Has double-cylinder air compressor and splash lubrication. Very convenient—can be wheeled anywhere and attached to any lamp socket. Occupies very little space—height, 30 in.; length, 35 in.; weight, 280 lbs. Made for any kind of current WRITE FOR PARTICULARS.

HERZ & CO., 245 W. 55th St. (nr. Broadway), New York
Mfrs. of the world-renowned Herz-Plug, Herz-Timer and Herz-Distributor

ANYONE CAN INSTALL IT



PRICE $7.50

Including Gauge, Gears, 12 Feet of Air Hose.

Manzel Tire Pump FOR FORDS

The engine-driven tire pump you have been looking for. A strong, business-like, and simple device that you can install yourself without the aid of a mechanic. Once on, it's there to stay, and is always ready for use when you want it.

It will fill a tire in less than three minutes to the correct pressure.

Is all metal. Nothing to wear out. Anybody can put it on in a short time. There are no holes to drill, no machine work of any kind to do.

Write for our interesting dealers' proposition.

MANZEL BROTHERS COMPANY,
321-323 Babcock Street, BUFFALO, N. Y.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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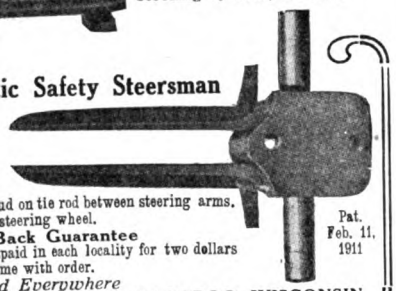


$4

Make Your Ford A Safe Family Car

Don't put the lives of your family and friends at the mercy of an inefficient steering system, when a—

Badger Ford Automatic Safety Steersman



—is absolute insurance against accident caused by a balky steering wheel. Keeps car running in absolutely straight course, *automatically*. Permits the driver to relax—relieves him from steering fatigue.

The BADGER bolts under front axle with stud on tie rod between steering arms. Acts as shock absorber for delicate gears of steering wheel.

Pat. Feb. 11, 1911

Sold On Money-Back Guarantee

To introduce, we will sell one postpaid in each locality for two dollars and fifty cents. Send your dealer's name with order.

Dealers Wanted Everywhere

SAFETY APPLIANCE CO. BARABOO, WISCONSIN

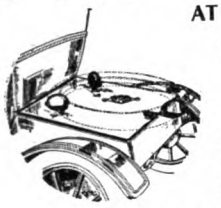
TRADE MARK UFASCO

PRODUCTS

FORD SPECIALTIES

PROTECTION

AT ALL TIMES



FORD LOCK TIRE HOLDER
No. 88-9

For $2.50 you can leave your car anywhere as long as you want to, and know that your spare tire **cannot be stolen.**

COMFORT

IN HOTTEST WEATHER



DASH VENTILATOR FOR FORD CARS. No. 240

For $2.00 you can keep cool all summer.

Just put on a pair of "Ufasco" dash ventilators and drive away that heat from your feet.

Be comfortable.

Jobbers and Dealers—Write for literature and discounts.

UNIQUE FINDINGS & SUPPLY CO.
PROVIDENCE, R. I., U. S. A.
Automobile Mountings, Parts and Accessories



"SLIKUP"

SLIKUP SILVER FINISH

A liquid silver plating for brass, copper or bronze. Rub it on with a rag as you would a polish.
Bottles (containing 8 ounces).....75 cents each

SLIKUP TOP LINING DYE

Prepared especially for top linings and refinishing faded mohair tops. One coating gives an even finish, oblitering all spots and stains.
Pint cans.....80 cents each

SLIKUP MOHAIR TOP CLEANER

Removes dust, dirt, oil and grease spots and brings the nap up to its natural gloss. Contains nothing that will injure the fabric in any way. Pint cans.....45 cents each

Sells itself. Write for Information on Slikup Salesman.

N. B. ARNOLD One Bay Street, BROOKLYN, N. Y.

INLAND

1 PIECE PISTON RING



A marvel of simplicity and efficiency. Made of only one piece, it has all of the virtues of eccentric, concentric, and more than one piece construction, and none of their disadvantages.

A continuous ring cut spirally for half of its circumference, heat-treated, so that the free ends will hug tightly together. That's the construction—the result is:

An absolutely gas-tight ring that uncoils in expanding, insuring uniform pressure and perfect contact with the cylinder walls.

The strongest ring on the market, because it is made of one piece, and

1. The gap is less than 1/3 the width of the ring.
2. The free end is supported by the full depth (cross section) of the ring.
3. The friction surface of the free end is less than 1/3 its depth, making it relatively very strong.
4. It is easier to put on and will not break in handling.

The best ring on the market, at a better price. Absolutely guaranteed. Money refunded on any ring not giving satisfaction at the end of 90 days.

The Inland will be the biggest seller. Dealers and jobbers, write for interesting prices. Full description in booklet. Free.

INLAND MACHINE WORKS,
802 Mound St., St. LOUIS, MO.

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YOU'LL never be ashamed to raise your top if you apply

"F-S" "Evernew" Auto-Top Dressing

It makes old tops look like new, as well as weather-proof and long-lived. It is easily applied and dries quickly, and leaves the top pliable. Eight standard colors and special shades to order.

Write for color card and prices

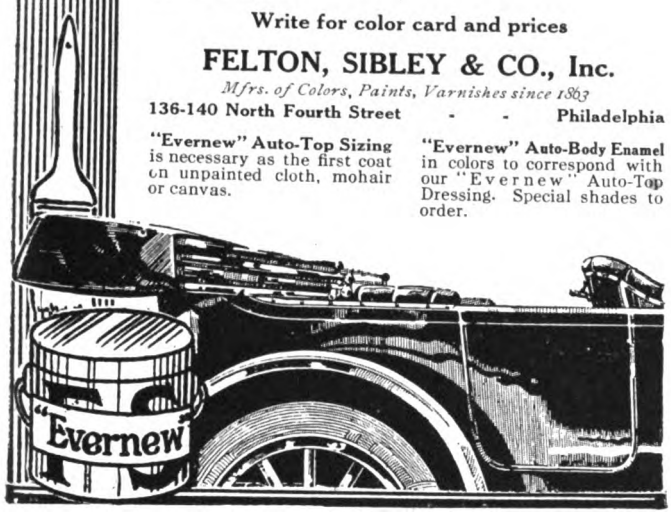
FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street - - Philadelphia

"Evernew" Auto-Top Sizing is necessary as the first coat on unpainted cloth, mohair or canvas.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special shades to order.





The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

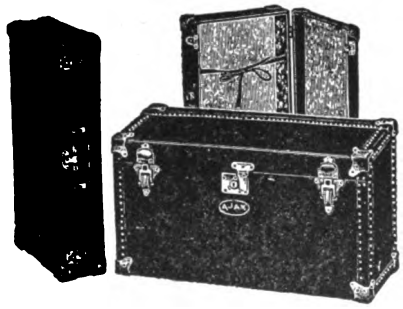
PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company

3326 Ludlow Street Philadelphia, Pa.

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South

A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver



Buick Roadster C-24

Empty $11
With Two Suit Cases 17

AJAX TIRE TRUNKS

LUNCH OUTFITS



The First and Largest Mfrs. of AUTO TRUNKS in the World.

Monroe 1915 . . Price, $9

At All First-Class Dealers and Supply Houses

OR AT

AJAX TRUNK & SAMPLE CASE CO.

91-93 MERCER ST., NEW YORK

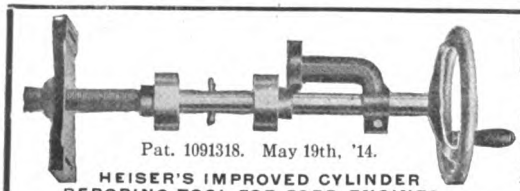
Write For Complete 1915 Catalogue



Buick Fender

Fits Models C-25-36-37

Complete with Two Suit Cases $25



Pat. 1091318. May 19th, '14.

HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

REPAIRMAN

There has been a period in your life that you were unable to tell a valve from a spark plug, a magneto from a carburetor, or a cylinder from a piston; some one had to tell you what these parts were and their function. The troubles arising from these and other parts of a car, you have mastered, but you are still at sea if you do not understand and are not prepared to rebore and fit oversize pistons, for this is the most important repair that can be given a worn engine.

The HEISER IMPROVED CYLINDER REBORING TOOL for Ford Engines, makes a good shop out of a poor one and a better shop out a good one, but best of all, it gives the owner service. The end of this season will see one million Fords on the highways; this means many million dollars will be spent on reboring and fitting oversize pistons.

The early bird catches the worm. We furnish oversize pistons to fit the rebored cylinder, $1.50 each, Complete.

Write for further particulars about this wonderful tool.

HEISER SPECIAL TOOL CO., (Dept. A) KINGSTON, MO.

POLISH YOUR CAR WITH MARVEL-MIST

FIFTY POLISHES FOR FIFTY CENTS

APPLIED THROUGH SPRAYER

Cleans Polishes Protects

Pints 75c

Half-Gallons $1.75



Removes Road-Tar and Oil

Quarts $1.00

Gallons $3.00

Prices Include Combination Sprayer and Polishing Cloth.

Be Economical. A pint of Marvel-Mist is equal to half-gallon of ordinary polish.
Spray Lightly with Marvel-Mist, rub off with cheesecloth and you have a wonder fully lustrous mirror-like surface. Cheesecloth furnished with outfit.
Beware of Imitations. Like everything good, Marvel-Mist is being copied.
It's Guaranteed. Money back if you want it.

Dealers Wanted Everywhere for Marvel-Mist

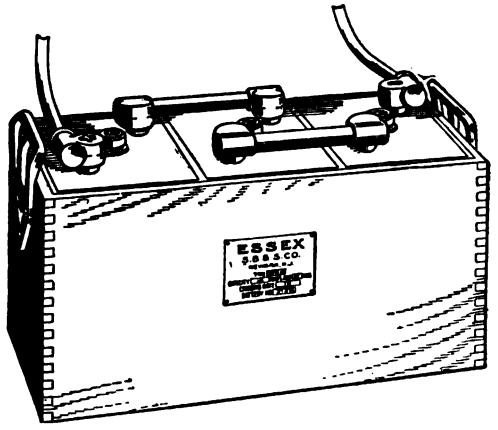
Positively the Best Polish on the Market

Send for descriptive circular. Tells all about Marvel-Mist.

MARVEL-MIST MANUFACTURING CO., 56 Greenpoint Ave., Brooklyn, N.Y.

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BATTERIES
OF ANY TYPE
=REPLACED=



Write for our Replacement Proposition on your old batteries for new ones, same type and size.

ESSEX STORAGE BATTERY & SUPPLY CO., Inc.
272 Halsey Street Newark, N. J.

Worn Cylinders Made Like New



Have us restore the compression and power to your motors. We specialize on the most practical and economical method of restoring worn cylinders to efficiency.

We have been regrinding such cylinders and fitting new over-size pistons and rings, to the complete satisfaction of motorists in many states.

The most improved equipment, and skilled workmen experienced in handling it, enable us to give unusually prompt service.

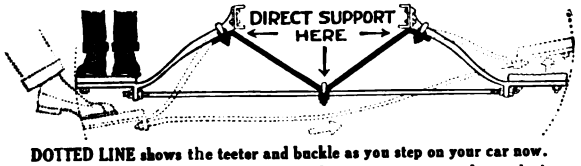
We can refer to hundreds of satisfied customers. Write today for detailed information, advising numbers of cylinders and bore diameters, for our guidance in making quotations.

WATERBURY WELDING CO.
1148-C South Main St., Waterbury, Conn.

Casey
Trade Mark K-C-Auto Supply Co.

Running Board Braces.

Make Your Ford as Quiet as an Electric and as STRONG as a Truck.



DOTTED LINE shows the teeter and buckle as you step on your car now.
SOLID LINE shows how rigid *CASEY* braces are guaranteed to make it.

Why not stop that rocking and teetering in your Automobile? Every time you or one of your passengers step into or out of your car (as illustrated by the dotted lines above) your truss rods, frame and fenders are strained into most strenuous contortions and then quickly released back into normal position again.

Is it, therefore, any wonder the mud guards become loosened at their fastenings and rattle or the truss rods snap off at the threaded ends?

Two dollars invested in a pair of *Casey* Braces will positively insure your Car against this abuse during its entire life. Will make your Running Boards STRONG and QUIET.

You can safely carry battery and tool boxes, entire camping or touring outfits or other loads on your running boards and there will be no strain or pull on your rods or fenders to make them LOOSE and NOISY.

The three-point suspension as used in bridge building and other metal construction, is an accepted standard, because it is scientifically right. Your Automobile will be rigid because the strain is equally distributed between the three points of support as indicated by the three arrows in the illustration, and jumping on the step with both feet cannot strain your Chassis in the least.

You can easily attach these braces in a few minutes yourself, and they will positively do wonders for your car. No drilling or fitting necessary. All you need is a wrench. Shipping weight, 4 pounds.

***Casey* Running Board Braces,** per pair complete..... **$2.**

All Cash Orders received for the next 30 days will be sent prepaid.

KANSAS CITY AUTOMOBILE SUPPLY COMPANY,
KANSAS CITY, MO.

Our New Ford Autolog Has Many Such Valuable Hints for the Ford Owner.

RAYNTITE TOPS



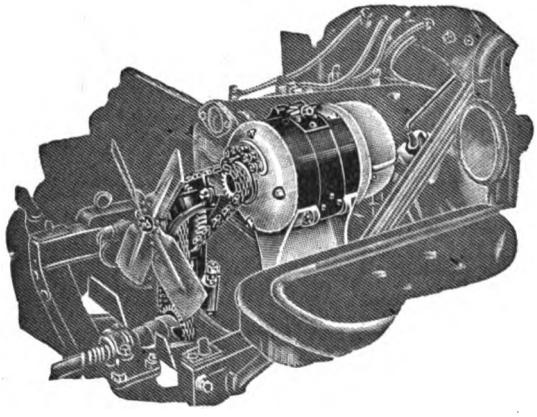
Guaranteed One Year
(We Really Mean This)

BY actual test against all other advertised top materials, we know none is better, and some are not as good. Rayntite Top materials are made both single and double texture, both are Fabrikoid guaranteed not to leak for one year. Washable, greaseproof, not affected by heat or cold.

Rayntite Tops can be supplied by any auto-top maker.
INSIST ON HAVING A RAYNTITE TOP.
SAMPLES OF MATERIAL FREE.

DU PONT FABRIKOID CO., Wilmington, Del.
Canadian Branch: TORONTO, ONT.

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North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.

Ask for Bulletin 33-A

North East Electric Company

ROCHESTER, N. Y.



DIXON'S

GRAPHITE GREASE No. 677

FOR TRANSMISSIONS AND DIFFERENTIALS

prevents all metal-to-metal contact. The selected flake motor graphite, used only in Dixon's Graphite Lubricants, can't ball-up or pack. The minute flakes form over the bearing surfaces a velvety oily veneer that reduces friction to a minimum.

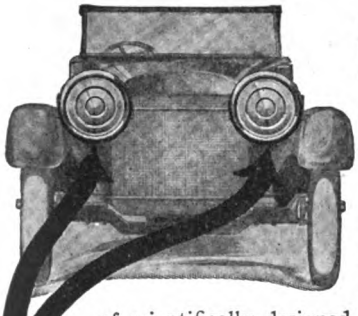
Write for Booklet No. 184-G.

Made in Jersey City, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY.

ESTABLISHED 1827.

G-3.



Something New From Europe

From Switzerland comes the latest and best in headlight aids—KLEARGLOW. Its popularity throughout Europe has proven its merit. This new appliance is made of scientifically designed corrugated glass surfaces in one piece. Permits touring in the country without removal, as must be done with dimmers, so as to light the dark, uneven roads sufficiently. "Dimmers" are dangerous—KLEARGLOW is safe. For city driving KLEARGLOW is 100% efficient—gives you *all* the power of the lamps without that dangerous glare. Use

KLEARGLOW
The Auto Light Diffuser

Fits any car and improves its appearance.

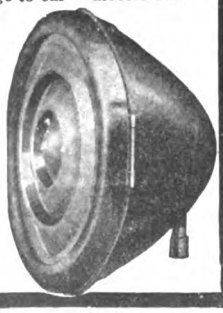
The law regulating headlights is strict. You can drive where you like with KLEARGLOW attached to your lamps, and *know* that you are conforming to all statutes covering this vital point.

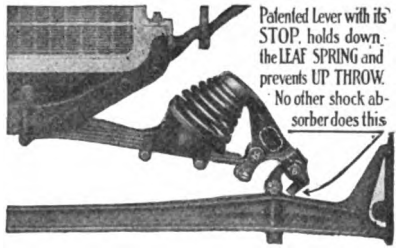
Avoid accidents to yourself and others—damage to car—arrests and fines—by installing KLEARGLOW in place of your present headlight glass. You can try KLEARGLOW for fifteen days before purchasing if you wish. Our illustrated folder telling all about KLEARGLOW and our liberal free trial offer will interest you. Write for a copy *today*. Address

H. G. PARO
743 Michigan Boulevard Bldg.
Chicago, Ill.

To JOBBERS and DEALERS:

We have some interesting data regarding KLEARGLOW and its business-building possibilities for *you*. Just say, "Send the folder," on a post card. We'll do the rest.





HASSLER

SHOCK ABSORBER FOR FORD CARS.

Has Made Good with Dealers

Every Ford owner who wants shock absorbers is a prospective Hassler purchaser—because the Hassler Shock Absorber has a patent protected feature that does what no other shock absorber will do—

Holds down the leaf spring and prevents up-throw.

Over 20,000 private users testify to their superiority and hundreds of commercial users have bought from 5 to 50 sets.

Don't Miss This Opportunity—Be a Hassler Dealer

Add this easy selling, profit making, Ford accessory to your stock. There is a good margin. The Hassler is sold with a satisfaction or money back guarantee. We will ship you a trial set.

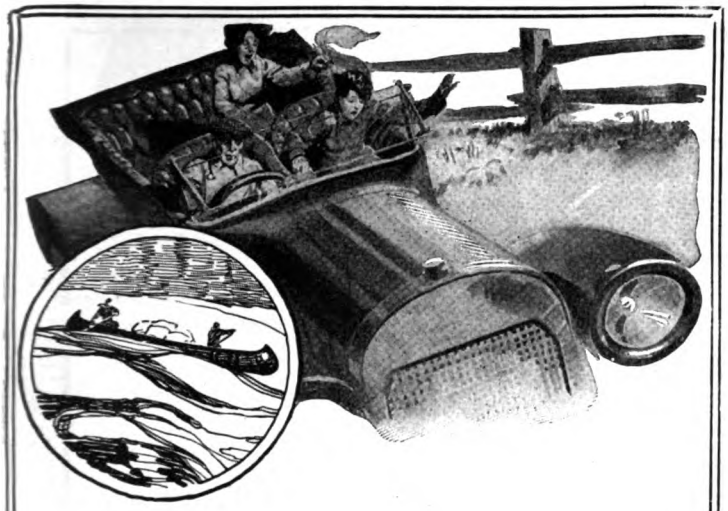
WRITE NOW!

For complete information and dealers' attractive, exclusive territory proposition. Not sold through jobbers. We protect you.

ROBERT H. HASSLER, Inc.,

INDIANAPOLIS, ∴ ∴ ∴ INDIANA.

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The Brakes Won't Hold!

Did you ever get sucked into rapids in a canoe?

You feel the same way when your brakes suddenly fail you on a bad hill. It's the duty of every automobile dealer to impress on his customers the vital, life and death importance of good brakes. *Remember*—brakes are not infallible. THEIR EFFICIENCY DEPENDS ENTIRELY ON THE BRAKE LINING. If the brake lining suddenly goes bad—becomes friction shy—you have no more control over the car than you would have on a barrel shooting Niagara.

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%

Thermoid is Brake Lining all through—not merely on the surface. It is a substance which has been hammered by hydraulic compression to a uniform density—it is not a stringy, loosely woven fabric with only friction surfaces.

Thermoid will still hold even though worn paper thin. It is 100% brake lining.

Watch the brake lining of cars sold by you or in your care. Guard the safety of your customers by having every car equipped with Thermoid.

Thermoid Rubber Co.
Trenton, N. J.



OUR GUARANTEE:
Thermoid will make good or we will.

Cannot be burned out nor affected by oil, heat, water, gasoline, dirt.



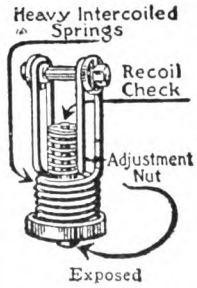
JOHNSON
SHOCK ABSORBER

Coil spring shock absorbers are good — they improve riding qualities.

Friction shock absorbers are good—they stop the recoil—but

There is only one shock absorber that does both under all road and load conditions and that's the JOHNSON SHOCK ABSORBER.

The Only Coil Spring SHOCK ABSORBER with a Recoil Check



Ordinary coil spring shock absorbers comprise only one spiral spring—the Johnson is composed of three fast working compensating springs so interposed that all shocks big and little are simply eaten up before they reach the car.

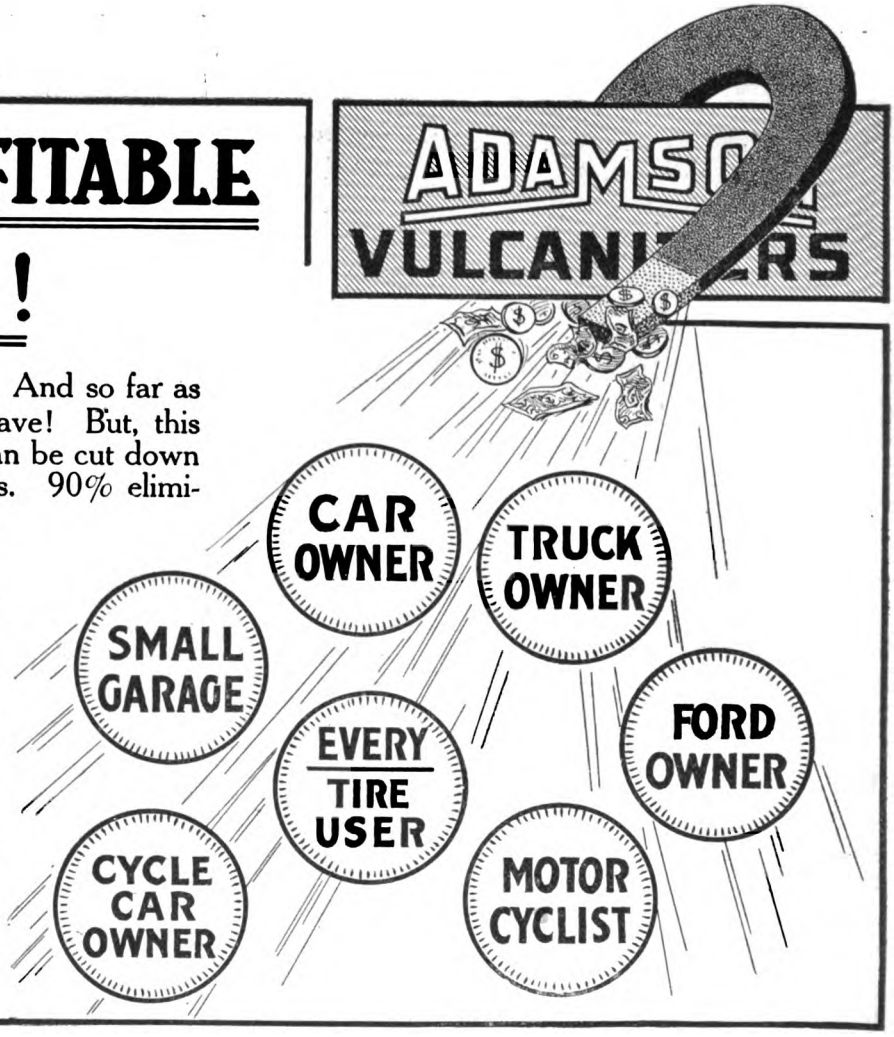
TEN DAYS' FREE TRIAL

There is a Johnson for every type pleasure and commercial automobile. Write, giving make and model of car and we'll explain our ten-day free trial test. A splendid proposition for dealers.

TRIPLE ACTION SPRING CO.,
ESTABLISHED 1906
55-57-59 East 28th Street, CHICAGO.

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DRAW PROFITABLE BUSINESS!



Every tire user has **trouble.** And so far as we can see, he always will have! But, this trouble can be lessened. It can be cut down to one-tenth of what it now is. 90% eliminated. This: by using the "ADAMSON" Vulcanizer. Every tire user sees the logic in our principle--and BUYS SOMETIME, for it's economy to carry an outfit in every car. Are you going to gather in some of these dollars which the "ADAMSON" is attracting? They will come to your place of business--if you've "ADAMSON" outfits on your counter. **Write for the dealer's proposition to**

Adamson Mfg. Co.
East Palestine, Ohio **Hamilton, Ont., Canada**

GARDNER

"GEE GEE"



The simple—reliable—large capacity air compressor for ***your*** garage. Self oiling, no adjustments, no grease cups, requires no attention, and is "fool-proof."

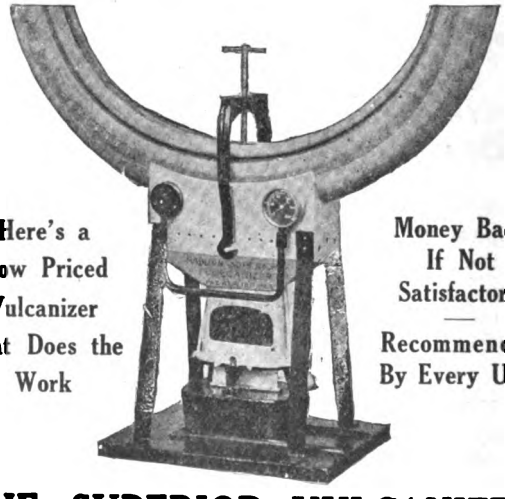
"The Gardner 'Gee Gee'— Best of All the Garage Pumps"

LOW IN PRICE
GARDNER IN QUALITY

Write at once for "Garage Booklet AC-7" which describes the complete Gardner garage line.

The Gardner Governor Co.
Station R **Quincy, Ill.**

Garage Owners and Repair Men



Here's a Low Priced Vulcanizer That Does the Work

Money Back If Not Satisfactory

Recommended By Every User

THE SUPERIOR VULCANIZER

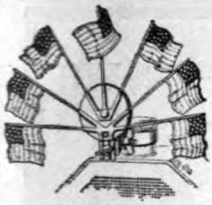
Simplicity in design and ease of operation. Next to these comes cheapness of operation, together with the entire absence of rubber air bags, bead molds, solid forms, etc.

To make it possible for an inexperienced hand to make repairs that will be neat and lasting, has been a study of considerable time on our part, and has resulted in a very complete little booklet of instructions which is sent with each machine. These booklets treat on tire repairs in such detail that it is practically impossible for a person of ordinary intelligence to make a failure of even his first job, if he follows the directions carefully.

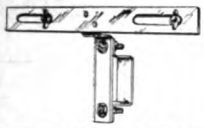
The price is low and it will pay for itself in a few days.
Write for full particulars.

LEE C. MAPES, 16 Fulton Avenue, ROCHESTER, N. Y.

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Wonermor Flag Holder



M & M Ford Special Front Axle License Bracket

Dealers, ask for catalogue and prices of our line of Flag Holders and License Brackets.

M & M BRACKET

29 East Third St., CINCINNATI, OHIO

Official Eastern Distributors

Gould Storage Battery

New and Second-hand Batteries at

Factory Prices

Batteries REPAIRED RECHARGED REPLACED

Complete Line Automobile Accessories—Electrical Supplies

MANUFACTURERS DISTRIBUTING CO. OF AMERICA

246 West 56th Street NEW YORK CITY

Just West of Broadway

CARBON REMOVED BY OXYGEN PROCESS

DEALERS! WE SAVE YOU MONEY

NEW ERA TORICLE GOGGLES ARE BEST — WRITE FOR 1915 CATALOG — WE ARE HDQTRS. FOR AUTO GOGGLES

NEW ERA OPTICAL CO. 123 W. MADISON ST.

MFGRS. OF GOGGLES CHICAGO, ILL.



THE LUND SHOCK ABSORBER

is the highest class absorber made, has been thoroughly tested and proven efficient. You cannot buy better if you pay $50.00.

Price $25.00

A very interesting proposition to dealers.

H. LUND SMITH

199 Paterson St. Paterson, N. J.

The Scientific Safety Garage Heater

The Only Heater Listed By Underwriters.

Send for printed booklet.

Built by THE SCIENTIFIC HEATER CO.

2300 Power Avenue Cleveland

"AMERICAN"

REPAIR STOCKS, ACCESSORIES AND CEMENTS.

Write for our Reduced Prices and Working Samples.

Address All Inquiries To Factory

THE AMERICAN TIRE & RUBBER CO., AKRON, OHIO

Goodrich

Safety Tread Tires

Best in the Long Run

LICENSE HOLDER

The most satisfactory front clips for attaching license number to any size rod between headlights **25c per set** (coin or postage) prepaid anywhere.

Write for printed matter.

Majestic Auto Supply Co.

P. O. Box 548 Philadelphia, Pa.

C-C SHOCK ABSORBER

Why *you* should sell this Shock Absorber

1st. They satisfy the customer. There are thousands of C-Cs in use today and every one is making good.

2nd. They are a quality product. All working parts are of special heat treated steel made to stand abuse. Incorporated in the C-Cs are mechanically correct features that make for efficient shock absorption.

3rd. The price is right. At $10.00 set of two, complete for the rear, the C-Cs will be attached to hundreds of automobiles in your vicinity. It is only due to enormous production that this exceptionally low price is possible.

4th. The profit for you is big because of the demand which has been created through the extensive advertising we have been doing.

Are you going to take advantage of the results of the thousands of dollars that are being spent to advertise C-Cs?

FORD MODEL $8.00 Set of Four—$4.50 Set of Two

Thousands in use today with exceptional results in comfort and reduction of upkeep expense.

Write for dealer's proposition.

COX BRASS MFG. CO.

Established 1872

ALBANY, N. Y.

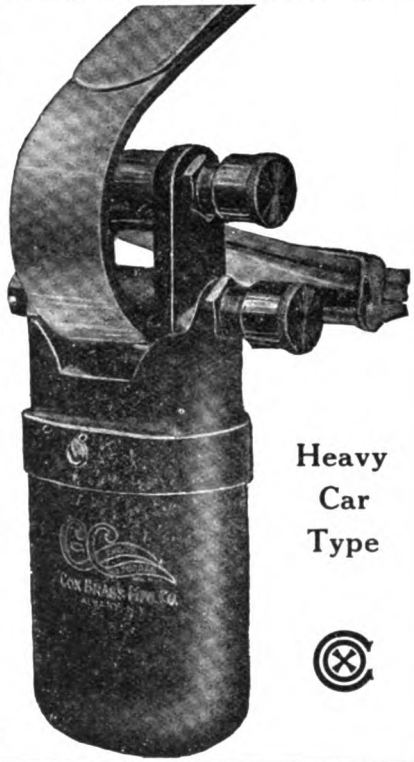
1777 Broadway New York City

2129 Michigan Ave. Chicago, Ill.

DISTRIBUTORS:

Boston, Mass., Philadelphia, Pa., Washington, D. C., Pittsburgh, Pa., St. Louis, Mo., Minneapolis, Minn., Davenport, Ia., Cleveland, O., Cincinnati, Columbus, Toledo, Buffalo, N. Y., Syracuse, N. Y., Sioux Falls, S. D.

Pacific Coast—San Francisco, Los Angeles, Oakland, Cal.



Heavy Car Type

$10.00 Set of Two Complete for the Rear **$10.00**

THE HAMPTON HUMEFIER

The biggest development to motor cars in ten years.

Agents Dealers Motorists

SOLE DISTRIBUTORS

J. B. SALMON & CO.

1790 Broadway New York

"K. & S." RATCHET WRENCH



WITH REVERSE SHIFT.

All parts Interchangeable. GUARANTEED. Price $2.25.

HENRY M. KOLB, Philadelphia, Pa.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.

71-73 Murray St., New York.



"CATARACT"

Auto-Vehicle Washer

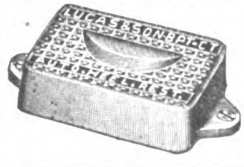
Attaches to your garden hose. Can't Scratch or Streak Varnish. Cannot rust.

Cataract Stop Cock Handle and Mop $2.00; plain handle and mop $1.50; short handle and mop $1.00; extra mops 50c. each; extension handle, making other handles longer, 50c.

CATARACT AUTO-VEHICLE WASHER CO.,

E. Belmont Ave., Topeka, Kansas

AUTO HEEL REST



Made of

POLISHED ALUMINUM

½, 1, 1½ and 2 in. high.

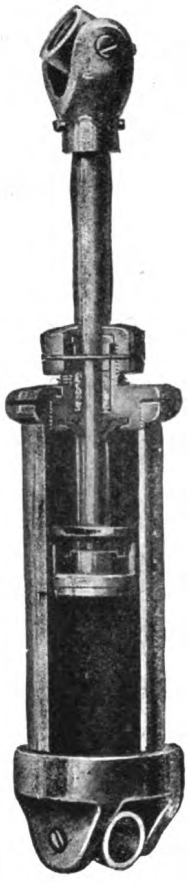
A heel rest for brake or accelerator pedals.

75c. Post Paid.

LUCAS & SON

10 Fox St., Bridgeport, Ct.

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3 Big Hits at the New York and Chicago Auto Shows

Lyon Resilient Bumper

Something entirely new.

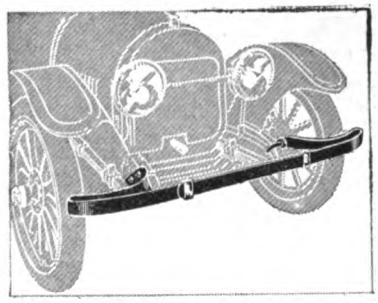
Indestructible

Other Bumpers cannot compete in Efficiency, Appearance and Quick Sales.

Lists $6.00 to $10.50

All Finishes

Made of Spring Steel



Hydraulic Shock Absorber

A dust proof cylinder with inside working piston attached by universal joints. Glycerine and air do the work. No springs to get out of order. Reduces wear on tires 50%.

Special Price for FORD Size

MANUFACTURED EXCLUSIVELY BY

Metal Stamping Co.

Long Island City, N. Y.

"Ideal" Transmission Brake Band



Showing Lugs Detached

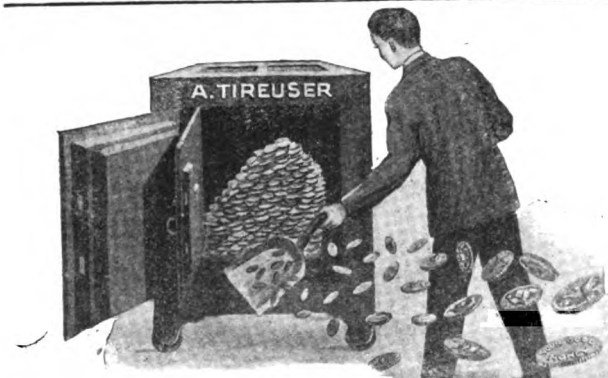
For Ford Cars

With Detachable Lugs.

A three hour job done in 30 minutes.

Further particulars on request.

Write for Our New Catalogue Embracing 150 Accessories, Including 50 Ford Specialties.

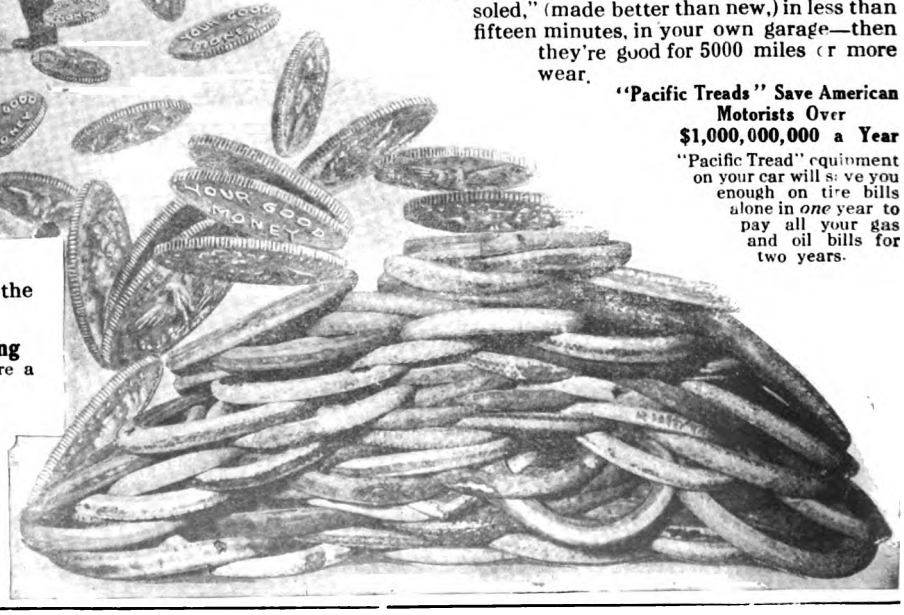


Stop! throwing money away on tires

Every WORN tire you discard is money thrown away. Every one of those tires can be "half-soled," (made better than new,) in less than fifteen minutes, in your own garage—then they're good for 5000 miles or more wear.

"Pacific Treads" Save American Motorists Over $1,000,000,000 a Year

"Pacific Tread" equipment on your car will save you enough on tire bills alone in *one* year to pay all your gas and oil bills for two years.



Stop! Today

Put "Pacific Treads" on your car and you can run it for two or three years on one set of casings with this fortified "Pacific Tread" protection.

No More Blow-Outs, Punctures, Rim-Cuts or Blisters

"Pacific Treads" eliminate all Tire Trouble the minute you put them on your car.

Forget About Sliding, Slipping or Skidding

Once you put "Pacific Treads" on, your tire troubles are a thing of the past for 5000 miles or more—5000 Guaranteed.

Cut Out and Mail Today

V. K. STURGES CO.
Oakland, Cal.

Gentlemen: Kindly send me full particulars about your "Pacific Treads" as advertised in June Automobile Dealer and Repairer.

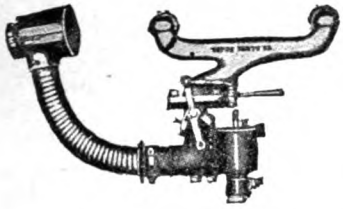
Name.....

Address.....

Car.....

Size of Tires.....

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ZENITH

Ford Carburetor Gives Extra Power FREE!

The strongest selling argument for the **Zenith Ford Carburetor.** A perfect mixture at all speeds with absolutely automatic certainty. Rapid pick-up with smooth, easy "get-away" without racing engine.

A ZENITH Demonstrated is a ZENITH Sold

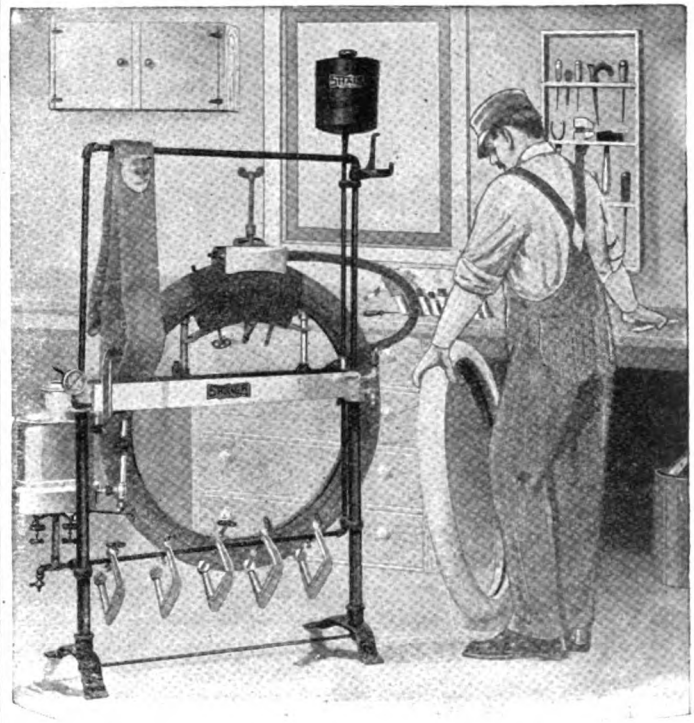
Once installed, the ZENITH is always right. Not a screw, spring, valve or clapper to adjust. The compound spray nozzle gives an automatic priming charge, and then adapts itself to every possible condition at every impulse of the engine, without further attention. **Nothing Like It!**

Retails at $20, with a generous profit to you. Write for proof of claims, trade terms, and selling helps.

$20

Complete with Manifold

The Motor Parts Company
SOLE PRODUCERS
818 No. Broad Street
Philadelphia



Make $60 a Week Repairing Tires

Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make $60 or more a week. One man made $45 the first day he received his outfit. Others are making $25 a day and hundreds of wide-awake men are making $200 to $500 a month clear profit above all expenses.

Be Your Own Boss

You can make big money in the Automobile Tire Repair business. No experience needed. We teach you how. Very little capital required. But slight risk as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day.

SHALER

Tire Repair Outfit Only $60

and will do as much and as perfect work as the big $250 to $500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It is the only vulcanizer that has **Automatic Heat Control.** It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

Let Us Tell You How

to open an Automobile Tire Repair Shop and make more money. Send the coupon or a postal or a letter and get our Big Catalog and Free Book "Care and Repair of Tires." Write quick before some hustler gets ahead of you.

C. A. SHALER COMPANY
805 Fourth Street Waupun, Wisconsin
Largest Manufacturers of Vulcanizers in the World.

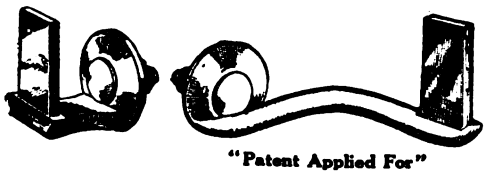
Mail Coupon For FREE Book

C. A. SHALER CO., 805 Fourth Street, Waupun, Wis.
Without obligation to me send me Catalog and Free Book "Care and Repair of Tires."

Name.....
Street.....
City..... State.....

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"SUPERIOR" STREAMLINE FORD HOODS



"SUPERIOR"

1915 Ford Lamp Brackets Will Enable You To Put On Any Stock Side or Tail Lamp.

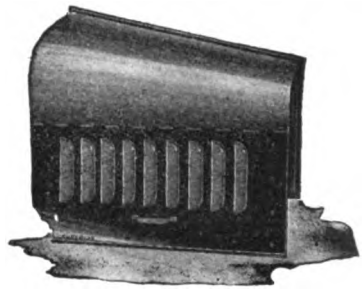
"Patent Applied For"

Furnished in "Malleable" Iron, 3 Brackets To A Set.

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are just merely painted and chip off easily.

IMMEDIATE DAILY DELIVERIES—NOW!



PATENT APPLIED FOR.

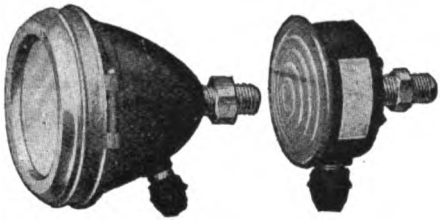
Price $8.00 Complete

No. 1. FITS 1912-13-14 FORDS.
No. 2. FITS 1915 FORDS.

"SUPERIOR" BOLT-ON 1915 FORD ELECTRICS READY TO ATTACH.

Attractively Designed—Complete with All Fittings

"SUPERIOR" BOLT-ON 1915 FORD OIL LAMPS NOW READY.



No. 800 No. 801

"SUPERIOR" FORD CROWN FENDERS GET THE PRICE!



"SUPERIOR" V-TYPE FORD RADIATORS.

Price—Brass $34.70 German Silver $38.00

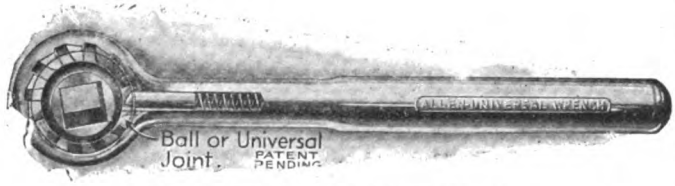
GET OUR CREDIT ALLOWANCE ON OLD RADIATORS

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

SEND FOR LATEST ILLUSTRATED FORD SHEET

ALLEN-UNIVERSAL WRENCH

"The Wrench With Universal Action"



A Drop Forged Wrench, Carefully Machined. All Parts Hardened. Fully Guaranteed. The "Universal Joint" principle makes this tool adaptable for use at any angle and in places where a straight wrench cannot be used.



Price $8.00

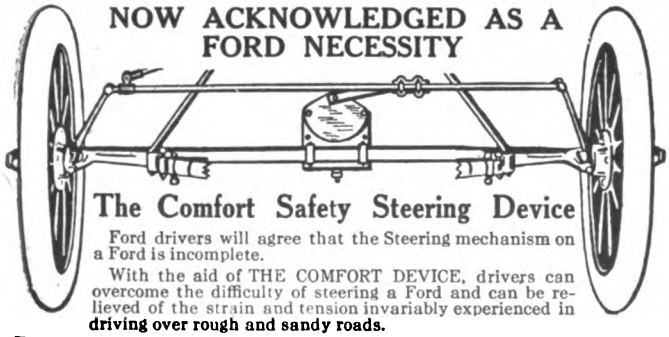
MANUFACTURERS' REPRESENTATIVES

STEWART & CO., New York City N. A. PETRY CO., Inc., Philadelphia, Pa.
WEISS-BOSLEY SALES CO., St. Louis, Mo.
H. G. PARO, Chicago, Ill. M. A. BRYTE, San Francisco, Cal.

Write for Circular D. R. 4.

ALLEN WRENCH & TOOL CO., PROVIDENCE, R. I.

NOW ACKNOWLEDGED AS A FORD NECESSITY



The Comfort Safety Steering Device

Ford drivers will agree that the Steering mechanism on a Ford is incomplete.

With the aid of THE COMFORT DEVICE, drivers can overcome the difficulty of steering a Ford and can be relieved of the strain and tension invariably experienced in driving over rough and sandy roads.

The possibility of wheels "doubling under" is reduced to a minimum. It saves tires by preventing the "side lash" of wheels.

Get ALL the pleasure of driving. PRICE $5.50 DELIVERED.

Agents Wanted in Unassigned Territory.

Special Introductory Price:—We offer a special discount to Ford drivers in territories where our Steering Device has not been introduced.

WRITE FOR CIRCULARS AND PRICES.

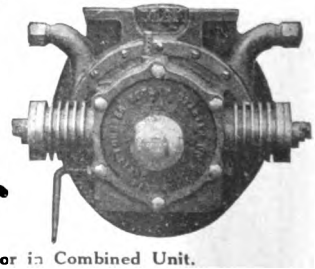
THE COMFORT MOTOR MACHINE CO., Denver, Colo.

Model "F" for Fords
Model "J" for Medium Cars
Model "M" for Large Cars

Get a Real Starter
The Compressed Air Rotary

Thurber Starter

AND TIRE INFLATOR



Air Pump and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 R P M under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc. Hundreds in use. PRICES: Model M, Large Cars, $85.00—Model J, Medium Cars, $70.00—Model F, for Fords, $65.00. F. O. B. Cars Our Works, Detroit.

NORTHERN ENGINEERING WORKS
12 CHENE STREET - - DETROIT, MICH.

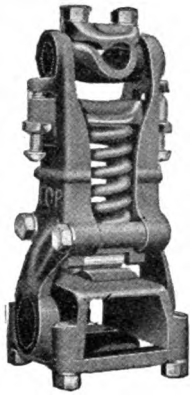
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DEALERS

There are 700,000 Ford owners in this country. Every one of them is a possible customer for

SAVIDGE
Steering Device



A simple, sturdy, easily attached device built along engineering lines for Ford cars, that makes driving positive, takes the wobble out of the front wheels, acts as shock absorber on steering, saves tire expense, doubles the comfort and safety of the car.

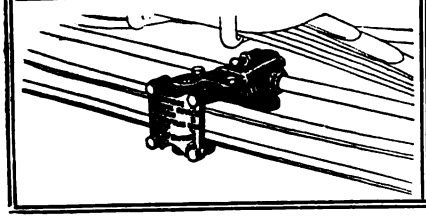
$4.90

Here Is a Live Proposition

Backed by men who have studied the Ford Accessory business and know that the Savidge Steering Device fills a long-felt want of Ford owners.

Get In On These Profits—Now!

There is a good margin for you. Write today and learn the details of our dealers' proposition for the finest and most inexpensive detail of equipment ever added for Ford cars.



Savidge
Steering Device Co.
508 Murphy Bldg.
Indianapolis, Ind.

The ALLEN TIRE CASE

The result of the protection afforded a spare shoe by a perfect fitting, waterproof tire case is measured in actual mileage when the shoe is put in service. The patented Allen Tire Case is guaranteed waterproof, perfect fitting and of finest workmanship. Made of highest quality enamel duck, in several styles and in all colors and all sizes. **Prices $3.00 and up.**

Ask your dealer to show you the Allen Tyrometer, the handy, accurate tire pressure gauge. **Price $1.00.**

The 1915 Booklet will surely interest you. Sent free on request.

WRITE TODAY!

The Allen Auto Specialty Co.
Manufacturers
1926 Broadway, New York
1627 Michigan Ave., Chicago

REFLEX

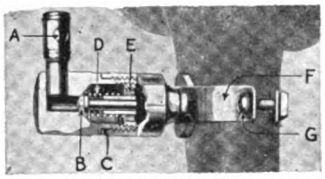
For The Motorcycle Trade
BABY REFLEX



Price $1.25, porcelain $1.00
If You Want the Best You'll Sell BABY REFLEX

The SPEED BOOSTER

More Speed, More Power
SAVES GAS
Makes Hill Climbing Easy



$2.50 Post Paid
Or at Your Dealer's

Attached to the manifold, the Speed Booster *automatically* supplies the right amount of air for any speed. The Speed Booster is not only an absolute necessity on every car because of the great saving in gasoline, increased speed and carbon prevention, but it gives the car greater flexibility, which means more satisfaction, comfort and riding ease.

REFLEX

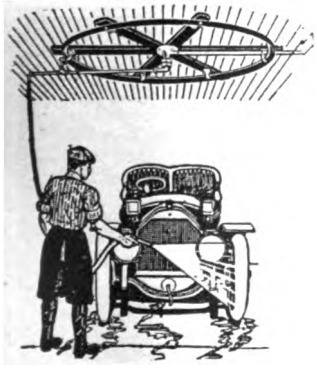
For The Ford Trade
FORD SPECIAL REFLEX



Porcelain only 75c.
The Plug For FORDS
Best in Actual Service

DEALERS:—Boost Your Sales and Profits with The Speed Booster and Reflex Spark Plugs
Send Today for Catalog and the Reflex Proposition

THE REFLEX IGNITION COMPANY, 211 HIGH AVENUE, CLEVELAND, OHIO



KEEP YOUR CAR CLEAN
WITH A
"PERFECT" VEHICLE WASHER

SAVES LABOR, WATER and HOSE

Send for Catalogue

PERFECT MANUFACTURING COMPANY
ALBANY, N. Y.

KORINE
CARBON REMOVER

CLEANS MOTOR IN ONE HOUR
QUICKEST SELLER ON THE MARKET
NO ACID, GRIT OR CHEMICALS
Quart $1.00, Half Gallon $1.75, Gallon $3.00
Every owner will buy a Carbon Remover that works. KORINE DOES WORK.
EVERY DEALER SHOULD STOCK IT.

KORINE CARBON REMOVER CO.
136 Federal Street Room 316 Boston, Mass.

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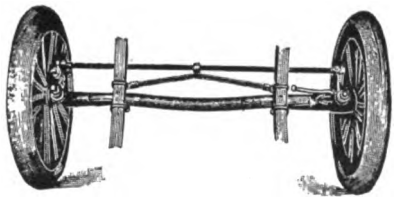
USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D, CHATHAM, N. Y.

Sent To Any Address

$1.00



PERFECTION GREASE RETAINER

FOR FORD CARS

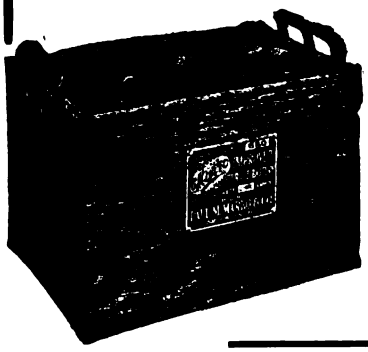
Guaranteed to stop oil and grease from working out of axle housing on to brakes and wheels. Anyone can apply them to axle in a few minutes' time. Full directions on box.

Fine proposition for Agents. Dealers and Jobbers, write for discount.

A. B. WORTHINGTON, *Manufacturer*

1220 San Pedro Street Los Angeles, Cal.

WHY REPAIRMEN SHOULD USE *Marko*



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

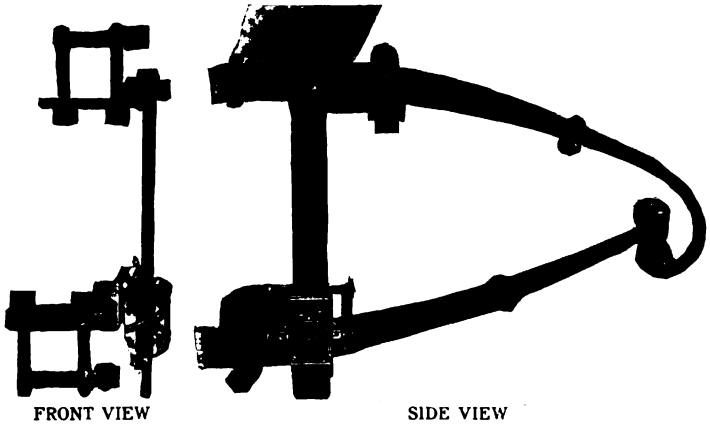
Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

"Marko" batteries lead because of their great efficiency and reliability.

Write At Once for Our Proposition to Repairmen and Dealers.

STORAGE BATTERIES

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.



FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

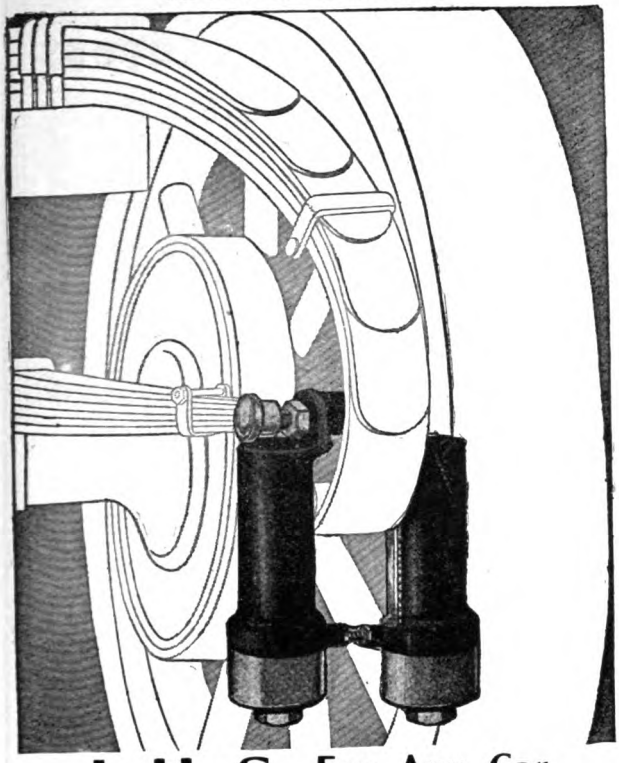
Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.

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SAGER PRODUCT

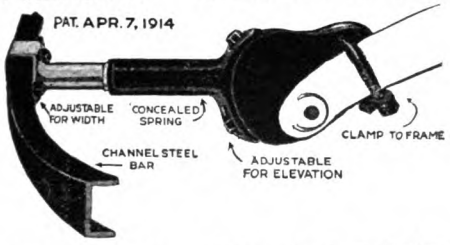
Endorsed by 20 Manufacturers and Over 250,000 Motorists.
Ten Years of Manufacturing.



J. H. S. For Any Car

Highest Standard of Quality. Minimum of Cost. Indispensable for Comfort and Economy of Upkeep. **Make Every Road a Boulevard**

Free Trial Offer. A Guarantee Worth While.



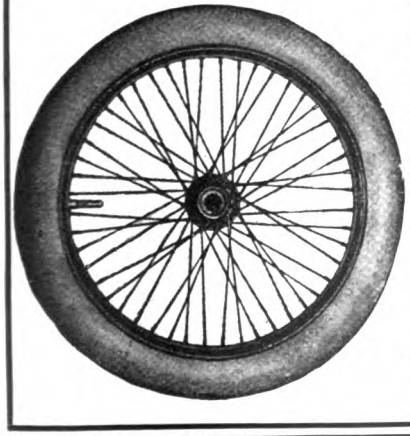
SAGER BUMPERS

Recognized as **best** and **oldest** in the trade. **Channel—Triangle—Square and Round Bars.** **List Price $5.00 and Upwards.**

Big discounts to the trade. **Write also for a Bumper Rack.**

We have the best proposition on Ford Absorbers, Ford Bumpers, Ford Auxiliary Radius Rods and Ford Truss Rods.

J. H. SAGER CO., 291 South Avenue, Rochester, N. Y.



WIRE WHEELS
FOR
FORD CARS

$20.00 per set, complete, ready to attach. No machine work necessary.

DEALERS:
These wheels are backed by a binding guarantee for satisfactory service. Our selling proposition gladly sent on application.

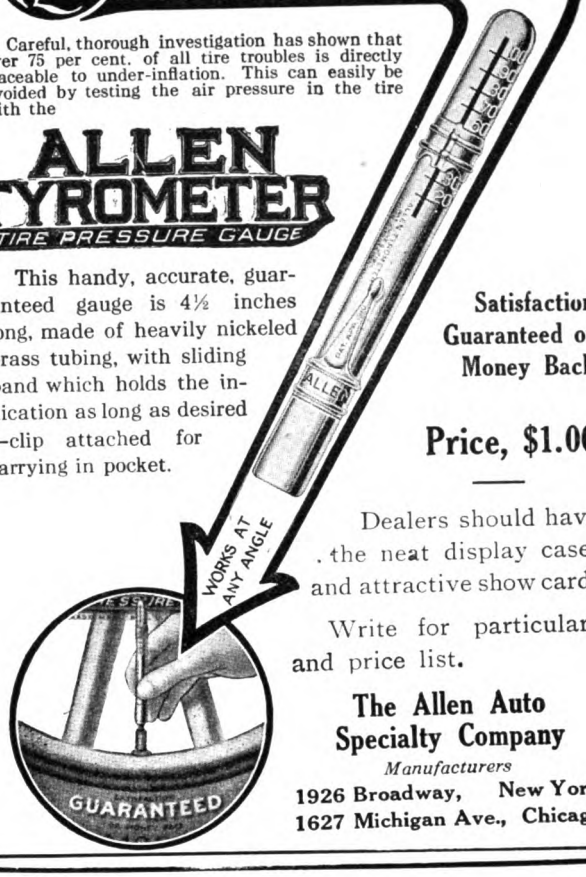
THE
MOTT WHEEL WKS.
100 Hickory St., Utica, N. Y.

Allen This Tire Pressure Gauge Will Save Tire Expense

Careful, thorough investigation has shown that over 75 per cent. of all tire troubles is directly traceable to under-inflation. This can easily be avoided by testing the air pressure in the tire with the

ALLEN TYROMETER
TIRE PRESSURE GAUGE

This handy, accurate, guaranteed gauge is 4½ inches long, made of heavily nickeled brass tubing, with sliding band which holds the indication as long as desired —clip attached for carrying in pocket.



Satisfaction Guaranteed or Money Back

Price, $1.00

Dealers should have the neat display case, and attractive show card.

Write for particulars and price list.

The Allen Auto Specialty Company
Manufacturers
1926 Broadway, New York
1627 Michigan Ave., Chicago

Is your car equipped with a low tension magneto?



If so, write at once for data on the J. & B. Transformer Coil. This coil increases the efficiency of your ignition 100 %. A coil that is guaranteed for life, absolutely fool-proof.

Don't bother with faulty ignition.

Write for particulars.

J. & B. MANUFACTURING COMPANY
PITTSFIELD, MASS.

Chicago Branch
W. A. BARRETT
910 Michigan Ave.

New York Branch
1777 Broadway

Foreign Distributors
AUTO SUNDRIES Co.
18 Broadway, N. Y.

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Reduces Sponge Cost

It gives more and better service—cannot scratch the finest car body—and is easy to handle.

The Perfolam sponge is made of lamb's wool, outer casing, and regular sponge filling. The soft yet tough lamb's wool gets the rough wear—the sponge center serves only to hold the water. The Perfolam will positively out-wear any high grade sponge by at least two to one. Used dry it is an efficient polisher.

SPECIAL OFFER: For a short time we will send you postpaid, this 7-inch $1.50 Perfolam sponge for $1.00. Money refunded if not satisfactory.

Dealers! This is a big winner. Write for lucrative dealer's proposition.

The Perfolam Sponge Company
1304 East 20th Street - - Cleveland, Ohio

AIR-IN-AL



Seals Punctures Instantly
$5.00 PER SET OF FOUR WHEELS
(For any size tire)

Ease of Installation
makes it the most salable article of its kind ever offered the motoring public.

ANY BOY CAN INSTALL AIR-IN-AL IN 15 MINUTES. NO TOOLS REQUIRED.

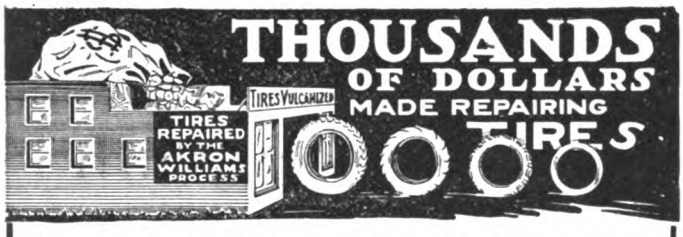
Guarantee

We guarantee that AIR-IN-AL is non-injurious to rubber, paint, varnish or fabric, and that we replace, free of charge, any inner tube should it prove defective by the use of **AIR-IN-AL.**

Send For Booklet

WOODBRIDGE CHEMICAL COMPANY, Inc.
U. S. Rubber Building, New York
Laboratories, Woodbridge, N. J.

CHOICE TERRITORY OPEN FOR LIVE REPRESENTATIVES



You can make anywhere from $1,500 to $3,000 a year above expenses. Your investment to start is small, returns are quick and income cash. Profits are large on every job. The tire repair business is growing every year. Every city and town offers **opportunity for you.** Buy only an

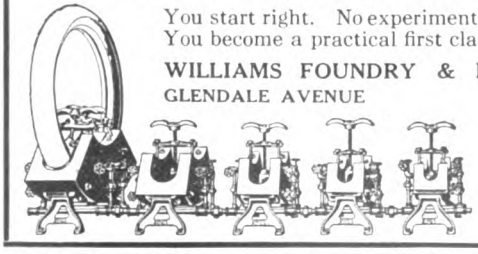
AKRON-WILLIAMS TIRE REPAIR EQUIPMENT

The better your equipment, the better your work, and the greater your volume of business. Start right. Use equipment which is

Endorsed by 30 Leading Tire Manufacturers

We are making an unusual offer to everybody who buys our equipment. You can become a tire repair expert by our plan.

SEND FOR OUR 30 DAY SCHOOL PLAN

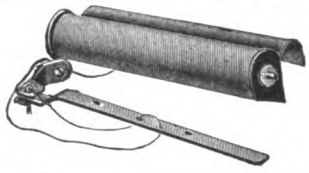


You start right. No experimenting. No failures. You become a practical first class repair man.

WILLIAMS FOUNDRY & MACHINE CO.
GLENDALE AVENUE AKRON, OHIO

SEND FOR CATALOG No. 121

REYNOLDS SAFETY LIGHT SHADE





When using Reynolds Safety Light Shade, you can pass cars with glaring lights—with perfect safety. Price, $2.00. Money refunded, if not satisfied.

Fits on All Windshields.

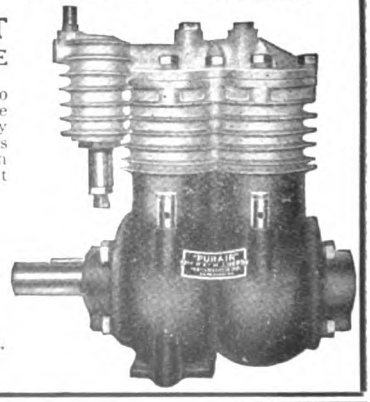
Positive Protection for the Eyes

Special Introductory Offer with this Ad., $1.50

REYNOLDS SAFETY LIGHT SHADE CO., Oneida, N. Y.

"PURAIR" TIRE PUMP

SAVES ITS COST IN A VERY SHORT TIME



May be installed by anyone, as no machine work or special tools are required. In most cases it is only necessary to remove two cap screws and put them back again with bracket in place, and clamp split gear to its shaft.

Effective and Compact

Every Pump Guaranteed

Made with either one or two cylinders.

Write for Prices and Full Description

HERT MANUFACTURING CO.
INDIANAPOLIS, IND.

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Did You Get Yours?

Have you received *your copy* of the Special Proposition we are offering to Garage Owners? If not, you are missing one of the "good things" of the season.

This Special Proposition offers you the chance to become experts in Electrical Equipment. It equips you to handle repairs and adjustments of Electrical Starting and Lighting Systems, and to gather in the large and steadily growing profits from this desirable trade.

Incidentally, it helps you to become the recognized leader in your trade in your entire district, for the control of the electrical trade will carry with it all other supplies, repairs, etc.

HERE'S THE SITUATION:

You know what Electrical Starting and Lighting Equipment has done for the Automobile—revolutionized it! It will do the same to the garage business!

If you attempt to handle this Electric Starting and Lighting repair business without proper knowledge and equipment, you will steadily lose your trade to your more enterprising and progressive competitor.

DON'T WAIT—WRITE US NOW!

We have an unusually advantageous offer to make you. Write to us *at once*, as we cannot afford to keep such a proposition open very long.

Weston Electrical Instrument Co.

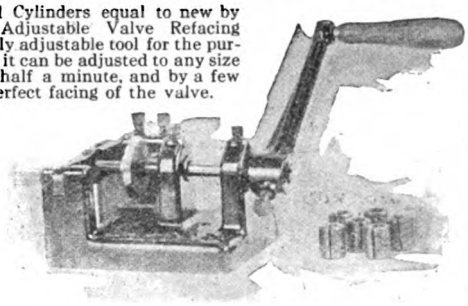
2 Weston Ave., Newark, N. J.

New York—114 Liberty St.
Chicago—832 Monadnock Block
Boston—176 Federal St.
Philadelphia—303, 304 Hale Bldg., 1326 Chesnut St.
Buffalo—Tower Electric Sales Co., Inc., 1205 Electric Bldg.
Richmond—38 Allison Bldg., 8th & Main Sts.
St. Louis—915 Olive St.
Denver—231 15th St.
San Francisco—682 Mission St.
Cincinnati—R. E. Ward, Mercantile Library Bldg.
Cleveland—1729 E. 12th St.
Detroit—Dime Bank Building
Toronto—A. H. Winter Joyner, Ltd., 100 Wellington St., West
Montreal—The Northern Electric Co., Ltd.
Winnipeg—The Northern Electric Co., Ltd.
Vancouver—The Northern Electric Co., Ltd.
London Paris Berlin
Petrograd
Johannesburg, South Africa

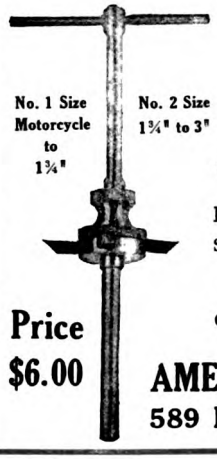
"AMERICAN"

ADJUSTABLE VALVE FACING TOOL

MAKE your old Cylinders equal to new by using this Adjustable Valve Refacing Tool. The only adjustable tool for the purpose on the market, it can be adjusted to any size valve in less than half a minute, and by a few turns will give a perfect facing of the valve.



Price $6.00



No. 1 Size Motorcycle to 1¾"

No. 2 Size 1¾" to 3"

"AMERICAN" ADJUSTABLE VALVE SEATING TOOLS

With these tools any set of valves can be seated to a perfect point of accuracy.

Instantly adjustable to any size valve cage

Set of Two Tools, comprising either size Seating Tool and the Facing Tool, both fitted with Bushings and Stems for the Valves and Cages of your car.....$10.00

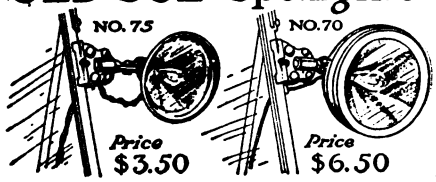
C. O. D. Express or Parcel Post, or from our Agent in your City.

Price $6.00

AMERICAN VALVE TOOL CO.
589 Hudson Street New York



OLD SOL Spotlights



will "Spot" Danger in any direction, front, back and sideways. (Attached to windshield.)

The Electric Switch in the handle of an Old Sol Spotlight can be operated quickly and is always within easy reach of the hand.

The Old Sol No. 75 Model is admirably adapted for use on Ford and other light cars. No. 70 makes a handsome addition to the equipment of any automobile. Can be quickly detached and used as a trouble light.

OLD SOL No. 58 HAND ELECTRIC LANTERN

A *Brilliant* Success

Old Sol No. 58 reaches the highest point of portable light efficiency. It is operated on two ordinary No. 6 dry cell batteries. Handsomely finished in black enamel with 5 inch silvered reflector. Old Sol No. 58 Hand Electric Lantern is needed by all motorists.



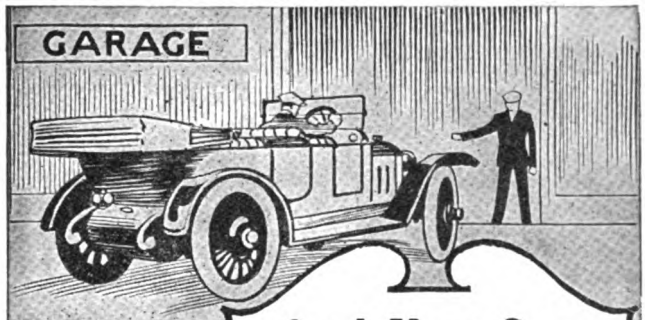
Price $2.00
Batteries not included

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Pacific Coast Representatives
Bailey-Drake Co., 604 Mission Street, San Francisco, Cal.

HAWTHORNE MANUFACTURING CO., Inc.

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Send Your Cars OUT *Leakproof!*

SOUND car repairing stimulates business. Soundly repaired cars have absolutely leakless gasoline oil and water joints. Sound work of this sort stimulates reputations. Progressive garage men use ENDURA SHEET PACKING, because it makes joints ***leakproof.*** It is made particularly for this purpose.

Valuable booklet and free samples on request.

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Miller's No. 14 Three Cavity Sectional

(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

With Gasoline Burner Outfit, extra - $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.

MILLER'S REPAIR MATERIALS

Common Tread Stock, per lb	$0.50
Standard Tread Stock, per lb	.70
High Grade Tread Stock, per lb	.85
Cement Stock for Casings	1.25
Cement Stock for Tubes	1.75
Inside Tube Patching Rubber, cured one side, per lb	1.50
No-Cement Patches, per dozen packages	2.50
No-Cement Patching Rubber, sheet form, per lb	2.00
Fabric Sea Island Cotton, 17½ ounces, one or two sides	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides	.65
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, Net	2.00
*Miller's Three in One Repair Stock	1.50

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 10 lb. lots or over, 10 and 5 per cent. On 20 pound orders, 25 and 5 per cent. for cash.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture

Patented

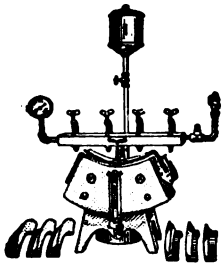
Other Patents Pending



That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 28 Bead Molds and 7 Tread Molds.....$95.00 Less All Molds.....$42.00

MILLER'S SECTIONAL VULCANIZER
With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $41.50

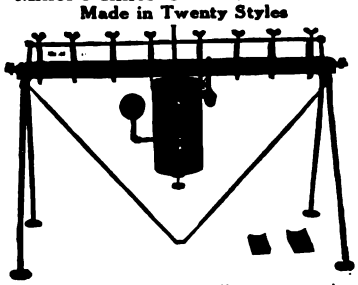
Miller's High Pressure Air Pump

is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. pressure. Write for details.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Inner Tube Vulcanizers
Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an **abundance** of steam.

PRICES FROM $5.00 to $30.00

Miller's Rubber Instruction Book.

Price Prepaid, $1.00 Net

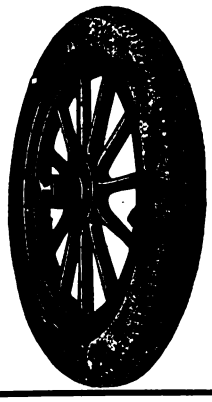
Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Ceg" Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*

CHAS. E. MILLER

Anderson Rubber Works

ANDERSON, IND., U. S. A.

TIRE PROTECTION



A complete protection of chrome leather constructed with patented INSULATING and LUBRICATING strip between rivet roots and rubber casing. Prevents heat and chafing.

Prevent skidding on wet and muddy roads.

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Prolong the Life of Your Tires

They may be successfully used upon old casings provided the fabric is in good condition, even though the rubber be worn off.

They fit like a glove and add sturdiness to the appearance of the car.

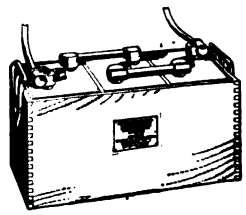
Made in all sizes for all makes of cars.

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"TWO MINUTE" TIRE TOOL

For Clincher Tires

Most wonderful device ever offered. A real necessity. A dollar will bring one tire tool by mail, prepaid, or ask your dealer.

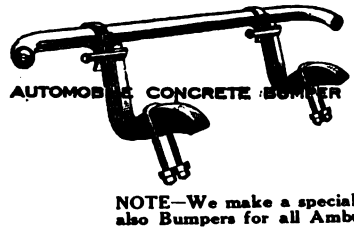
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No boring of the frame of the cars. Made of good materials reinforced by a steel rod and filled with well seasoned concrete. Made in all sizes of round and square tubing.

Write for our dealers' prices and printed matter.

NOTE—We make a specialty of Rear Bumpers, also Bumpers for all Ambulances and Trucks.

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100% Efficient

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Takes 15 Minutes

Think of this saving of time—think how quick and how simple. Remove spark plugs, put in a little OPCO, replace them and off you go!

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Compare with prices you usually pay. Also consider the inconvenience saved. The OPCO way is so remarkably inexpensive you just can't overlook it.

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BUFFALO, N. Y.

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Electrically Heated,—Garage

Vulcanizer $65

Subject to Trade Discount

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SERVES TWO PURPOSES

A Loud Warning Signal That Also Protects Your Car From Thieves

When leaving your car you simply take the key with you, which leaves the whistle open so that your engine cannot be started without the same blowing loud enough to be heard blocks away.

It is a whistle that will blow for you as long as your engine goes, with just a kick of your foot, thereby giving you the use of your hands and feet in case of accident.
It is a whistle that will prove it was blowing at time of accident, if necessary.
It is a whistle that will tell you if a cylinder is leaking or skipping on your engine.
It is a whistle that cleans itself. *Write for prices and full particulars.*

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Eagle Light Cars Equipped with the Wonderful **Macomber Rotary Engine.**
FORTY to FIFTY MILES to the **GALLON** of **GASOLINE**
Cost of maintenance of these cars, about half that of standard tread automobiles. Sales price, $375.00 up—depending upon equipment.
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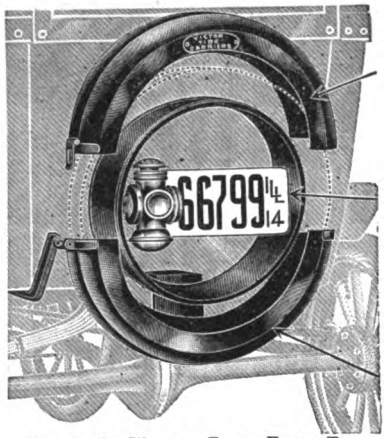


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INVINCIBLE INNER TIRES *Write for Details and 1915 Price List*
SAVE 40%
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53 SABIN STREET PROVIDENCE

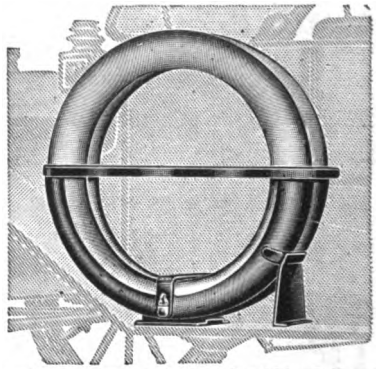
VICTOR, SIMPLEX AND DUPLEX TIRE CARRIERS

HANDSOMELY FINISHED IN BLACK ENAMEL



The Right Way to Carry Extra Tires





Duplex on Running Board of Ford Cars

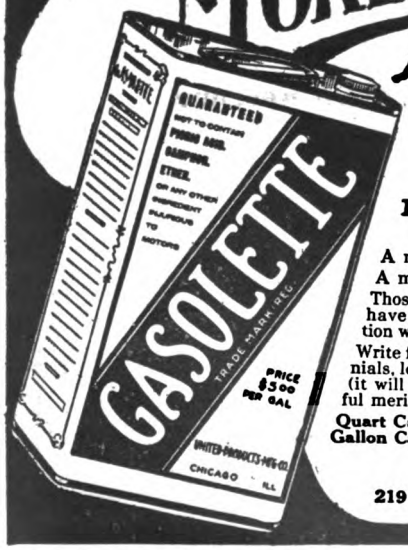
A handy man with carpenter's brace and bit and a wrench can attach any of these carriers to the car in thirty minutes,

The **VICTOR** is made of sheet steel in three sections, formed to fit, completely enclose and protect the two tires, as shown.
The **DUPLEX** is an abbreviated portion of the lower half section of the **VICTOR** with bars across the top.
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Made by THE INTERNATIONAL STAMPING CO., 1852 Austin Avenue, Chicago, Illinois

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MORE POWER AND A CLEANER MOTOR



Increases Mileage Per Gallon From 40 to 60 Per Cent
Decreases Fuel Cost of Operation In Like Percentage

A money saver for the user.
A money maker for the dealer.

Those who use it come back for more, and so, you Mr. Dealer, can have a steady income from its sale, if you will take up the proposition we have to offer you.

Write for FREE territory selling plans, etc. Also ask for testimonials, letters, or better still order a quart can "GASOLETTE" prepaid (it will treat 64 gallons Gasoline) and convince yourself of its wonderful merits.

Quart Can (will treat 64 gallons Gasoline)..... **$1.35**
Gallon Can (will treat 256 gallons Gasoline)..... **5.00**
Never Sold In Bulk

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Increases the efficiency of Gasoline without injury to motors.

Gives the motor greater pulling power, more speed and 100 per cent flexibility. sparks quicker and helps the engine to almost instantly pick up and to run smoother.

Prevents pre-ignition, pounding and over-heating of engine.

Removes and prevents carbon deposits on spark plugs, pistons, cylinders and valves, and thereby eliminates engine troubles.

Prevents carbon deposits on exhaust valves and seats, thus eliminating cutting and pitting, and consequent loss of power that can be remedied only by grinding valves.

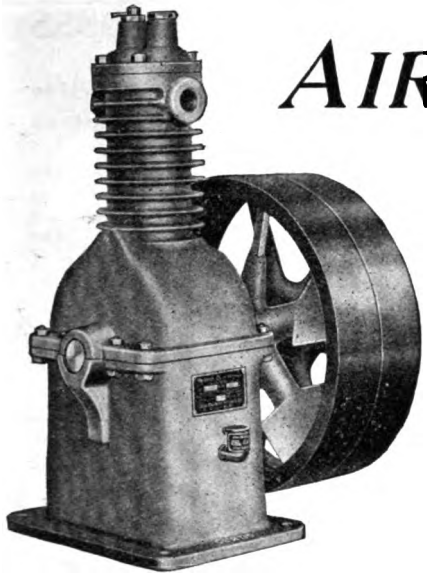
Prevents carbon Jeposits on intake valves and seats, which deposits cause loss of compression, loss of power and back firing in intake pipe.

Prevents carbon deposits on pistons, gumming and sticking of piston rings, loss of compression, loss of power—and you avoid the trouble and expense of taking down the engine to clean.

Lessens smoke, odor and noise.

Leaves cylinder and valves in an oily condition and therefore adds life to the engine.

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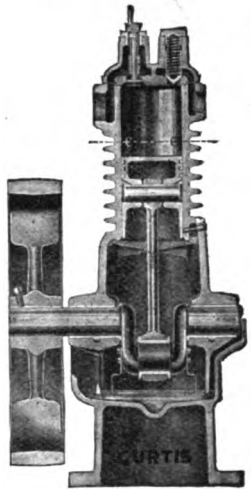
AIR FREE FROM OIL

Unintentionally or not, you certainly will damage your patrons' tires if the air you furnish is not free from oil—but how are you going to do otherwise ?

There is only way out of it

USE A

CURTIS GARAGE AIR COMPRESSOR



NOTE *HOW THE OIL IS PICKED UP*

A Curtis will furnish Air Free From Oil—note the cross sectional view. You will notice that unlike other splash oiled compressors the Curtis crank and connecting rod do not dip into the oil, nor is the oil thrown directly up in the cylinder—the amount of oil furnished the cylinder is limited to only sufficient to properly lubricate without excess to be carried over into the air line.

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There are a lot more good features that make for cheap air.

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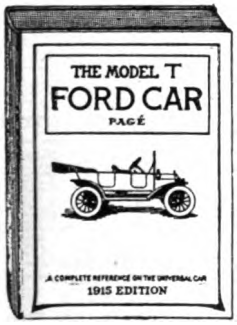
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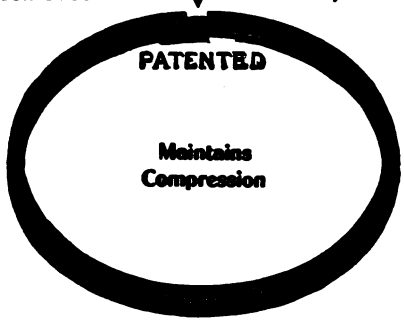
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Compression Tight and Carbon Proof

Guaranteed Not to Leak Sold on a Money-Back Basis



PEERLESS PISTON RINGS

Its lock joint is integral with the ring—no loose pieces to drop out—no multiple parts.

Its opening is sealed by the patented Peerless Lock Joint—and compression leakage is impossible.

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The Peerless is easier to install than any multiple-piece ring—easier to carry in stock because rings never become separated—easier to sell because they are sold on a money back guarantee.

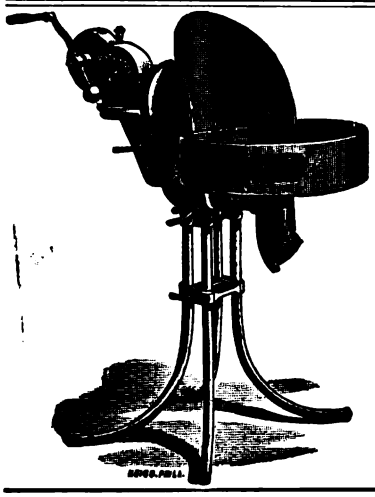
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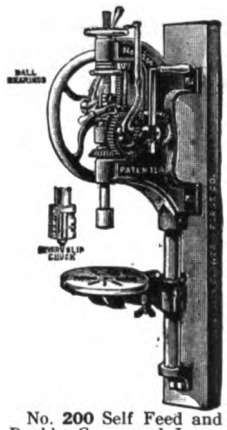
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SELF FEED AND
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Has Quick Return of Drill Spindle.

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Hyatt Quiet Bearings are used in the majority of American made automobiles

Bearings required for motor car repairs may be obtained on short notice at any of the service branches indicated.

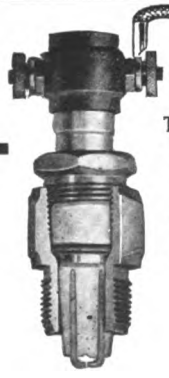
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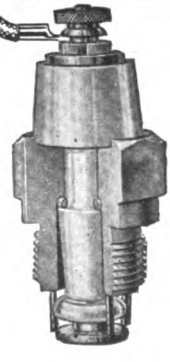
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PECO

Single Ignition Valve Plug



These Plugs Have Revolutionized Ignition!

Constructed on an entirely new principle. Series Plug for two-point ignition. Valve Plug for single ignition. They eliminate waste by burning all the gas. Far greater efficiency than any other plug. Peco Series Plug has proven the only reliable source for two-point ignition. Peco Valve has jumped as a leader among single plugs. If you want the best ignition on your car, either two-point or single, don't fail to install Peco Plugs.

"More Power to You"

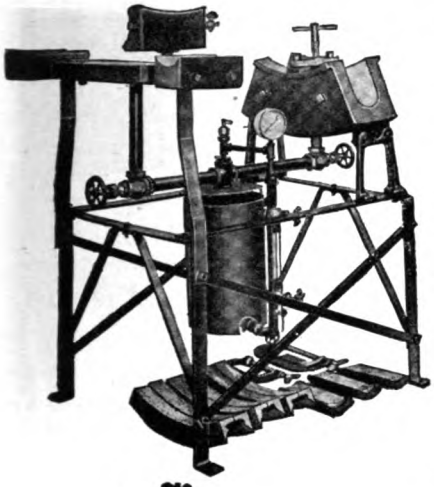
Write for descriptive literature and prices.

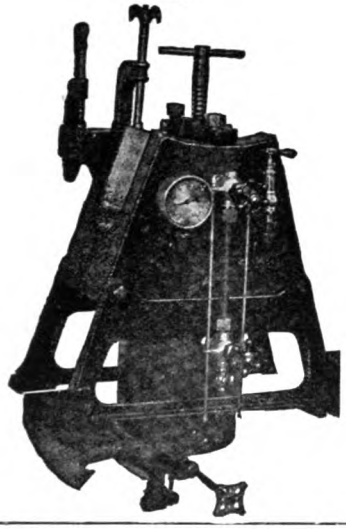
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After giving the Vulcanizer we bought from you a fair trial we find it to give absolute satisfaction. Have you another at the same price equipped with gas burner? —*A. W. Childress, Richmond, Va.*

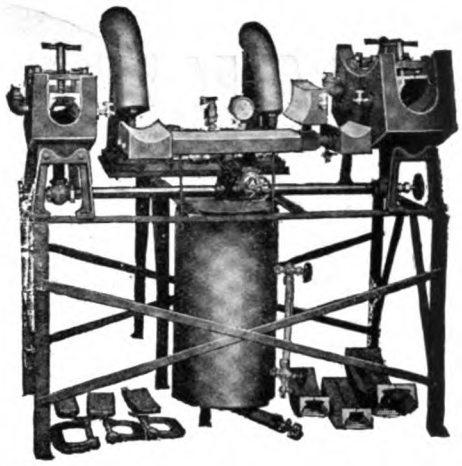
Shipped Mr. Childress another Vulcanizer, March 23, 1915.

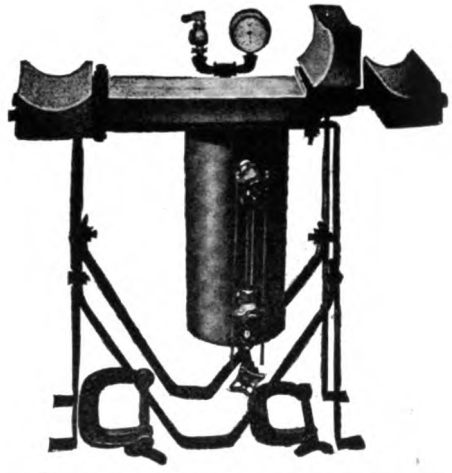
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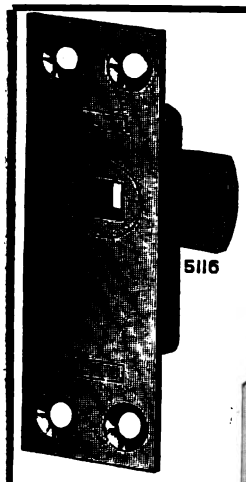
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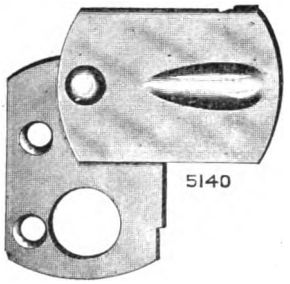
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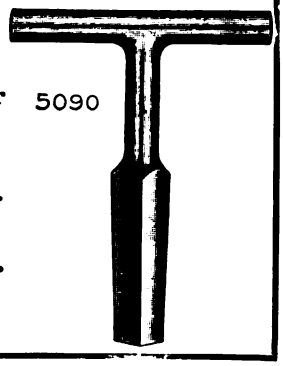


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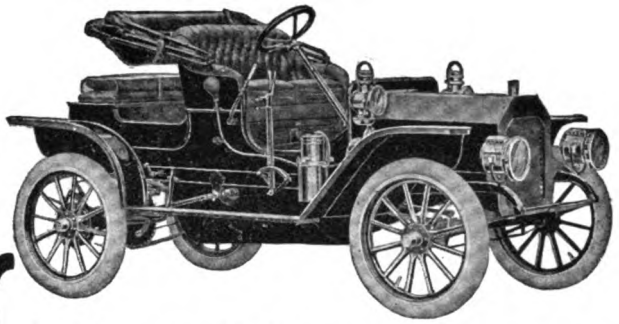
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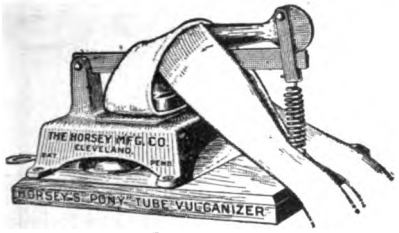
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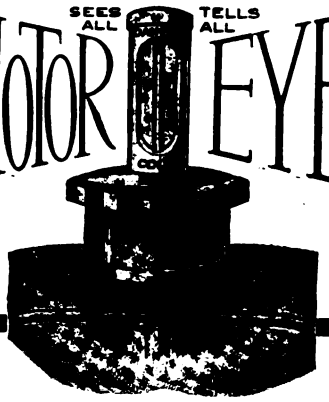
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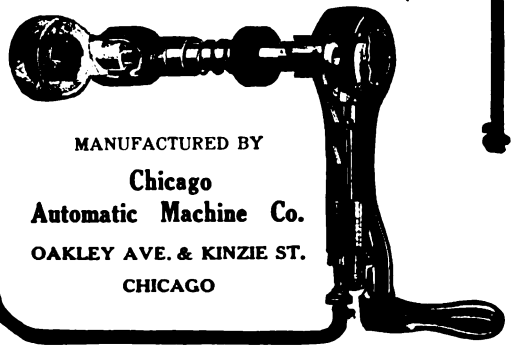


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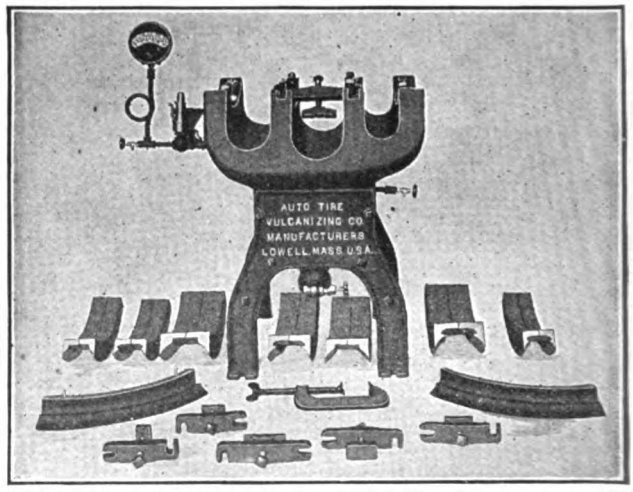


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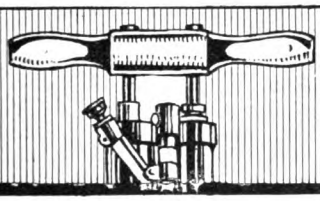
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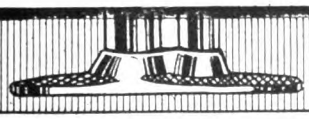
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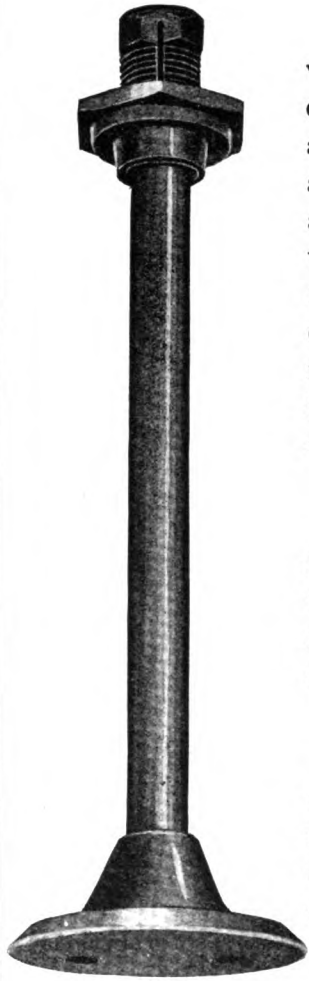
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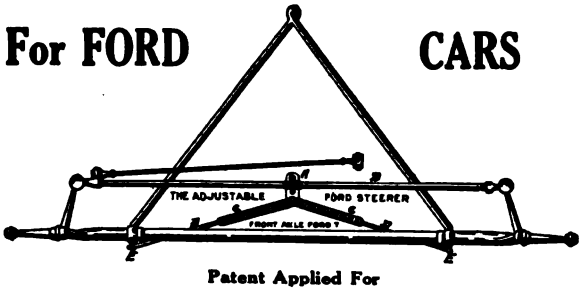
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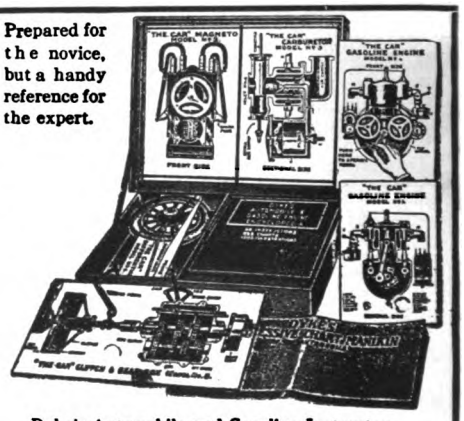
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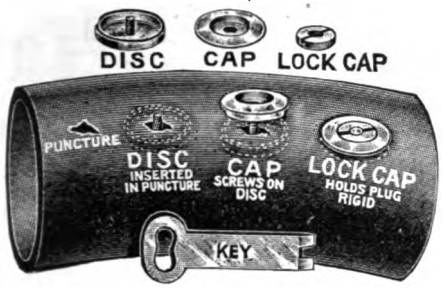
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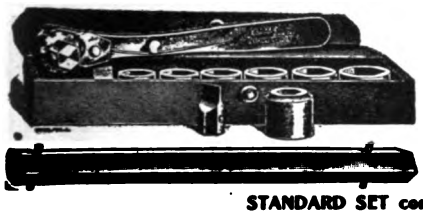
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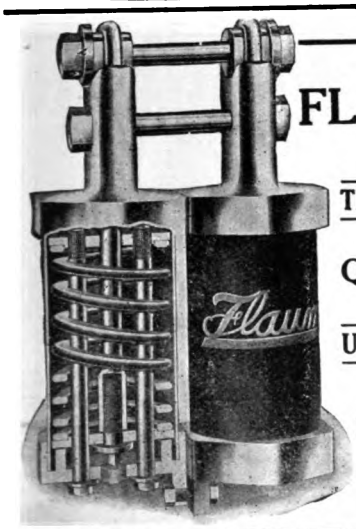


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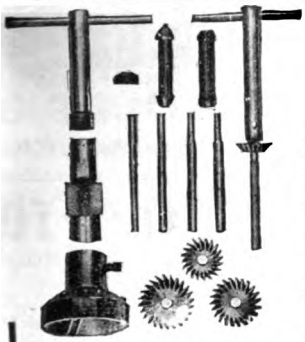
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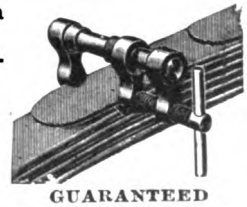


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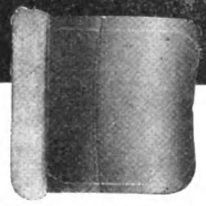
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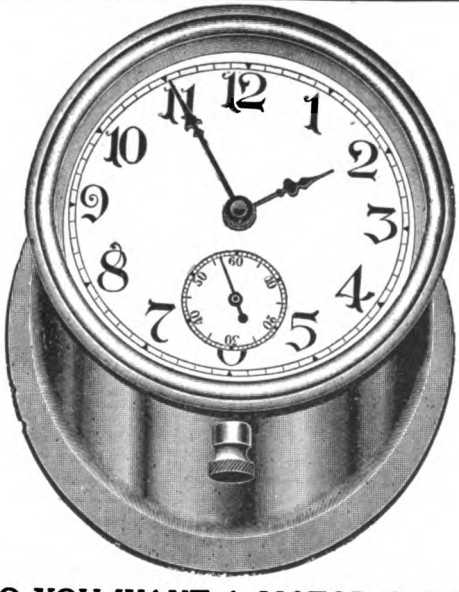


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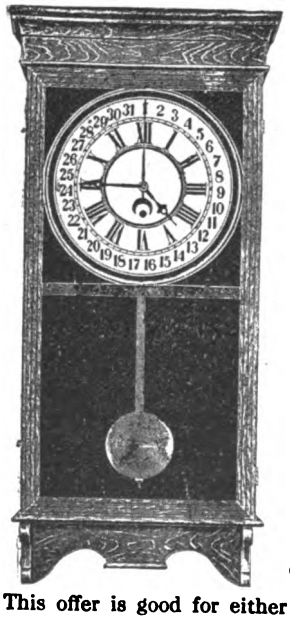


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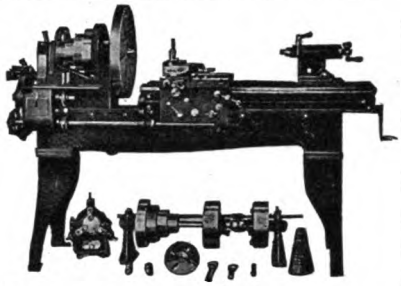
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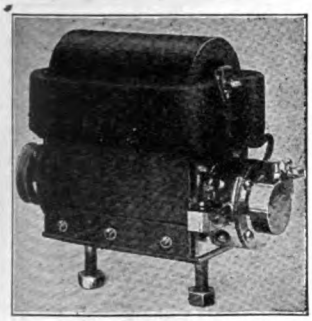
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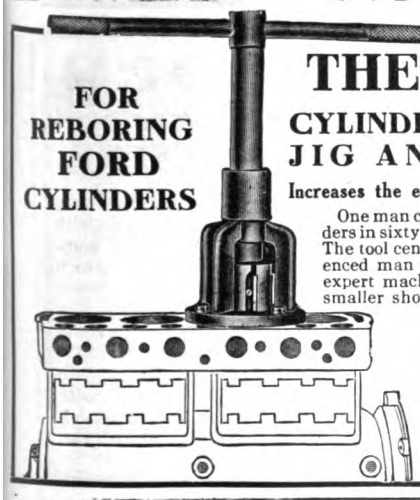


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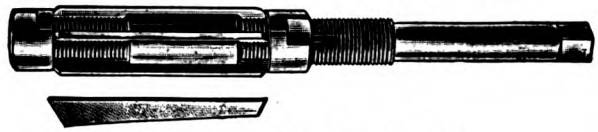
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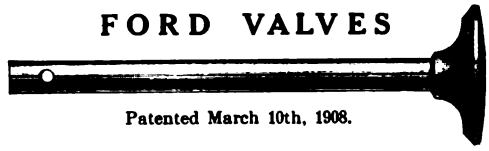
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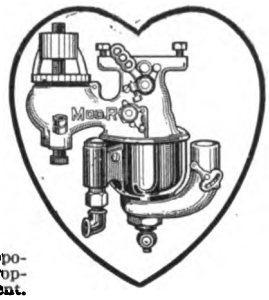
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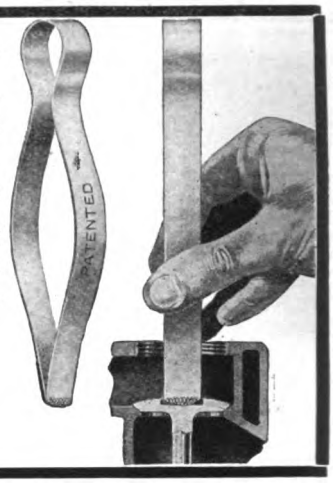
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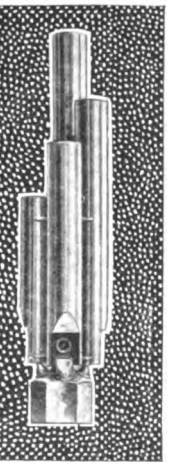
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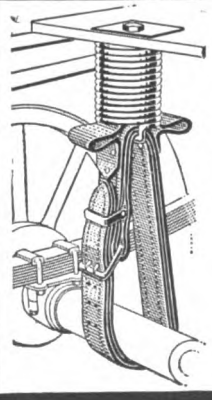
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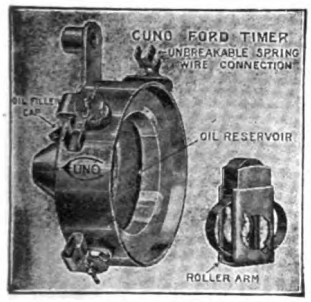
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***For* FORD CARS**

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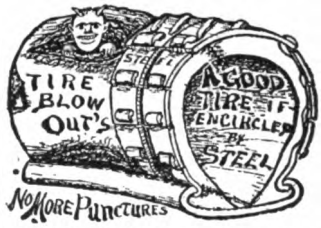


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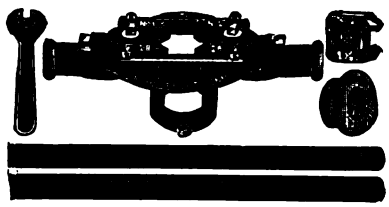
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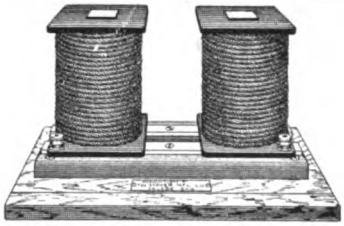
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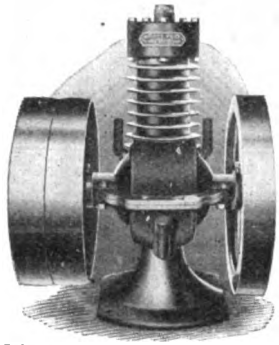
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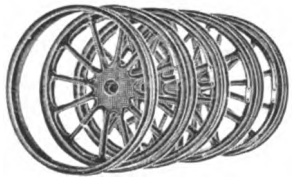


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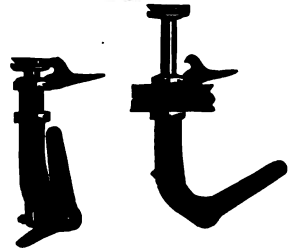


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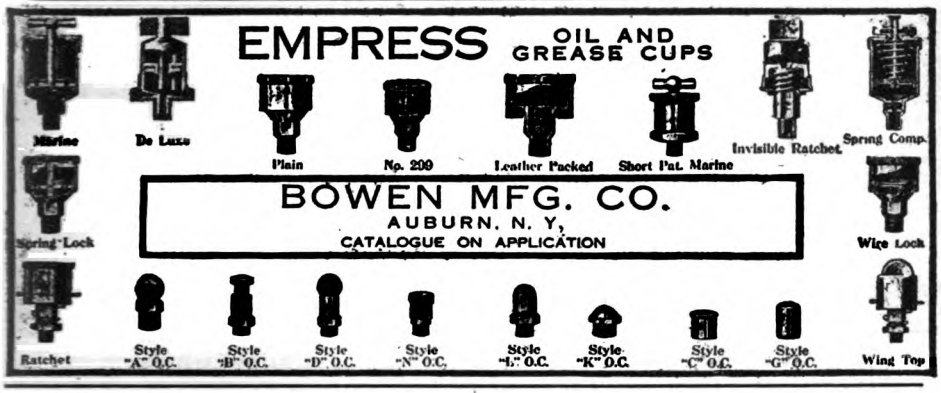
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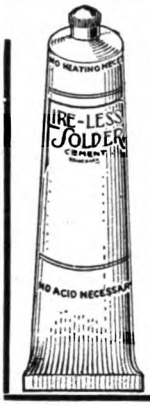
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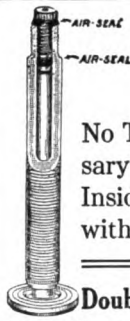
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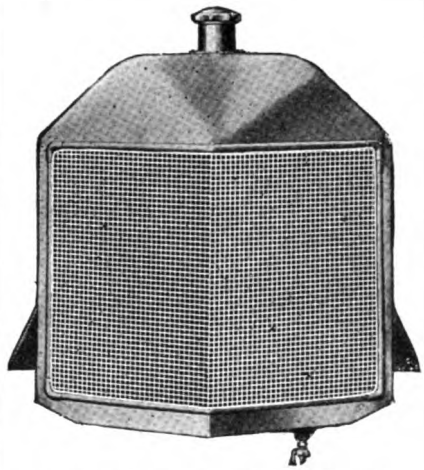
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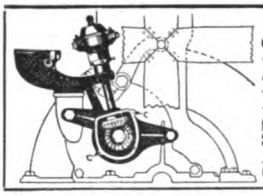
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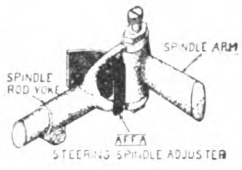
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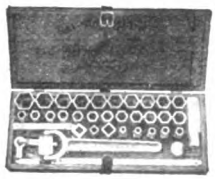


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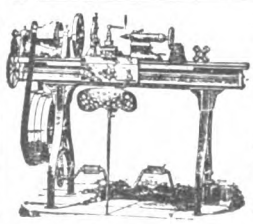
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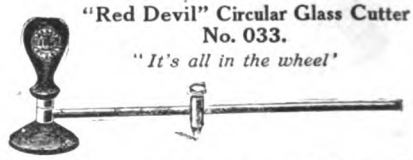
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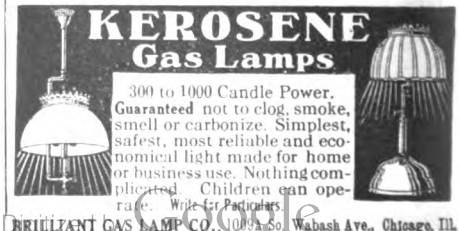
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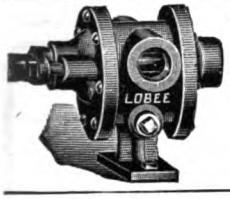
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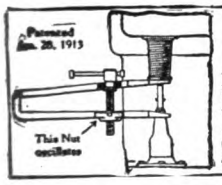
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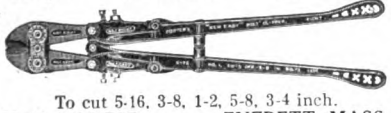
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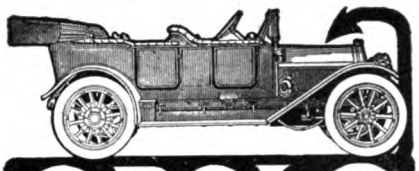
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IN 30 MINUTES-COSTS 83 CTS.

FAILURE GUARANTEED IMPOSSIBLE

WRITE FOR TRIAL CAN TODAY.

Agents and Dealers Wanted Everywhere

OROLO MANUFACTURING CO.
INCORPORATED
LOUISVILLE, KY.

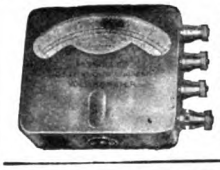


AUTO DEALERS, ATTENTION!

UTILITY VARNISH RENOVATOR is a money maker for you, and keeps your customers happy. Keeps the varnish on the Auto looking new, is non-acid, non-alkali; saves time, labor and varnish. Ask your jobber or send direct for trial size.

POUGHKEEPSIE UTILITIES CORPORATION
Department A, Poughkeepsie, New York

ACCURATE and INEXPENSIVE



Voltmeters, Ammeters, and Voltammeters for testing storage batteries, electric starting systems, etc. Write for complete catalog of portable and switchboard meters.

L. M. PIGNOLET
78 Cortlandt St., New York

SANDBO STARTER

AGENTS DEALERS WANTED

FOR FORDS, Maxwells, Saxons, Cylcecars, etc. Differs from all others—never fails to start. It gives crank a complete revolution—past

Two Compressions

Over two ignition points. Fully guaranteed Easy to attach. Nothing to get out of order. Price, $14. Write



$14

SANDBO STARTER COMPANY, 34 Sandbo Bldg., Rock Island, Ill.



PERFECT HICKS FOUNTAIN BRUSH

WASHES YOUR CAR IN 15 MINUTES

ATTACHED TO YOUR GARDEN HOSE

FLOWS THE MUD AND SAND AWAY

Warranted Not to Scratch and Guaranteed Longer than Your Car

NO. 2. PRICE $4.50 DELIVERED

HOWARD W. HICKS BRUSH COMPANY, DENVER, COLO.



A 50 CENT TIRE SAVER

Casing cuts permanently sealed with "JIFFY" Tire Cut Filler and the aid of "PECO" Tire Tool.

"JIFFY-PECO" OUTFIT

Quick Seller for Dealers—Get Discounts.

PREMIER ELECTRIC CO.,
4038 Ravenswood, Chicago.

Woodworth Treads

The Tire Covers That Do Not Chafe

THE LEATHER TIRE GOODS CO.
2104 Whirlpool St. Niagara Falls, N. Y.





Lower Prices:
2 H-P $34.95; 3 H-P $52.50;
4 H-P $69.75; 6 H-P $97.75; 8 H-P $139.65;
12 H-P $197; 16 H-P $308.80; 22 H-P $389.65.
Portable Engines Proportionally Low.
Buy Direct; Cash or Easy Terms.

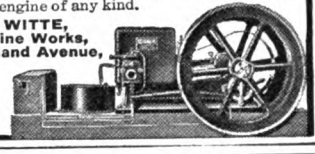
WITTE Engines

Gasoline, Kerosene, Distillate, Gas,

Besides lower price, WITTE engines use less fuel per H-P hour—from one-fourth to one-third less—enough saving in a year to pay entire cost of engine. Easy starting; no cranking. My 28 years engine building makes this higher quality. Write for my **New Engine Book, Free,** by return mail, before you buy an engine of any kind.

ED. H. WITTE,
Witte Engine Works,
2198 Oakland Avenue,
Kansas City, Mo.

5-Year Guaranty



WATCH for our advertisement next month. We are coming out with the greatest line of Garage Equipment ever offered.

THE UNITED ENGINE & MFG. CO.
HANOVER, PA.

"Easy to Load" **Little Giant Patented Grease and Oil Gun** Two Sizes



The gun you can load and shoot without mussing or fussing. No. 1 capacity 2½ lbs. $5.00. No. 2 16 oz. $3.50. See it at your dealers or write.

NEIMAN MACHINE WORKS, Freeport, Ill.

CATALOGUE OF
AUTO ACCESSORIES and TOOLS

Sent free to Dealers and Repair shops in the middle West on request written on business stationery.

CAMPBELL IRON ACCESSORIES
811 Cass Avenue St. Louis, Mo.

OUR NEW MODERN WHEEL AND GEAR PULLERS

2 or 3 arm, are furnished with 2 Sets of the New Combination Hook and Extension arms.

The New Screw has a flat end with an intersected tempered tool steel point. *Will not injure centers.*

Send today for Bulletin No. 2, which contains our novel Guarantee . . .

CRANE PULLER CO. Arlington, Mass.

Moore Tire-Saving Jacks



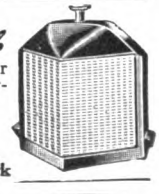
$6.50 Per Set of Four. 20,000 Sets in Use.

MOORE Jacks save tires by relieving them of heavy weight of car. Easy to apply—simply slip padded loop over hub and press down lever. At dealers, or sent prepaid on receipt of $6.50.

WALKER-MOORE MFG. CO.
326 WISCONSIN ST. - RACINE, WIS.

Just Out—Get The Agency

Fords Appearance Improved 100%



This V-Front goes on your radiator and gives it a classy foreign appearance. Don't pay $30.00 or $40.00.

Our price, only $7.00.

At your dealer's or at the
AUTO ECONOMY CO.
1624 Broadway New York

Do Your Valve Grinding with a ONE-GRADE PASTE

HUSTLER

Save time and energy. Get a circular of a far better COMPOUND.

10 and 25 cent sizes.

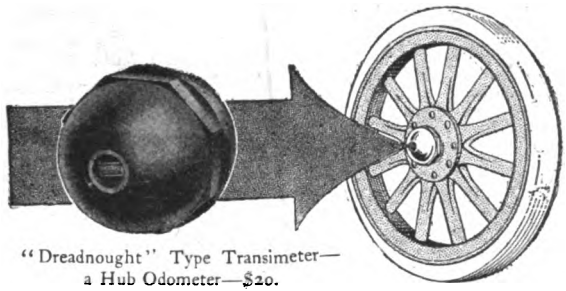
S. C. LOW & CO.
25 St. Nicholas Terrace New York



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"Dreadnought" Type Transimeter—a Hub Odometer—$20.

Other types, $16 50 and $15.00, for lighter trucks.

TRANSIMETER

(Hub Odometer)

will accurately record the mileage of your truck so you can definitely get at your costs.

The "Dreadnought" Type is guaranteed indestructible. It is oil- dirt- and grease-proof and figures are always horizontal and therefore easy to read.

Write for booklet describing three types of Transimeter and the Recordograf, a tape recorder that gives time, stops, speed and distance.

AMERICAN TAXIMETER COMPANY

Mfrs. of Jones and Popp Taximeters

39th Street and Broadway New York



Sta-Tite Piston Rings

Are Mechanically Efficient

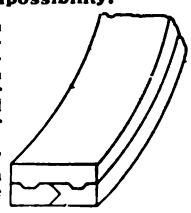
Sta-Tite Piston Rings are made up of three individual interlocking rings, grooved together to give Maximum Flexibility and Resiliency.

The wonderful resiliency of the Sta-Tite Ring enables it to automatically adjust itself to the width of the Piston Ring Groove.

Leakage of Compression and Oil is a mechanical Impossibility.

"Piston Ring Service Is the Key to Perfect Compression."
—Efficiency Ed.

This cross-section shows the Groove Construction which prevents the sections from slipping out of place or "riding" the pins and scoring the cylinder walls.



Prevents the "vents" or slot openings from getting in line and allowing the leakage of Power and Compression.

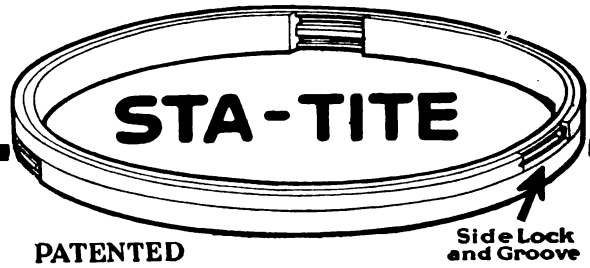
Install a complete set of these Mechanically Efficient Piston Rings and notice the Increased Efficiency of your Car.

Special Inducements to Dealers and Agents.

Rings in All Sizes. **Write for Literature.**

STA-TITE PACKING RING CO.

3037 OLIVE STREET **ST. LOUIS, MO.**



PATENTED

Side Lock and Groove

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The Advantage of Local Factory Service

NO MATTER where your business is located our system of distribution offers you every advantage our factory in Bridgeport can give Bridgeport dealers, garage and repair men.

There are upwards of one hundred distributing organizations in the United States who carry on hand at all times a complete stock of RAYBESTOS—all sizes—a stock adequate to supply any demand, short of the requirements of a big automobile manufacturer.

TRADE MARK Raybestos REG. U.S. PAT. OFF.

The RAYBESTOS Distributor in your city or in the city nearest your town can, and will, quote you the same prices, terms and discounts as the home office and serve you to better advantage than the home office because of the saving in time and expense involved in receiving, billing and shipping your orders—large or small.

Each RAYBESTOS Distributor is, so far as business relations with you are concerned, a direct factory branch.

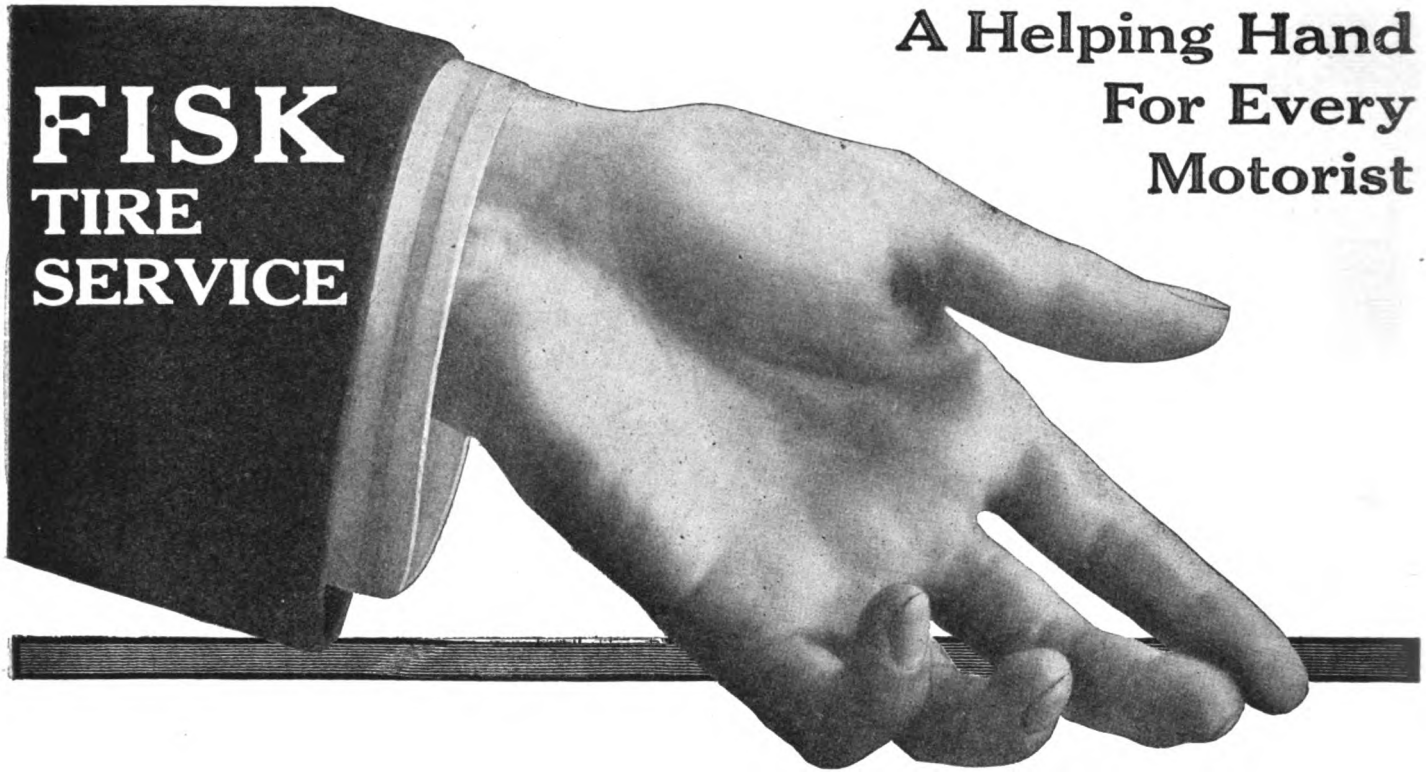
It will be to your benefit to take advantage of our local factory service.



The Royal Equipment Company

1354 Bostwick Ave. Bridgeport, Conn.

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This Is To Be Taken Literally And Interests Every Car Owner!

SO FAR as we can, through our Service System, we will eliminate for *any* car owner all inconveniences in the use of tires. If you use tires other than Fisk, we particularly invite you to stop in at one of our Branches the next time your tires need attention and thereby inform yourself as to the *substantial* qualities of Fisk Service.

To present Fisk Users we would say that the privileges enjoyed at your local Fisk Branch are to be found in every city where we are located. The Secret of the Success of the Fisk Service Policy is its uniformity. The Service is organized. There is nothing like it in the tire industry. We are building our business on an Established Reputation for Good Tires and for Courtesy and a Personal Interest in the requirements of *all* tire users.

Tourists should send for a list of Fisk Branch Addresses and plan to take advantage of our Service even though they may not use Fisk Tires.

Every car owner, regardless of what tire he may use, is *welcome* in any Fisk Branch. He will find there a spirit of accommodation which will add materially to his pleasure and convenience when his tires are in need of attention of any kind.



Fisk Tires Are An Extraordinary Buy

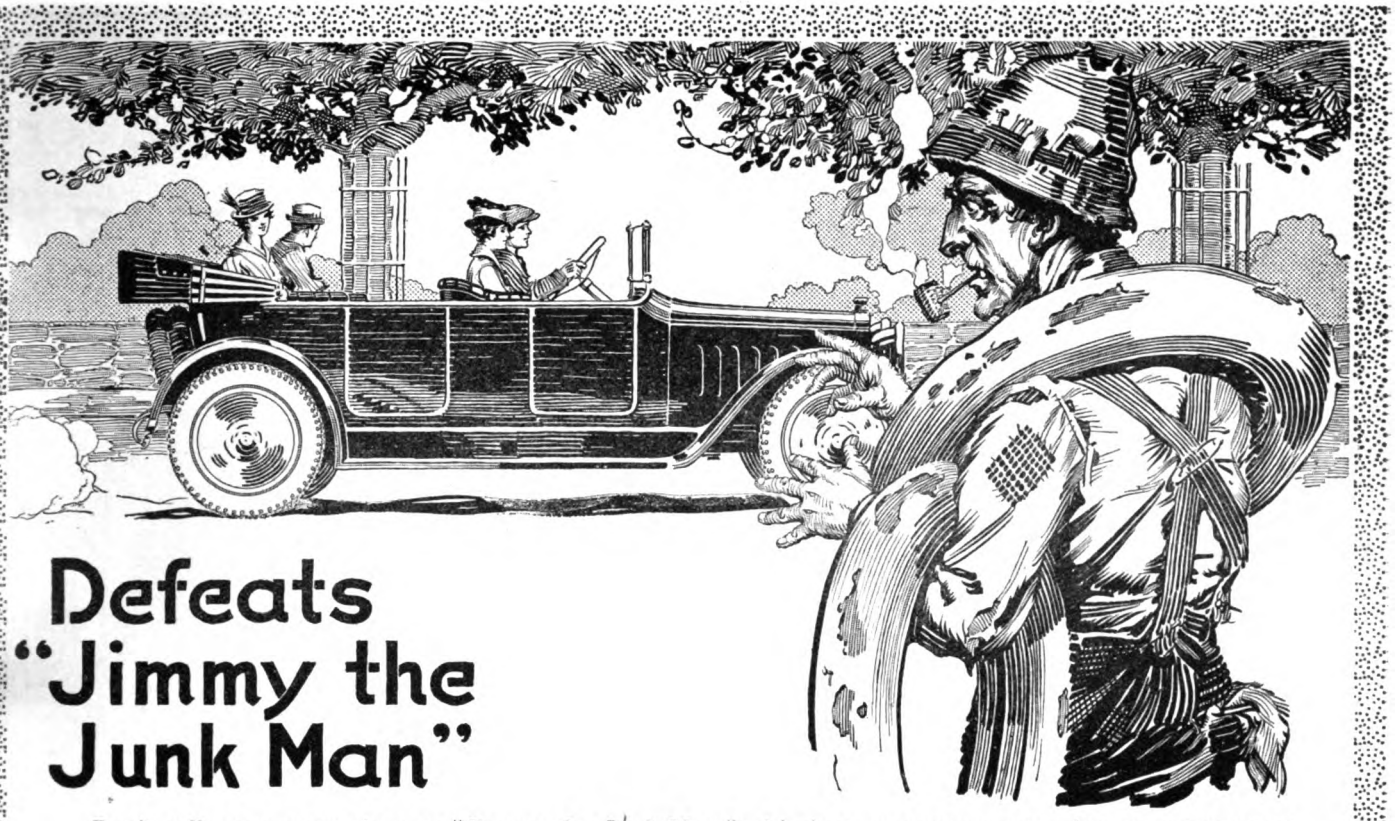
Prices are Low. There never was a time when Fisk Tires were better quality or gave more universal satisfaction. This statement can be easily verified by inquiry among Fisk Tire users.

THE FISK RUBBER COMPANY

Factory and Home Office **Chicopee Falls, Mass.**

You Can Buy Fisk Tires From ALL Dealers—Fisk Branches in ALL Principal Cities

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Defeats "Jimmy the Junk Man"

Don't sell your worn tires to "Jimmy the Junk Man"—it's just as unnecessary—just as extravagant—to sell your tires when they get rim cut or rut worn as it is to throw away your shoes when the first sole wears thin, for you can NOW get 5,000 miles more service out of them by doing what European motorists have done for the past three years. This will result in a saving of $50.00 to $200.00 a year for you.

What European Motorists Are Doing

For three years European motorists have been getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American Motorists have been getting only from 3,000 to 5,000 miles, and—what is perhaps more important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim-cuts.

In the past 9 months over 20,000 American Motorists have followed their example—and are "half-soling" their tires with "Durable Steel Studded Treads" just as we "half-sole" our shoes when the original sole gets thin.

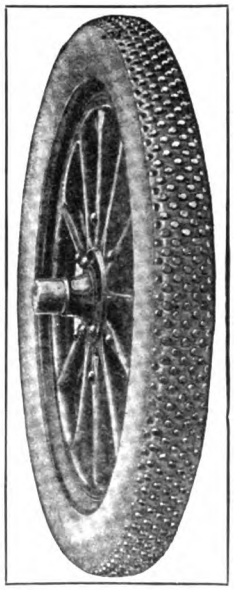
Guaranteed 5,000 Miles Without Puncture

To many motorists this fact is of more importance than the money saved by eliminating tire repair bills—the constant dread of puncture or blowouts spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop"—makes the man at the wheel think of tire trouble FIRST.

Durable Treads are backed by a signed guarantee—as good as a Government Bond—for 5,000 miles **without** puncture. Think of the joy of motoring when you KNOW in your own mind that your tires are **impervious** to the roughest roads—when you KNOW that **you** won't have to get out and sweat fixing a puncture or blowout, besides, you save nearly enough to pay your yearly gas and oil bills, and the guarantee holds good no matter whether your tires are new or old, rim cut or rut worn.

No More Skidding

"Durable Treads" are as sure-footed as a Rocky Mountain Burro—look at the photograph—they're simply BOUND to be safe—the sharp-edged steel rivets make skidding almost impossible. With Durable Treads on your tires you receive **perfect non-skid** service while your tires are **protected instead of injured,** and you don't have to get out in the mud and put on chains.



Strong, Sturdy — impervious to the worst roads, "Durable Treads" add a touch of distinction to any car—and make the tires the much desired over-size.

We Ship On Approval

We ship on approval to any motorist—without one cent of deposit—prepay the express—and allow you to be the judge. Durable Treads are easily applied in your own garage, without special tools, in thirty minutes.

If your tires are new then protect them from cuts and punctures by putting on Durable Treads at once—don't wait until they are all shot to pieces. **If they are old and rutworn** don't sell them to Jimmy the Junkman—remember that "Durable Treads" are **guaranteed** for 5,000 miles without puncture—no matter whether your tires are old or new.

Special Discount Offered

To motorists in new territory where "Durable Treads" have not been introduced we offer a special introductory discount. The sales of "Durable Treads" increased 917% in the United States alone during the past year—over 40% of these sales were **unsolicited**—made through the recommendation of "Durable Tread" users. Where is there **another** automobile accessory that has received such universal, country-wide endorsement?

Mail the Coupon

Let us make you a special introductory offer. Let us give you a demonstration of "Durable Treads" **at our own expense.** Let us make you an offer so fair and square that you do not stand to lose one red cent, either before or after you buy. Act NOW—don't run your tires "barefooted" another week. Tear off the coupon, sign and get it in the mail box today—if you haven't got a pen or pencil handy tear off the coupon anyway and then sign it later—it will be the means of adding 5,000 miles to the life of the tires on your car.

TEAR OFF—MAIL

Colorado Tire & Leather Co.
75 Tread Bldg., Denver, Colo.
Dept. G 5, Box 228, Chicago.
Suite 57, 162 West 34th St., New York.

Gentlemen:

Please send me full information, sample, copy of guarantee—without any obligation to myself.

Name .....

Address .....

.....

My tire sizes are .....

The Colorado Tire & Leather Co.

75 Tread Bldg., Denver, Colo.

Dept. G5, Box 228, Chicago — Suite 57, 162 West 34th St., New York

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Buy from this Case and get—

BETHLEHEM FIVE POINT SPARK PLUGS

Guaranteed for the Life of the Car

ALL over the country, dealers, who are striving to give SERVICE, are offering their customers Bethlehem Plugs, in these Cases.

You will see them in Automobile Supply Stores, Garages and Hardware Stores.

The Bethlehem is a Quality Plug—a Service Plug.

It is specially designed and specially constructed—and has been proven by every sort of test to give more power on less gas.

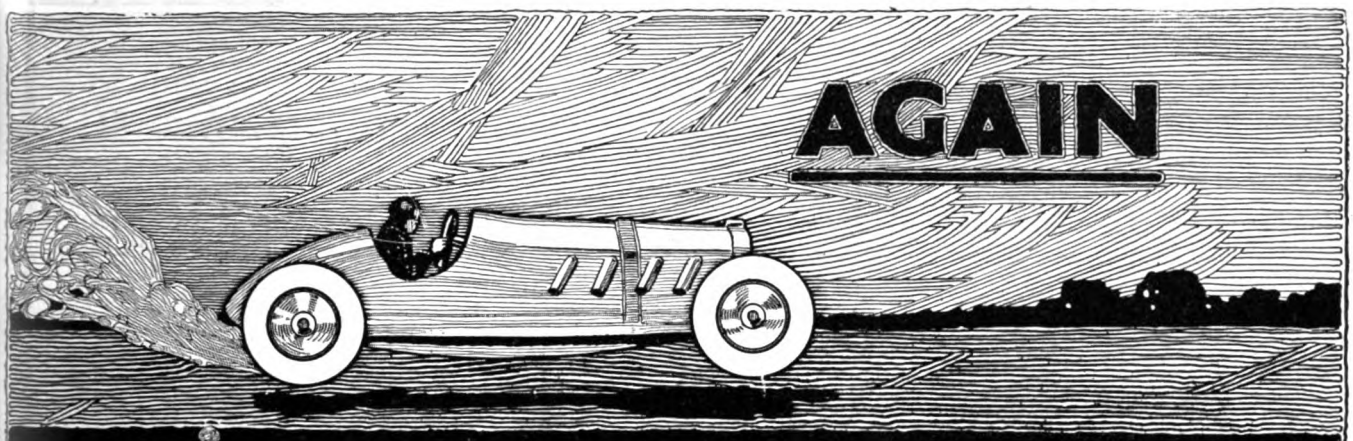


BUY Bethlehem's and you will be glad—they eliminate Spark Plug troubles. The Display Case contains a right type for every motor. Bethlehem's are $1.25 each—and worth it. Send for illustrated Booklet. It is free.

THE SILVEX COMPANY, Factory: South Bethlehem, Pa. 171 Madison Avenue, New York City

Pacific Coast Branch: Oakland, Cal. W. N. Davidson, Mgr.

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1915

BOSCH MAGNETOS WIN 500 MILE SWEEPSTAKES

Every Driver in the Record-Breaking 500-Mile Race Used a Bosch Magneto

There was no difference of opinion among these close students of the motor car. They adopted Bosch Ignition without a question, not only because Bosch is more speedy, not only because Bosch is more capable, but mainly because Bosch Magneto Ignition is

Absolutely Reliable

A broad statement, but proved by facts; for not a single driver experienced a moment's trouble with his magneto during the terrific pace set by De Palma's Mercedes, the Bosch-Equipt Victor and New Record Holder.

If you want Reliable Ignition Be Satisfied----Specify Bosch

Correspondence Invited

BOSCH MAGNETO CO.

202 West 46th Street New York

Chicago - Detroit San Francisco—Toronto

Over 300 Service Stations

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Champion

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"

Champion

X

Special ½ inch

Price 75c

Factory Equipment on Ford Cars since 1911

Champion

Conical 7/8-18 Long

Price $1.00

Specially Designed to develop Maximum power in Buick Motors. Has extension base, conical porcelain, Buick terminal.

Champion

One-Piece Heavy Stone

All Sizes

Price $1.25

For High Powered Automobiles, Trucks and Stationary Engines

You Must Have Reliability

Your spark plugs must stand terrific punishment when you call on your motor for that last ounce of power to get over the crest of a steep hill.

The porcelain in your spark plugs must not crack under the force of those maximum explosions in your cylinders.

Champion Spark Plugs are constructed so that they take such punishment unflinchingly.

We test them over and over again, in the motor they are intended to serve, *under every conceivable strain.*

We leave nothing to chance or theory—we *make sure* of reliability.

That's why Champions give the most dependable service.

That's why we can sell them under such a sweeping guarantee.

The Champion Guarantee Complete satisfaction to the user—free repair, replacement or money back.

Dealers—Get our Profit Sharing Agreement from your Jobber's Salesman, if it is not already in your strong box.

Champion Spark Plug Co., 2004 Upton Avenue, Toledo, Ohio

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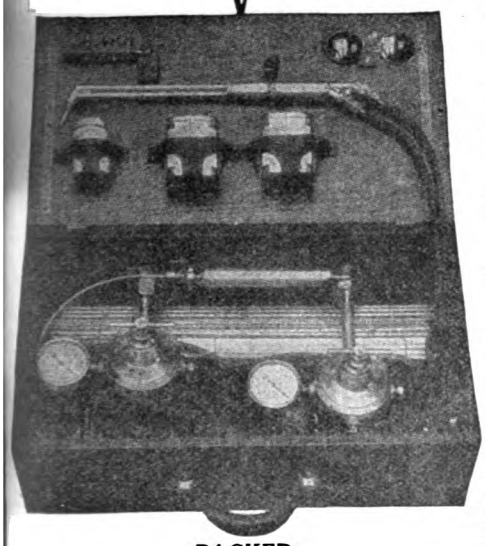
Mr. Garageman: Mr. Repairman:

$ LOOK HERE $

You need a WATERHOUSE Welding Outfit, for with it you can save broken auto parts and make them as good as new at very little cost.

To illustrate, a repairman, with this outfit, repaired a broken crank-case, which in its damaged condition was only worth 14 cents per pound as old junk. After welding it was made precisely as good as a new part, which would cost $68.

Here the repairman saved the car owner lots of money, and by so doing the car owner was willing to pay the repairman a big price for his welding, which meant big profits.

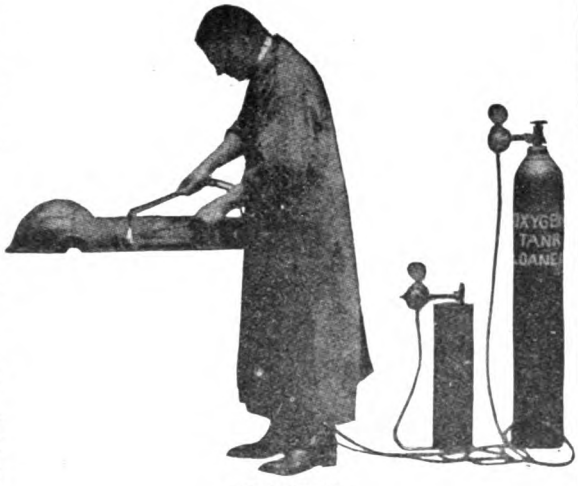


PACKED

The Waterhouse Outfit

	Value
1 B Welding Torch with 5 tips	$17.00
1 Oxygen Reducing Valve with 50 lb. line pressure gauge	10.25
1 Acetylene Reducing Valve with 50 lb. line pressure gauge	11.00
1 Set of Special Welding Hose (20 ft.)	3.00
1 Pair of Welding Glasses.	.75
1 Carbon Burning Torch..	Free
1 Set Instructions	Free
Net Cost Complete	**$42.00**

If you have a regulator for carbon burning, the oxygen regulator with the outfit is unnecessary, and you can deduct the price ($10.25), from the above total price.



AT WORK

TERMS: 5% discount cash with order or C. O. D. or $20.00 cash with order, balance in two payments, first of $12 in 30 days, $10 in 60 days.

ABOUT TANKS

The two gases used are oxygen and acetylene. The regular automobile lighting cylinders contain acetylene, so you can use them, and oxygen can be bought in loaned cylinders at little cost.

If supplies are desired as well, we will sell for $4.50 additional the following, making you ready for any auto welding:

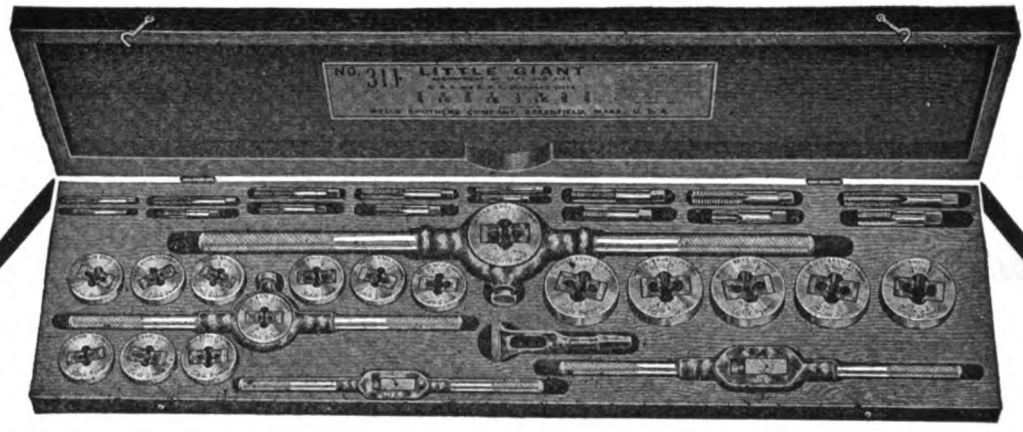
1 Bottle Aluminum Flux	5 pounds Cast Iron Welding Rods
1 Can Cast Iron Flux	2 pounds Aluminum Welding Rods
1 Can Copper and Brass Flux	2 pounds of Steel Welding Rods
	2 pounds Brass Welding Rods

WATERHOUSE WELDING COMPANY

16 PELHAM STREET, BOSTON, MASS.

See Waterhouse Ad's in previous issues of this paper

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Little Giant **AUTOMOBILE SCREW PLATES**

GOOD WORK REQUIRES GOOD TOOLS

Now that the overhauling season is at full blast repairmen and garage owners need tools for cutting screw threads by hand and should have the best. Out of our large and varied list of assortments of taps and dies we want particularly to call your attention to the screw plates, one of which is illustrated above, called

Little Giant **COMBINATION ASSORTMENTS** (Containing both S. A. E. and United States Standard Threads.)

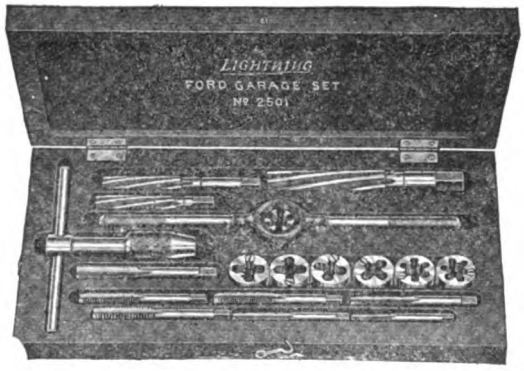
These assortments avoid the expense of buying a separate outfit for each thread standard and the expense of duplication of stocks and tap wrenches.

Little Giant **DIES CUT EASIER** Little Giant **DIES ARE MORE DURABLE**

Impossible for them to tilt or get out of alignment. Increasing the working strain only tightens the grip of the collect upon the working parts of the dies. Send for circular, "Tools for the Automobile." A postal brings it.

WELLS BROTHERS COMPANY DIVISION

LIGHTNING **GARAGE REPAIR SET FOR FORD CARS**



TAPS, DIES AND REAMERS—No. 2501

Designed especially for repairs on **Ford Cars, Model T.** A necessity for every garage and repair shop.

Contains:

Seven sizes taps and dies cutting
$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $13/32^{16}$, $7/16^{24}$, $7/16^{14}$, $1/2^{20}$.

Reamer for connecting rod arm bushing.
" " spindle " "
" " wrist pin " "

Stock and T tap wrench—all contained in neat hardwood case.

Write for catalog describing other screw plates for automobile repairs.

WILEY & RUSSELL MFG. COMPANY DIVISION

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SCREW CUTTING TOOLS AND MACHINERY

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The Luxurious Scripps Booth is made even more attractive by Campbell Detachable Upholstery.

Adding luxury to luxury!

Owners of thousands of cars that are trimmed in finest hand buffed leather, equip with Campbell Detachable Upholstery.

Not because they are ashamed of the leather. Not because the cars are old—(most Campbell Detachable Upholstery goes on new cars,)—

But because Campbell Detachable Upholstery adds a touch of richness and comfort, a sense of luxury that no other single accessory can give. If there is such a thing as "painting the lily," Campbell Detachable Upholstery does it.

Owners of old cars, too, find that Campbell Detachable Upholstery gives new attraction and added luxury to their cars.

No matter what make or model of car you own or contemplate buying, even the latest models, you should equip with Campbell Detachable Upholstery. The cost is surprisingly low; the results remarkable. It goes on over your regular upholstery and is held in place by special simple snap fastenings so that it can be instantly removed for cleaning. Many colors and fabrics to choose from. **The Perkins-Campbell Co.,** 628 Broadway, Cincinnati, Ohio. New York Office, 89 Chambers St.

Write for Samples and Prices.

The name Campbell on the fastenings guaranteesthe genuineness of Campbell Detachable Upholstery. Look for it.



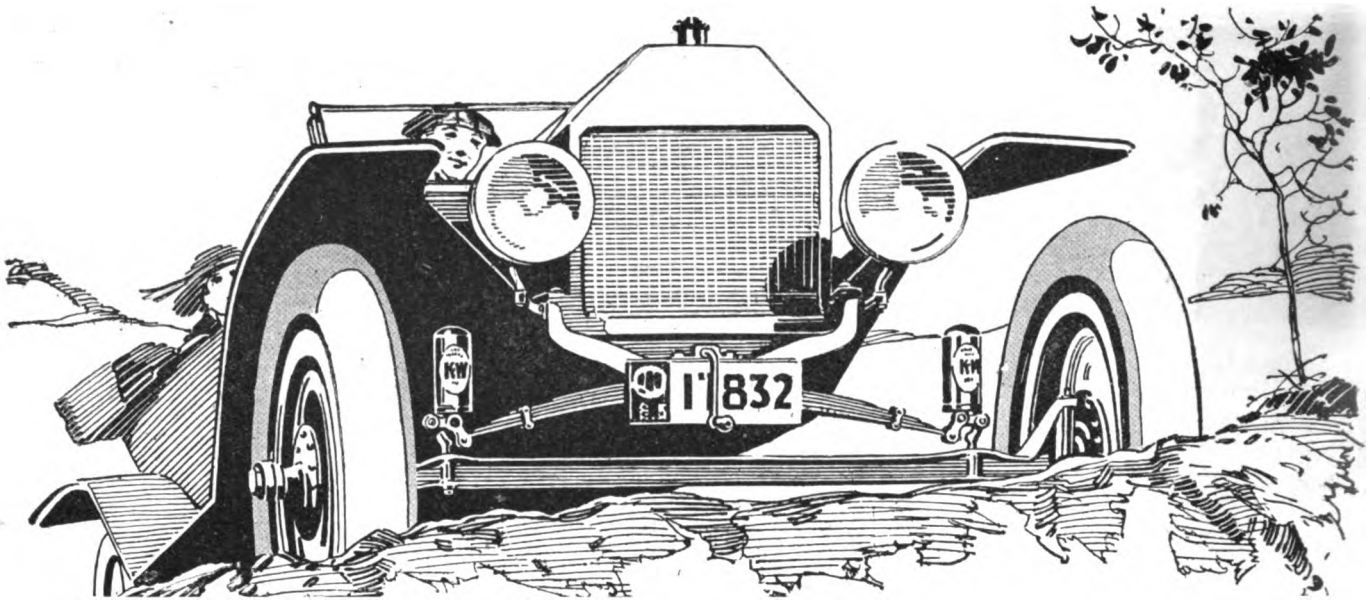
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—describing and illustrating Campbell Detachable Upholstery and many other high-grade motor car accessories. Every car owner and Dealer should have this book.

Interesting Agency Proposition to Dealers

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES

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There are Two Kinds of Comfort—Body and Mind—You Get Both With

TRADE K-W MARK REG U.S. PAT OFF **Road Smoothers**

QUICKLY APPLIED TO YOUR FORD CAR

They give you the body comfort that comes ***only*** from motoring "relaxed" in a smooth riding car—regardless of the road's roughness. They give you mind comfort—that freedom from the tiring effort of steering around bumps and ruts so common to the average road. You are relieved of the nerve-racking tension of "picking the road." You get the same comfort as your passengers, plus the pleasure of "no road worry" driving.

K-W Road Smoothers give you this enviable comfort because their design combines three vital factors.

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in ***one*** device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost ***twice the length of spring action*** or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.



K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all of these vital factors *only* in K-W Road Smoothers

K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

$15 SET OF FOUR ONE FOR EACH WHEEL

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your car's usefulness, and bring you home with that "satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet "That Satisfied Feeling"

THE K-W IGNITION Co.
2817 Chester Ave. CLEVELAND, OHIO. U.S.A.

Makers of 125,000 K-W Master Vibrators

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How He Won Two Ajax Tire Mileage Prizes

Read how this man kept his tire expense down. Besides winning for two successive years the cash prizes which were offered to drivers obtaining exceptionally big mileage this motorist reduced his tire up-keep cost more than 60%. That is, he secured three times the usual average mileage from his tires. Other winners of cash prizes in this tire contest have written us attributing their success to use of Shaler Vulcanizer.

Of course due credit must be given to the make and quality of the tires used—but care and attention given to the tires had an important bearing on their long lives.

NEW YORK OFFICE 55 WHITE ST.

THE BOSTON STORE
CHARLES TRANKLA & COMPANY

Grand Rapids, Mich.
May 7th, 1915

C. A. Shaler Co.,
Waupun, Wis.

Gentlemen:—I just want to drop you a few lines to tell how I made $75 from $3.50. I won the 1913 mileage prize of $50 and last week I received the 1914 prize of $25 from the Ajax Tire Co., both of which I got by using one of your small $3.50 Vul-Kits to keep the small cuts repaired.

Yours truly,
R. Vlas Blom
18 S. Diamond Ave.

This Vulcanizer was bought from one of our dealers and we were unaware that user had it until this letter was received.

Your tires can just as well run from 15,000 to 20,000 miles too. They will run that far if you keep them in perfect condition by sealing the small cuts with a

SHALER Vulcanizer

The Vul-Kit



The $3.50 Investment that paid $75 Dividends

This is the Shaler Vul-Kit, the kind of Vulcanizer Mr. Blom used to aid him in getting his big mileage and win $75 in prizes. Has no exposed blaze. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. No watching, no regulating. You can't overcure or undercure a repair. Handle always cool. Can be carried in tool box. Anyone can use it. Complete $3.50. Sold direct on receipt of price if you mention dealer's name.

Close up the small holes, the tiny cuts and cracks before sand and water works in. This keeps sand blisters from forming, the fabric from rotting, prevents a blowout and probably a ruined tire.

The Shaler Vulcanizer will repair these small punctures, cuts, tears, holes, rips in casing or tube and will make the repair the strongest part of the tire. It will stop tire trouble and expense, save your tires, save repair bills, increase your mileage and prevent tire trouble by vulcanizing the small cuts and holes.

Free To Motorists!

"Care and Repair of Tires"

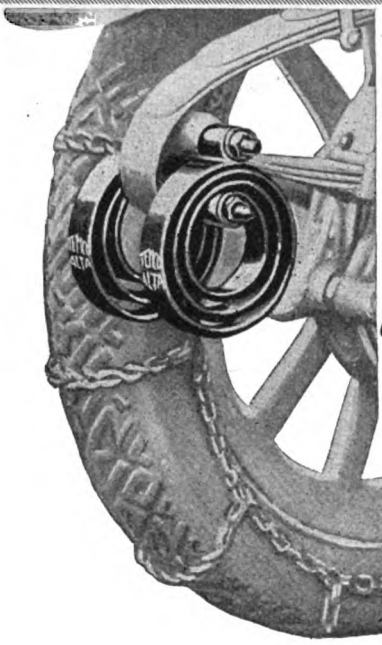
Every motorist who is interested in increasing his mileage should have a copy of this valuable tire book. It explains everything about tires. Contains valuable hints and suggestions and shows you how to overcome every kind of tire trouble. Send for a copy today, it's free.

C. A. SHALER CO. 806 Fourth St., Waupun, Wis.

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TEMCO Automobile and Garage Necessities



TEMCO Alta

Universal Shock Absorber

$12

COMPLETE REAR SET

Make Every Road A Good Road

TEMCO-ALTAS make you forget the "thank-you-mams."

They take your car over the roughest places ***with all four wheels on the ground***—smoothly and evenly, without oscillation, swinging or vibration.

Each set contains over 15 feet of the finest heat-treated steel. This is actually added to the springs of your car, taking all the road shocks, jolts and jars.

Temco-Altas contain only the highest grade materials and are sold on an unlimited guarantee of complete satisfaction to the user

Equip your car with Temco-Altas today:

They are exceedingly simple and easy to install. No holes to drill—no adjustments to make. They can be easily and quickly put on every ¾ elliptic spring car such as

Overland	**Reo**
Studebaker	**Dodge**
Maxwell	**Chalmers**
Buick	**Oakland**
Chevrolet	**Mitchell**

Ohio Electric

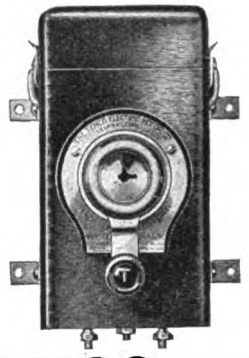
Chicago Electric

And a large list of other leading cars.

DEALERS:—Temco-Alta Universal Shock Absorbers, the Temco Shock Absorbers for Ford cars and the other well-known Temco products are the fastest money makers in the automobile accessory trade. They are widely used, widely demanded and widely advertised. Get into line with the livest dealers in the country.

The Temco Electric Motor Company

2116 Sugar Street, Leipsic, Ohio



TEMCO Improved Master Vibrator For FORD Cars $12.50



Write for full Information about TEMCO Portable Electric Drill



TEMCO Shock Absorbers For FORD Cars Complete Set of 4 $15

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THE TRUTH ABOUT PISTON RINGS

New Features of Piston Ring Construction You Cannot Afford to Overlook

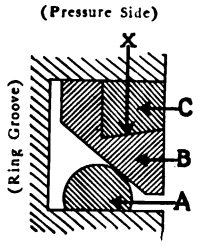
WHY PISTON RINGS LEAK

Piston Rings may leak from one or more of the following causes:

1. Poor fitting in ring groove when installed.
2. Wear of the ring and groove while in service.
3. Imperfect contact of rings against cylinder wall, due to unequal radial expansion, also distortion of rings by stretching when applying. Also loss of tension in ring material.
4. Unsealed openings on **side** of rings where they bear against **face of ring groove,** allowing leakage **under** the ring.
5. Unsealed openings on face of ring bearing against cylinder wall.
6. Broken rings, and scored cylinders due to broken rings.

The Pressure Proof Ring Constructed to Remedy These Faults

1. The **PRESSURE PROOF** ring is self adjusting, the expander A being variable on bevel of ring B according to groove width, up to 1/32 of an inch large. No fine fitting necessary.
2. The **PRESSURE PROOF** ring does not wear loose, as wear is taken up as described in No. 1.
3. The **PRESSURE PROOF** ring has even tension at all points on cylinder wall, because it is made the size of cylinder, therefore it is a perfect fit. Other rings are made larger and compressed to secure tension. In the **PRESSURE PROOF** tension is obtained by the expander A pressing equally in all directions on the beveled ring B (see sectional cut) producing tension outward against cylinder wall and against side of ring groove, thus securing and **maintaining** an absolutely tight joint. As the ring is neither opened nor closed, it is under no strain whatever. Owing to the distinctive construction, the **PRESSURE PROOF** ring is applied without stretching over the piston (see cut of piston). One ring has been applied over 1000 times without breaking.





4 and 5. The **PRESSURE PROOF** ring has no unsealed openings, therefore there is no opportunity for pressure or oil to leak under the ring.

6. The **PRESSURE PROOF** ring is under no strain whatever, and never breaks in service. The spring expander takes the strain and the cast iron rings do the packing.

The Pressure Proof is the only Self-Adjusting Piston Ring, and will produce results impossible to secure with any other ring.

The manufacturer has devoted many years to the perfection of metallic packings, and a large number of satisfied users is ample proof that the **PRESSURE PROOF** ring is thoroughly practicable and reliable. All rings are sold on a basis of money back if not satisfactory after 30 days.

DEALERS: We have the best yet in piston rings. If you are progressive and keep up with the times, write now.

PRESSURE PROOF PISTON RING CO., 3368 Washington St., Jamaica Plain, Boston, Mass.

To install **PRESSURE PROOF PISTON RINGS** in a motor means that that motor will thereafter work at the highest degree of efficiency possible to obtain, and we stand always ready to adjust, to help, to advise, in fact, to guarantee in the highest sense of the word. Can you afford to accept by-gones any longer?

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What's the Answer to the Touring Question?



But they can't give you the greatest enjoyment the most comfort—and freedom from excessive tire bills—unless they're on your car.

IF ALL roads were smooth as billiard tables; if there were no ruts or thank-ye-ma'ams—no tracks, cobblestones or rough streets to jolt and jar; if all roads were ideal it would not be necessary to equip with strong, sturdy and rugged Miller Tires.

But roads are far from being ideal. The man who wants the most pleasure from his car, must select the tire built to give him the utmost in mileage, safety and service under all road conditions.

All Roads look alike to Miller Tires

because the exclusive Miller Method of building tires does not cook the life out of either fabric or rubber in vulcanizing! Life in the cotton fabric means miles on the road. ***The Miller Method retains the natural vegetable wax and oil in the cotton fibre for wear in your tire.***

This natural lubricant carbonizes at 240 degrees. The old method of vulcanizing requires about 287 degrees to properly vulcanize a tire. And a brittle and lifeless fabric, with the power of resistance gone, results in short mileage on the road.

But the Miller Method of vulcanizing with a low degree of heat—overcomes all that.

And just as this exclusive Method retains the natural vegetable wax and oil in the fabric, so does it conserve all the toughness and wearing qualities in the rubber. Thus it makes a rugged unit of both rubber and fabric—without carbonizing the wax and oil in the fabric—or cooking the native endurance out of the rubber.

The result is a tire that insures practical immunity from blowouts and irritating road-side repairs.

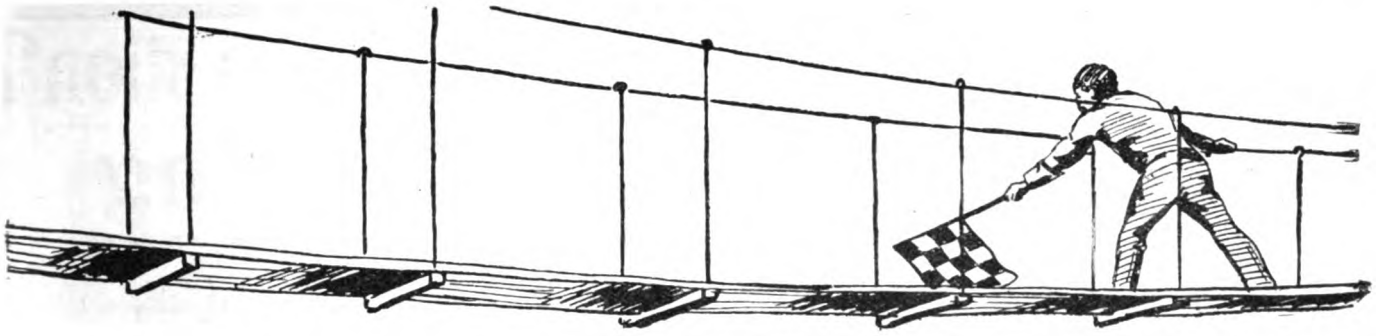
Get yours from the Miller dealer today, and make touring what it should be—a constant pleasure.

If you don't know the Miller Dealer in your town, it will pay you to write us.

The Miller Rubber Co., Akron, U. S. A.

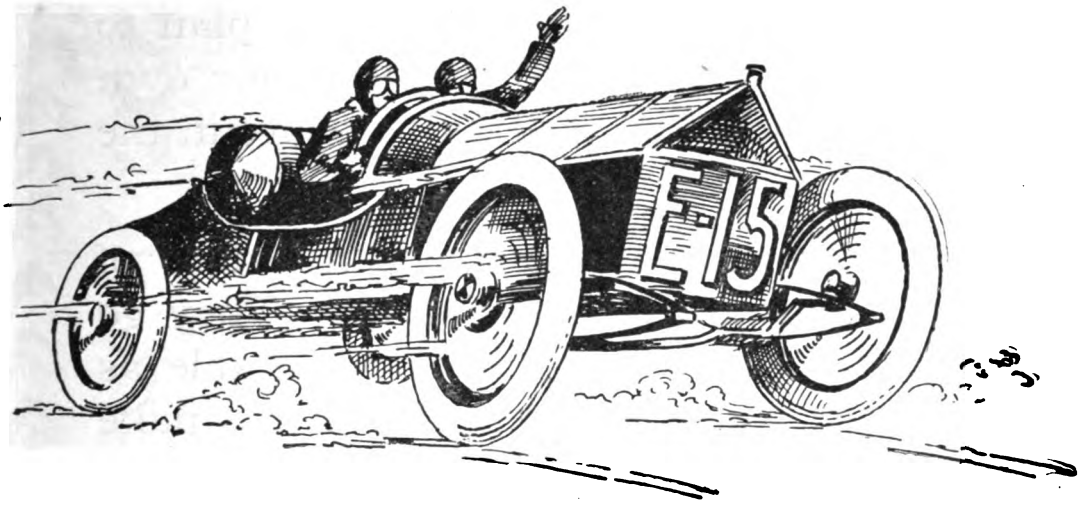
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ANOTHER "NORMA" VICTORY

In the fastest, hardest race ever run—the Indianapolis Sweepstakes on Memorial Day the winning cars, and all the cars that finished, carried magnetos equipped with "NORMA" Ball Bearings.



In this—as in all the great races of recent years both in America and abroad - the unequaled speed qualities and service capacity of "NORMA" Ball Bearings have been demonstrated by their performance in the magnetos of the winning and finishing cars. It is this character of performance which has made "NORMA" Bearings the standard in most of the high-grade magnetos, lighting generators and starting motors of today.

Are **your** electrical accessories "NORMA"-equipped?

Send For The Catalog.

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

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No matter what your angle of interest in efficient production, sales and distribution, you will find inspiration, mental refreshment and helpful suggestion at the

Tenth Annual Convention



Sept. 7-8-9, 1915 Philadelphia

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More men attend each successive convention of the Federation of Trade Press Associations. They go back to their daily duties stronger and more able as a result. If you have not attended heretofore, make the Philadelphia Convention your first.

As you will wish more information, write your trade paper or communicate with

Bartley J. Doyle, Chairman Committee on Arrangements

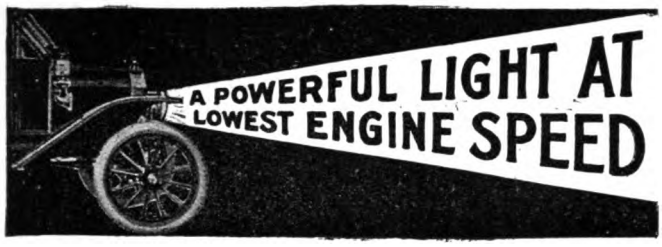
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ATTENTION, FORD OWNERS!



THE NEW YORK AUTOMATIC HEAD LIGHT CONTROLLER FOR FORD CARS

PRICE $5.00

(Patent applied for)

Delivers a powerful light at the lowest engine speed. Uses the Regular Ford magneto, requiring no batteries or complications. **Entirely automatic in its operation**—no belts, gears, or movable connections to the engine are employed. **It also prevents the bulbs from becoming burned out at excessive engine speed.** This is positively the first and only solution to the electric head light problem on Ford cars. We furnish necessary wires already connected so that anyone can install in ten minutes by the simple removal and replacing of one bolt.

You need one—Why delay. Send us $5.00 with the understanding that you may return the device if you desire.



Install a New York Master Vibrator On Your Ford Car

and enjoy the smooth, evenly applied power so noticeable in six cylinder engines. It is immaterial if your car is the latest or oldest model—our vibrator dispenses with all coil adjustments, insuring easy starting and a hot, perfectly timed, powerful spark under all conditions. The proven standard for the past six years.

PRICE $10.00

With fittings to install on the new 1915 models.

Prevent your Ford from being stolen

by buying

OUR NEW YORK KICK SWITCH WITH YALE LOCK—PRICE $2.50

which fits the new Ford metal or wood coil boxes. This is a handsomely constructed Kick Switch containing a genuine Yale Lock, which affords the convenience of the regular Kick Switch, but possesses the locking feature which is found in no other type.



Anyone can install—Remit $2.50 today—Money back if not satisfactory.



Two Ignition Systems for Ford Cars

The New York UNI-Coil Ignition System for Ford Cars. Price $15.00

Operated by the Ford Fly Wheel Magneto (or Battery).

This system is primarily intended to operate on the Ford fly wheel magneto. It consists of a well-made elevating gear bracket upon which our Combined Timer and high tension Distributor is mounted. The Distributor is of the most simple construction containing the essentials of the high tension magneto. It uses one unit equipped with vibrator of your regular Ford coil. It dispenses with the timer and practically all of your present wiring, insuring a perfect timed spark and freedom from trouble.

The only satisfactory distributor system for the Ford magneto. Furnished complete to the smallest detail.

THE RHOADES BATTERY IGNITION SYSTEM

is intended for the class of Ford owners who prefer to **dispense entirely with vibrators.** This system operates entirely on battery, six dry cells supply ignition for from two to four thousand miles. We supply a **handsome non-vibrating coil** fitted with Kick Switch, also elevating gear bracket. Six years of hard service have proven it to be the best battery system obtainable for Ford cars.

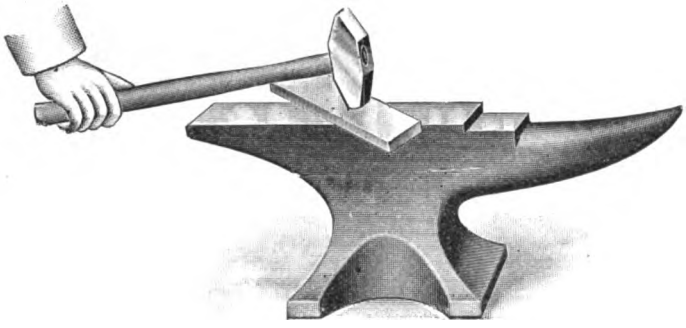
PRICE $20.00

NEW YORK COIL COMPANY

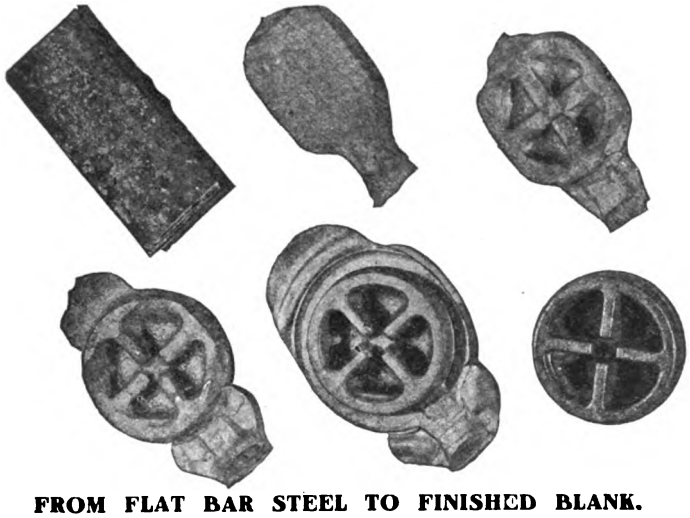
338 Pearl Street **New York, N. Y.**

***Western Branch*—1461 Michigan Avenue, Chicago, Ill.**

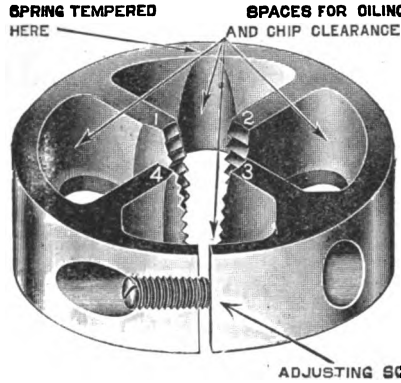
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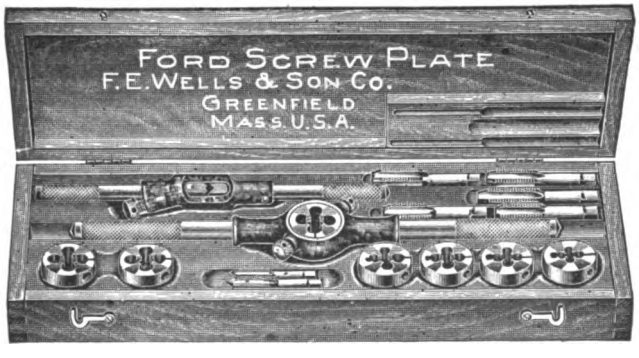
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FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.



Take the Slant Out of Hills

THOSE hills your car used to take so easily on high, that now seem to grow steeper every time you try them. Even in second you find it more and more difficult.

The piston rings in your motor are giving out. They are worn and fit badly—they leak compression. You can't get full power with them.

LEAK-PROOF
Piston Rings

Made by McQuay-Norris Mfg. Co.

will take the "slant out of the hill" by restoring proper compression and making each fuel charge deliver maximum power.

The two-piece, angle-to-angle interlocking construction of the LEAK-PROOF Ring is the only mechanical principle securing equal, firm and sustained bearing on the cylinder wall, while preserving exact fit to piston head. Identify the genuine LEAK-PROOF Ring by this exclusive feature. Be sure you get it when you ask for LEAK-PROOF.

In Use on Over 300,000 Motors

FREE BOOK

"To Have and To Hold Power." Tells all about piston rings. WRITE FOR IT TODAY.

Sold by all up-to-date Dealers, Garages and Repair Shops.

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"Ask the User"



Angle-to-angle interlocking construction identifies LEAK-PROOF—insist.

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BRING YOUR CAR
UP TO DATE WITH

Atwater Kent
Ignition

Magneto Replacement

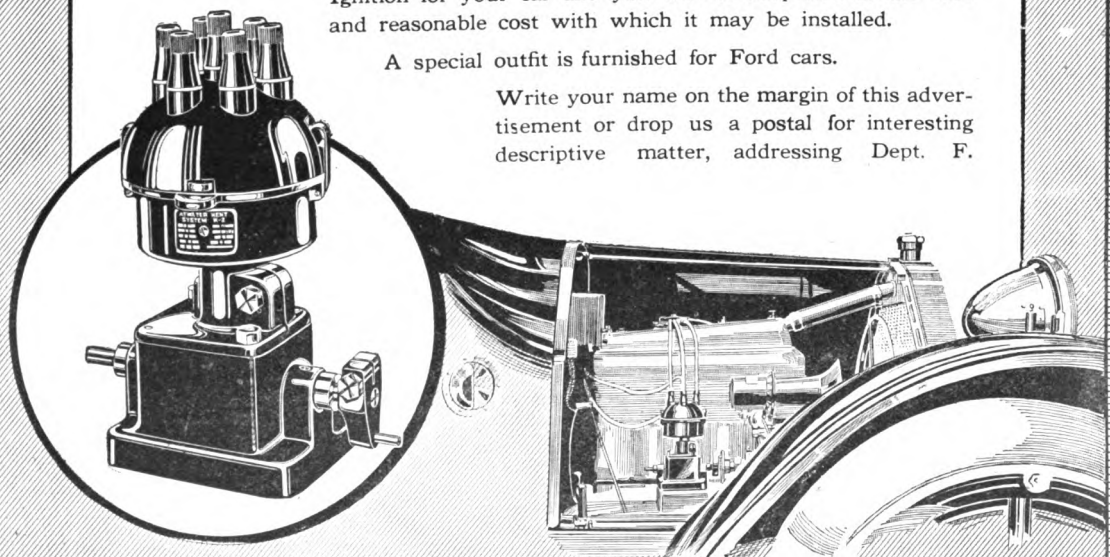
This famous system—standard equipment on thirty of the best known and most modern cars, has also been adopted by thousands upon thousands of wise owners whose cars were previously magneto equipped.

The Atwater Kent System with magneto replacement mounting is easily and quickly installed in the place of your present magneto, making it possible for you to realize in your own car the pleasure, comfort and increased safety secured by the A. K. automatic spark control, together with the better power performance, acceleration, idling and easier starting due to the unfailing constancy of its hot, dynamic spark.

Any one of more than five thousand dealers, garage and repairmen will gladly inform you regarding Atwater Kent Ignition for your car and you will be surprised at the ease and reasonable cost with which it may be installed.

A special outfit is furnished for Ford cars.

Write your name on the margin of this advertisement or drop us a postal for interesting descriptive matter, addressing Dept. F.



Atwater Kent Mfg Works 4937 STENTON AVE PHILADELPHIA PA

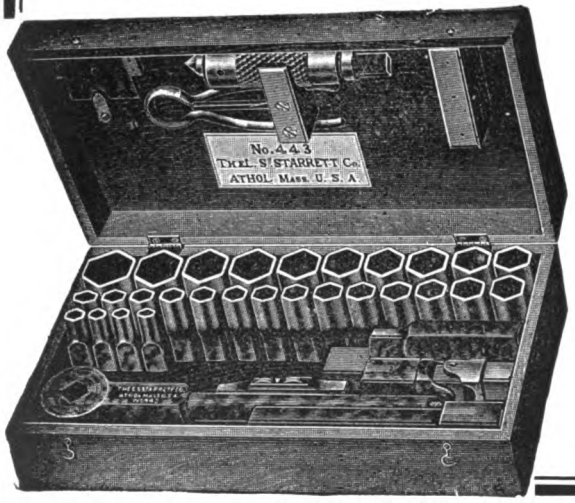
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A Complete Ratchet Wrench Set—$15.00

Pay Less — Get Less!

BY INVITATION MEMBER OF

The Starrett Ratchet Wrench Set was made to meet every requirement for such a set and the price was then made to fit it. You can buy cheaper sets but remember—Starrett Tools are always full value for their cost. This set includes a wrench handle with ratchet and full set of 28 sockets which take any standard hex nut or bolt, an extension for getting at difficult work, a spark plug socket and drilling attachment for square shank drills up to ½ inch in diameter, also several drilling adjustment attachments and a screwdriver with reversible ends. This makes a complete set for practically every need that such an outfit could be expected to fill.



Sold at all good hardware stores and supply houses.

Send for 320-page free catalog No. 20 D. C., describing 2100 styles and sizes of fine tools and hack saws.

The L. S. Starrett Co., Athol, Mass.

WORLD'S GREATEST TOOLMAKERS

NEW YORK LONDON CHICAGO

42-457

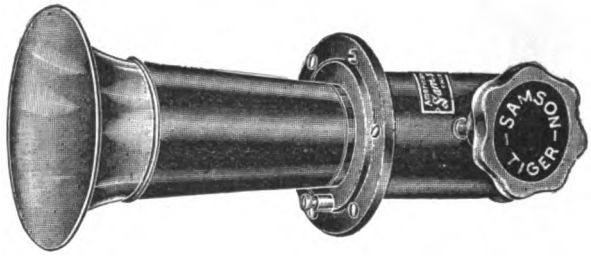
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"The Samson-Tiger comes nearer to being mechanically perfect than any other hand actuated automobile horn that has been devised. The principle on which it is constructed is fundamentally correct and overcomes the great objection to the plunger and lever type horns."

AMERICAN ELECTRIC CO. STATE AND 64th STS. **CHICAGO**

Manufacturers of Motor, Vibrator and Hand Actuated

Samson Automobile Horns



Samson-Tiger Automobile Hand Horn. Shaft-Driven

The projector is one piece of brass; the horn is beautifully finished in black with brass or nickel trim, and the tone volume is unequalled in any other hand horn produced. List price **$5.00.**

Write today for our liberal discount to dealers and sample horn at our expense.



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ROMORT GUARANTEED SPECIALTIES

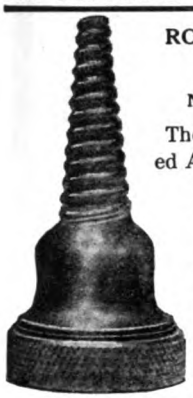
MR. JOBBER
MR. DEALER
MR. VULCANIZER
MR. TIRE MAN
MR. GARAGE
MR. MOTOR CYCLE
MR. CAR OWNER

ROMORT GUARANTEED SPECIALTIES ARE FOR YOU. MR. JOBBER, if your 1915 Catalogue don't list ROMORT GOODS, we invite you to write us. MR. DEALER, if your Jobber can't supply you, ORDER FROM US DIRECT. MR. GARAGE, VULCANIZER, MOTOR CYCLE, CAR OWNER—ROMORT SPECIALTIES will interest you. Each article is built for severe service, and sold only under a POSITIVE SATISFACTION GUARANTEE, or MONEY REFUNDED. There is nothing on the market "JUST AS GOOD." INSIST ON ROMORT GOODS. If your Dealer don't carry THE ROMORT LINE, DON'T WAIT—MAIL US THE COUPON BELOW—WE WILL PROMPTLY FILL YOUR ORDER DIRECT.

ROMORT STRAIGHT PUMP CONNECTION.

Price 25 Cents Each.

Not Automatic. **Patented.**



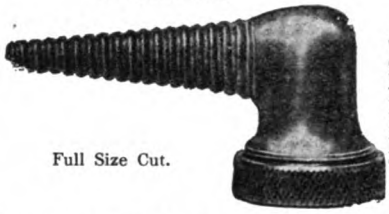
Full Size Cut.

The ideal Air Connection for use on direct Connected Air Pumps, hand and foot pumps, Spark-plug and Power Tire pumps. Solid Casting with Center pin. REPLACES THE AWKWARD AND INCONVENIENT SCREW CONNECTION. Has threaded taper stem to fit ⅛ to ⅜ inch tubing. Will not leak OR BLOW OFF, when connected to tire valve. If your Dealer is up-to-date he has them in stock, if not—Fill out the Coupon below—INSIST ON "THE ROMORT."

ROMORT ANGLE PUMP CONNECTION.

Price 40 Cents Each.

Not Automatic. **Patented.**



Full Size Cut.

Extra heavy solid bronze one-piece casting, with center pin. Designed for Direct Connected air compressors of all types. ESPECIALLY RECOMMENDED FOR POWER TIRE AND SPARK PLUG PUMPS ATTACHED TO AUTOMOBILES. Threaded taper stem to fit ⅛ to ⅜ inch tubing. HOLDS FAST TO TIRE VALVE WHEN ATTACHED. Your Dealer should have them, if not, order direct—See Coupon below. DON'T TAKE A SUBSTITUTE—GET A "ROMORT."

ROMORT AUTOMATIC AIR VALVE, STYLE "A."

Price $3.00 Each. **Patented.**



The Master Valve for Use of Free Air Stations. Stands the Hard, Rough Usage and Abuse.

Full Size Cut

PRICE LIST OF PARTS
See Letter On Cut

a—Body	$1.50 each
b—Nut	.40 "
c—Spring	.05 "
d—Plunger	.50 "
e—Gasket	.05 "
f—Cap	.50 "

PUBLIC AIR STATIONS, GARAGES, VULCANIZERS, TIRE SHOPS, all use it. IT WON'T WEAR OUT. ABSOLUTELY AUTOMATIC AND FOOL PROOF. AIR CANNOT BE WASTED. Attach it to the hose, kick it around on the cement walks and forget it. Always in order and ready. First Cost is years' total cost. NOTE THE TAPER SCREW STEM TO FIT ANY COMMON SIZE TUBING. Special Stem to fit extra large or small tubing, at no additional cost. ALL LEADING JOBBERS AND DEALERS CARRY THIS VALVE IN STOCK—if yours does not, fill in Coupon below. GET THE BEST—GET A ROMORT, STYLE "A."

ROMORT AUTOMATIC AIR VALVE, STYLE "B."

Price $1.00 Each.

Patent Pending.

A High Grade Automatic Air Valve Designed to Meet the Popular Demand for a Small and Inexpensive Air Device.



Half Size Cut.

PRICE LIST OF PARTS.

Body	$ .50	Cap	$ .25
Plunger	.30	Gasket	.05

Solid Bronze, one-piece casting, taper screw stem to fit any size air tubing. AUTOMATIC IN OPENING AND CLOSING AND POSITIVELY AIR TIGHT. We highly recommend this valve for use of private or public Garages, Vulcanizers, Tire Repair Shops, where the service does not require the use of a heavy valve. Ask your Dealer for a ROMORT, STYLE "B," or fill out Coupon below.

ROMORT AIR NOZZLE---CUSHION CLEANER

Price 25 Cents Each



The handiest little device ever invented for the purpose of **blowing the dirt and dust off cushion tops, foot mats, machinery, etc.** When attached to a Romort Automatic Air Valve, or Pump Connection, air flows out of the needle point **with terrific force**, forming a perfect and effective Air Cleaner. Ask your Dealer, or order direct.

ROMORT PUMP CONNECTION RUBBER---or ROMORT RUBBER WASHER

FITS ALL VALVES AND PUMP CONNECTIONS

One Dozen Rubbers to a Carton **Price 25 Cents per Carton**

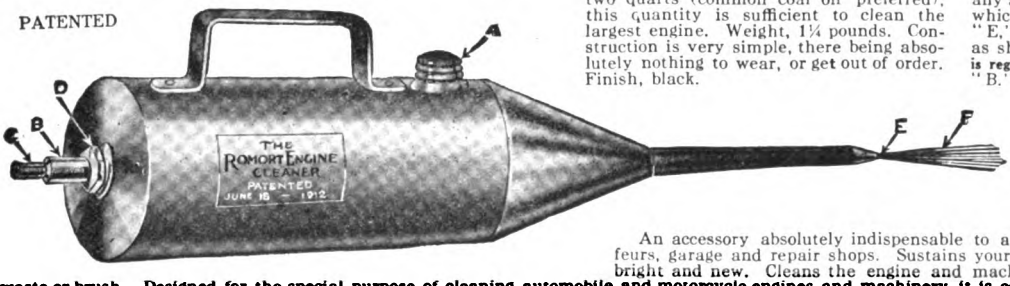
A scientific Romort design, made of a Special Compound of Rubber (not dope), has the best wearing qualities. Easily slips on the tire valve, **Will hold fast and will not turn inside out. Don't be misled by cheap inferior washers similar to Romort design—Genuine Romort Rubbers are stamped "Romort."** Leading Jobbers and dealers carry **Romort Rubbers** in stock—if yours don't, fill out Coupon below.



The Romort Engine Cleaner

PRICE $3.00 Each

PATENTED



DESCRIPTION

The Romort Engine Cleaner is 20½ inches long by 4 inches in diameter, a convenient size for carrying in a car. Fluid capacity, two quarts (common coal oil preferred); this quantity is sufficient to clean the largest engine. Weight, 1¼ pounds. Construction is very simple, there being absolutely nothing to wear, or get out of order. Finish, black.

HOW TO OPERATE

Fill the tank as shown in the cut at letter "A," attach the cleaner to hose or air supply at letter "C," (standard connection will fit any air hose). Turn knurled rod at letter "B," which opens valve and lets fluid out at letter "E," fluid is forced out in a very strong spray, as shown by letter "F." **Light or heavy spray is regulated** by a slight turning of knurled rod "B." The packing nut, as designated by letter "D," may be easily detached and repacked if found necessary.

NO DANGER OF EXPLODING

As the air does not enter the tank, but passes right through, picking up the fluid at letter "E," there is absolutely no danger of the tank blowing up—this being impossible.

An accessory absolutely indispensable to automobile and motorcycle owners, chauffeurs, garage and repair shops. Sustains your car efficiency by keeping the machinery bright and new. Cleans the engine and machinery perfectly without the use of rags, waste or brush. **Designed for the special purpose of cleaning automobile and motorcycle engines and machinery, it is constructed with a long spout or point, so the operator may easily reach every nook and part of the machinery, an impossibility with the old method of rags and waste. The dirt and grease readily disappear before a strong spray, which works under a very low air pressure. Use an engine-driven or spark plug pump, garage storage systems or in fact any air pressure system from 10 pounds to 200 pounds. It cleans the machinery of your automobile or motorcycle just as readily and with the same result as one would hose off the outside of the car. The Romort Engine Cleaner, one quart of coal oil and five minutes of your time will do the work.**

For sale by all up to the minute Dealers or order direct—See Coupon attached.

ROMORT MANUFACTURING CO., Mfrs. of Romort Guaranteed Specialties, **1322-1326 Michigan Ave., Chicago, Ill., and 1810 Westlake Ave., Seattle, Wash.**

Fill in and mail this Coupon to our Chicago or Seattle address, your order will have our prompt attention.

JOBBERS and DEALERS

Let us have your initial order for one dozen each of our line. We refund you if not satisfactory. You don't have to carry any Romort dead stock.

ROMORT MANUFACTURING COMPANY

1322-1326 Michigan Ave., Chicago, Ill. **1810 Westlake Ave., Seattle, Wash.**

GENTLEMEN:—Enclosed find.....Dollars, for which please send me via post, mail or express, Prepaid.....

.....

NAME..... ADDRESS.....

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Removes Rims Instantly

AN INSTANTANEOUS TOOL for the immediate removal and replacement of tires in an *upright position. Fits the Tool Box.*

TWO MODELS

Straight Side Tool operates all sizes of Kelsey and Stanweld Split Rims.

Clincher Tool for Kelsey Split Rims, 4 inches and smaller.

Friestedt Rim Contracter $2.00



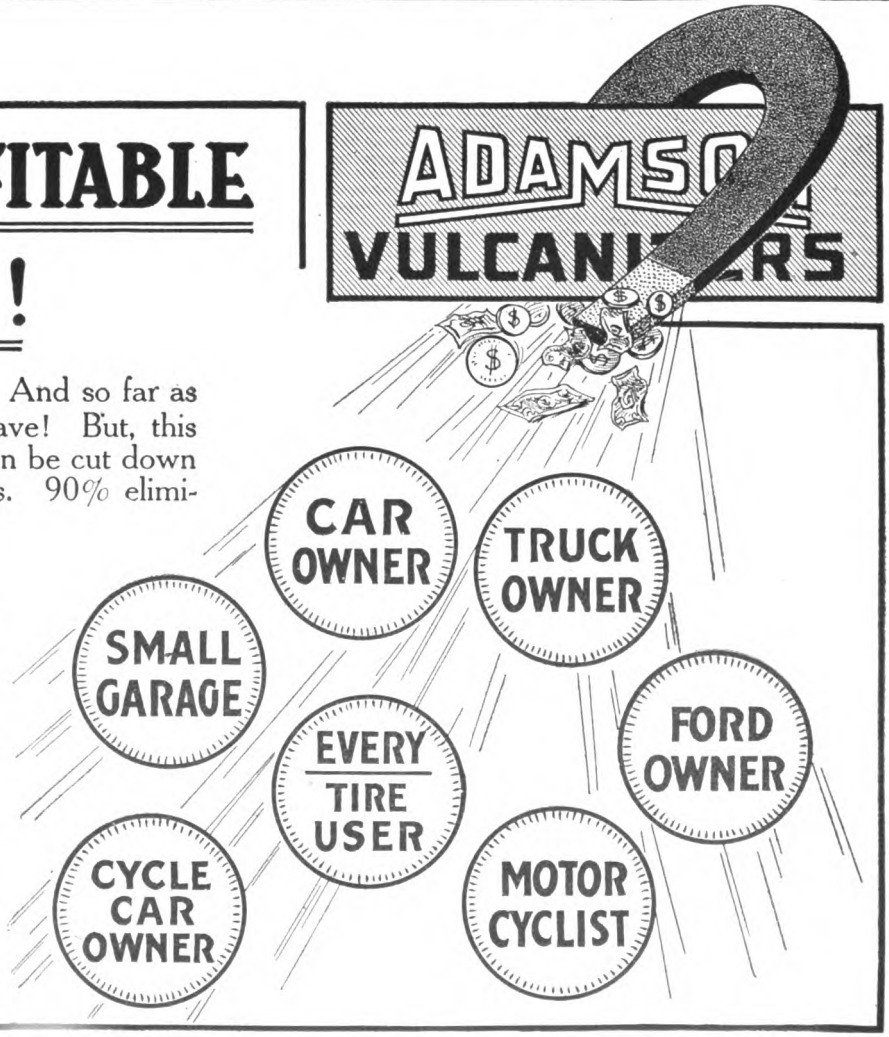
"IT OPENS THE RIM LOCK"

Guaranteed to make good every claim. Order direct or through your dealer. Indicate which tool is required and give tire size.

Dealers: Write today for attractive proposition. 75 per cent of the cars have these rims.

FRIESTEDT RIM CONTRACTER COMPANY
2931-2939 W. LAKE STREET CHICAGO, U. S. A.

DRAW PROFITABLE BUSINESS!



Every tire user has **trouble.** And so far as we can see, he always will have! But, this trouble can be lessened. It can be cut down to one-tenth of what it now is. 90% eliminated. This: by using the "ADAMSON" Vulcanizer. Every tire user sees the logic in our principle--and BUYS SOMETIME, for it's economy to carry an outfit in every car. Are you going to gather in some of these dollars which the "ADAMSON" is attracting? They will come to your place of business--if you've "ADAMSON" outfits on your counter. Write for the dealer's proposition to

Adamson Mfg. Co.
East Palestine, Ohio Hamilton, Ont., Canada

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FOR FORDS

Gemco MILWAUKEE TRADE MARK "THE SIGN OF SATISFACTION"

FOR FORDS

Buy The Best Ford Equipment

Look for the Trade Mark



Reliable accessories and equipment are the only kind worth buying for your Ford car. You can spend a small fortune on the other kind without finding satisfaction, if you do not take every care in providing the reliability first.

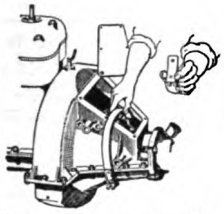
We are the largest manufacturers of general accessories in the world. The most reliable established supply dealers in all parts of the country sell Gemco accessories. For that reason, for the protection of our own business, we have made reliability and value the first requisite in designing our Ford Specialties. Mechanical Starter, $15.00; Pneumatic Spring Shock Absorbers $15.00; Economy Shock Absorbers $10.00; "Gemco" Quick Detachable Transmission Band $1.50. Clamp-On Channel Bumper $8.00; Combination Tire Holder $3.95; 17-inch Steering Wheel, Corrugated, $4.50; Plain $3.60; Tilting $1.00 extra; Foot Accelerator $1.50; Cut-out Outfits $0.95 to $1.10. Also Radius Rods, Mufflers, Ventilating Wind Shields, Exhaust Horns, Lamps, License Brackets, Brake Shoes, Robe and Foot Rails, Wheel Pullers, Anti-Rattlers, Radiator Cradles, etc.

The Famous "Gemco" Bumper

and many other standard accessories for use on all makes of cars are also included in the complete "Gemco" line.



Complete with Straps....$3.95



Thirty Minutes to Attach.
Price, Lined Complete $1.50
Lining Only, Three in Box, with Rivets 1.00

"17" Tilting Steering Wheel for Ford Cars



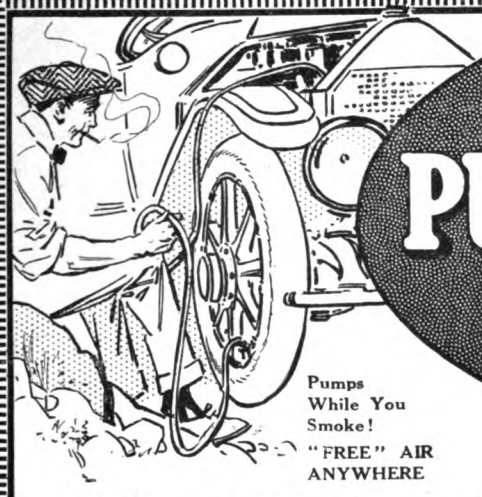
17 in. Stationary, Plain Rim, $3.60
Corrugated 4.50
17 in. Tilting, Plain Rim..... 4.50
Corrugated 5.50

Look for the "Gemco" Trade Mark on the Ford equipment you buy.
Write today for complete catalog and prices.

GEMCO MANUFACTURING COMPANY,

Formerly Garage Equipment Mfg. Co.

756 So. Pierce St., Milwaukee, Wis.



Let The PURAIR TIRE PUMP DO IT!

Pumps While You Smoke!
"FREE" AIR ANYWHERE

The joy-killing, back-breaking hand pump is a LOSS!

THE BEST POWER PUMP—NO OIL, NO GUESSWORK

May be installed by anyone, as no machine work or special tools are required. A simple, durable pump that will inflate your tires to required pressure then pop off with a loud noise, no gauge necessary.

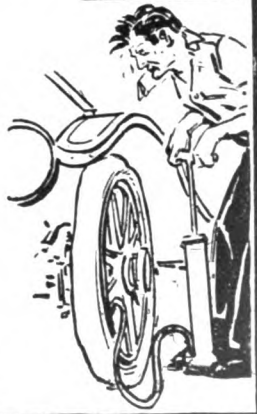
Perfect Inflation! Very few succeed in pumping up their tires to required pressure with a hand pump; the last ten pounds count the most but are hardest to get.

The PURAIR PUMP does the work in a minute or two. Proper inflation of tires means more mileage, less blowouts and longer life.

The PURAIR PUMP garage outfit should be in every garage—handy, convenient, a necessity. Price **$55.00,** Complete with Motor and Accessory.

PURAIR PUMPS, ready to attach to cars, single cylinder **$12.50,** double cylinder **$16.50,** Ford Special **$7.00.**

Attached to your car by a bracket and connected with engine.



Hert Manufacturing Co., 150 South Delaware St. -:- Indianapolis

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EVERY FORD NEEDS A WALDEN WORCESTER WRENCH

MR. FORD OWNER

Walden-Worcester wrenches for Ford cars have been built *specially* for use on the Ford. They are designed to meet the hardest service. Every wrench is *guaranteed*. Your money back, if it fails to do the work required. If your dealer tries to substitute and hand you a cheaper tool, demand the **Walden-Worcester**—(Look for the name on the tool and get your money's worth. Insist on a **Walden-Worcester.**

No. 1620—Triple Socket Wrench for Cylinder Head and Housing Bolts



The most useful single wrench for Ford cars. Cylinder head bolts, rear axle nuts and housing, water intake pipes and sundry other places. The offset gives necessary leverage for tightening or releasing bolts, the tee handle feature being wonderful for quick work.

PRICE **38c**

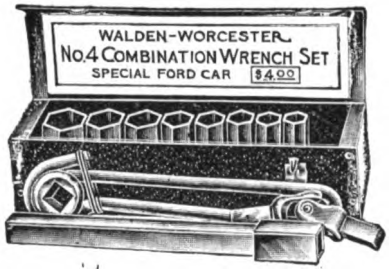
No. 4564—For Reverse and Brake Bands



The only wrench for use on brake and reverse bands, giving a full clearance around nuts. The peculiar shape of the handle allows full working space at all times. A Ford car is not complete without one of these wrenches.

PRICE **50c**

No. 4—The Set That Fits Every Bolt and Nut on Fords

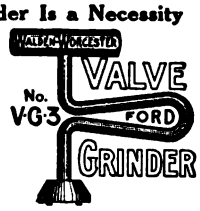


A complete outfit that enables you to reach *every* nut and bolt on the Ford. It is the strongest, simplest, best constructed ratchet wrench set ever devised. Every part of this set is made for service and absolutely guaranteed against defects. With this outfit you are prepared for any emergency. Every Ford owner endorses it. It will pay you to invest in one of these sets today.

PRICE **$4.00**

A WALDEN Valve Grinder Is a Necessity

Consists of a special brace having a grip hold attachment that fits into the Ford engine valves. Will grind Ford valves better and in less time than any other valve grinder on the market. Made of Bessemer Steel Rod. You will like this little tool and will be glad to recommend it to your friends.



PRICE **30c**

ASK FOR OUR LATEST CATALOG

We have a money-making proposition in our new catalog that will be of extreme interest to you. It's something you have always needed. It will pay you to write. Just say, "Tell me about that 'box' you are giving Free."

MR. FORD DEALER

Walden-Worcester wrenches for Ford cars are *big sellers*. They are the most practical, most reliable tools that you can handle. Every Walden-Worcester specialty is backed by a *guarantee* that protects you and your customer. Why sell inferior, unreliable tools when you can sell the *best* at the same price? You will make *more* money in the long run by giving your customers **Walden-Worcester Wrenches.** Ask for our Wholesale Price List.

No. 5810—For the Connecting Rods

A tool of the greatest practicability and service, one that reaches any position without removing the motor from the car. Its peculiar shape affords splendid grip and powerful leverage No Ford owner should be without one.



PRICE **35c**

No. 1824—Double Socket Wrench

A splendid double end wrench for removing main bearing and engine base bolts, etc. Sockets are of different size and are steel machined. They are case hardened and applied to the rod by our special process. Guaranteed not to twist or shear off.



PRICE **35c**

WALDEN MFG. CO. Specialty Department 64 CENTRAL STREET WORCESTER, MASS.

ADDRESSING

To Automobile Owners,

Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

100% POSTAGE GUARANTEED

ALL DUPLICATES CUT OUT

We Have the Largest Addressograph Plant in the World for Public Business

List of Fords, Overland, and All Makes At Rock Bottom Prices

Card Systems any Make, any State or Section Thereof

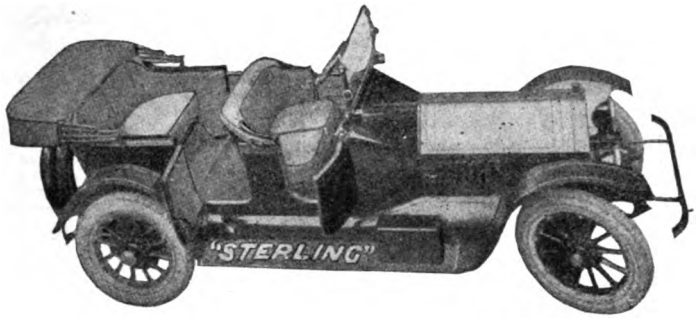
PROMPT SERVICE

AUTO LIST & ADDRESSING CO.

1735 BROADWAY Telephone, 6600 Columbus NEW YORK CITY

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LOOK!!! AUTOMOBILISTS, LOOK!!!



PRE-INVENTORY, CLEAN-UP SALE

At Prices Below Cost

Seat and Top Covers

For All Cars

$5.00 PER SET UP

1912-1913-1914-1915

Cadillacs, Hudsons, Buicks, Fords, Overlands, Reos, Maxwells, Chalmers, Appersons, Chandlers, Chevrolets, Dodges, Kings, Mitchells, Studebakers, Oaklands, Etc.

Place Your Order Today. **This is a Chance of a Lifetime.**

Samples of Materials sent upon request.

STERLING TOP & EQUIPMENT CO., Inc.

519-521-523 WEST 57th STREET **NEW YORK, U. S. A.**



The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company

3326 Ludlow Street **Philadelphia, Pa.**

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South

A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver



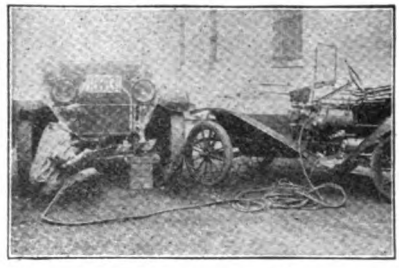
IMPERIAL WELDING AND CUTTING EQUIPMENT

OXY-ACETYLENE PROCESS

Meets Any Emergency!

In the shop or on the road—for welding cracked cylinders, broken aluminum cranks, transmission cases, crank shafts, frames, axles, rear axle-housings, steering knuckles and all other automobile parts quicker, more effectively and *considerably cheaper than you ever have done before.* Removes carbon from engine cylinders in a jiffy. Imperial Equipment pays for itself in one or two operations. Safe, compact, reliable, portable; can be moved anywhere—*always ready.*

You Too, Can Do This!



This picture has money-meaning value to garage men. A broken axle out on the road—five miles from a repair shop. Instead of hauling the car back to the shop this progressive garage owner puts his Imperial Outfit and an oxygen tank in his runabout—drives quickly to the job—hitches it to the acetylene tank used for lighting—and *in a few minutes* the axle is as good as new, *without dismantling car.*

Imperial Equipment is indispensable in the garage.

Write Today!

Ask for prices, catalog and full details. *Prove to yourself* how you can save enormously in time and money with Oxy-acetylene Welding and Cutting Equipment.

Imperial Brass Mfg. Co.

520 S. Racine Ave.

CHICAGO

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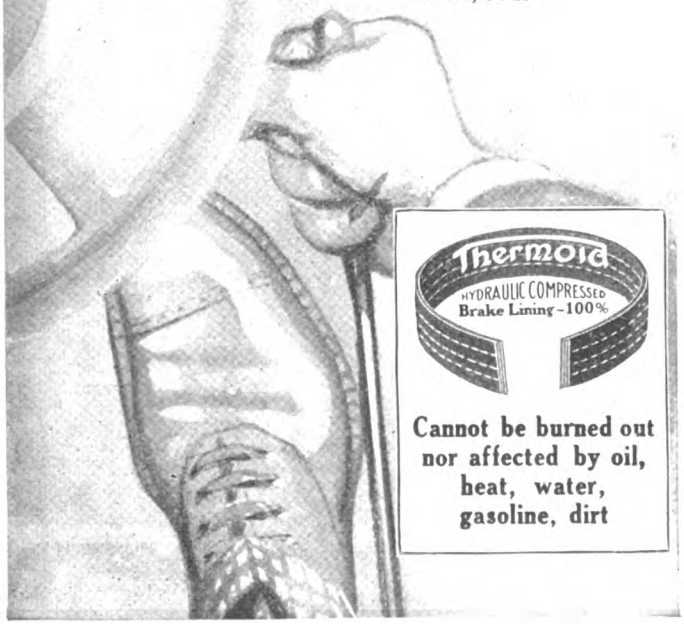


Thermoid Brake Lining SAVED THE CHILD

It never fails in emergency. It has the same sure gripping friction at the core as on the outside. It is 100% brake lining. Watch your brake lining—guard against accidents with

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%

Thermoid Rubber Co.
Trenton, N. J.



Cannot be burned out nor affected by oil, heat, water, gasoline, dirt

Free to Dealers
Handsome Display Card

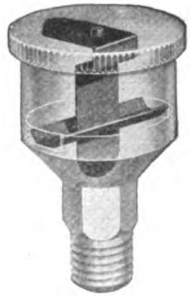


It Sells the Goods

This striking colored display card comes free to every "KLICKET" dealer. 19x39 inches in size. Punched to contain three dozen assorted KLICKETS of every size. It stands on the counter or in the window. Hang it up if you like. Sells KLICKETS at sight. Increases your grease cup sales without any more investment.

KLICKET
Ratchet Grease Cup
"HEAR IT KLICK"

A New One Free If You Lose the Cap



That's why they sell so fast. The finest ratchet grease cup made—and guaranteed against loss or breakage. We ask no questions. If the ratchet breaks or the cap is lost off—you get a new one free.

One set of KLICKETS will outlast any car. Cap locks on as soon as threads engage. Makes a loud "klick" at every quarter turn. Turn it down as accurately at night as in daytime. No more guesswork about amount of grease forced into bearings.

Can be turned with but one hand. No outside jimcracks to catch dirt or get broken off. Cheaper and better than any other ratchet type of cup. Made for all cars—in steel, brass and nickel. 15 cents and upward at dealers.

Write for Sample

Send 25 cents for sample "KLICKET"—postpaid. Just state inside diameter of cap, size of pipe thread on bottom of cup, or diameter of bearing hole. Money back upon request.

FORD SPECIAL: Replace both steering knuckle oil cups with brass "KLICKETS" for 50 cents, postpaid.

Write for dealer's proposition and terms. You can put "KLICKETS" on new cars as well as old ones. Selling like hot cakes. Get our free counter display.

American Stamping Company
604 Burchard Street, Battle Creek, Mich.
(6)

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This REAMER For Motor-Bearings

Will Abolish Hand Scraping!

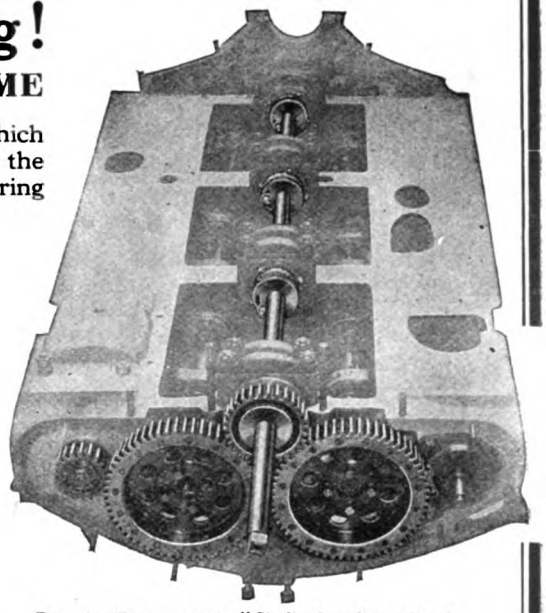
DOES BETTER WORK—TAKES 1/4 THE TIME

Do you want to learn about a reamer for motor bearings which cuts out three-fourths the time of hand scraping, which aligns the bearings perfectly and which lets you double your profit on bearing work? Then write for our booklets describing the

MARTELL
ALIGNING REAMER

This wonderful new tool revolutionizes bearing methods. It was invented by an engineer who was tired of the slow, tedious, hand-scraping method. It BORES the bearing to size (micrometer adjustment to .001") and BURNISHES the bearing surface, insures accurate meshing of gears and leaves the bearings in absolute alignment. You can charge your customer less, but make more profit yourself on work of this kind.

Set No. 1 for ordinary motors having bearings from 1 5-8 to 2 1-4 inches.
Set No. 2 for small motors, bearings from 1 1-4 to 1 5-8 inches.



Reaming Bearings on a "Six." Cut shows Crankshaft Gear in Position on the Reamer Shaft.

Write for booklets, "Bearings—Use and Misuse" and "A New, Better and Quicker Way to Scrape Bearings"

Harding Distributing Co., 40 Court Street, Boston, Mass.

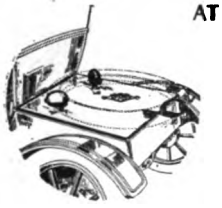
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TRADE MARK UFASCO

PRODUCTS

FORD SPECIALTIES

PROTECTION
AT ALL TIMES



FORD LOCK TIRE HOLDER
No. 88-9

For $2.50 you can leave your car anywhere as long as you want to, and know that your spare tire **cannot be stolen.**

COMFORT
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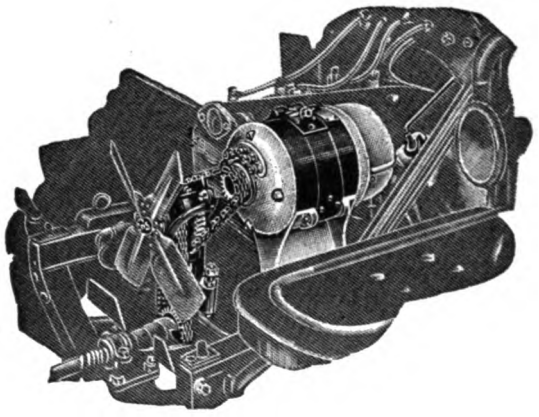
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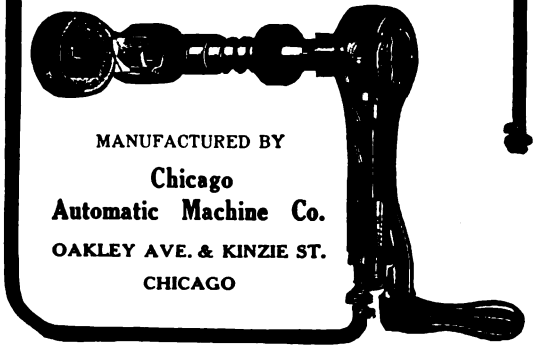
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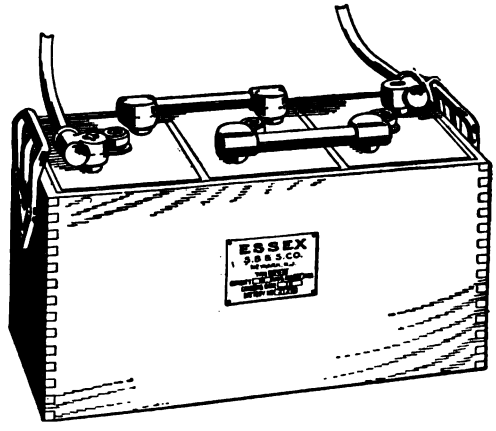
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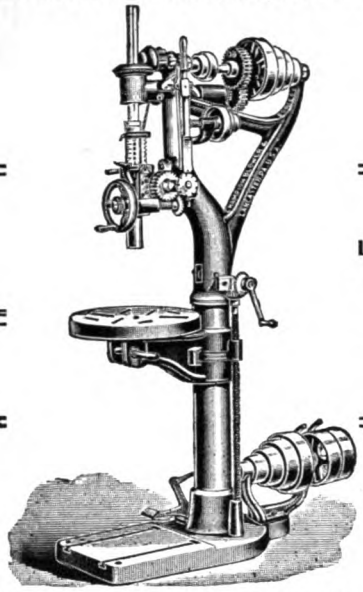
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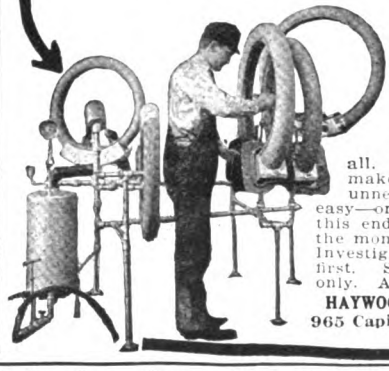
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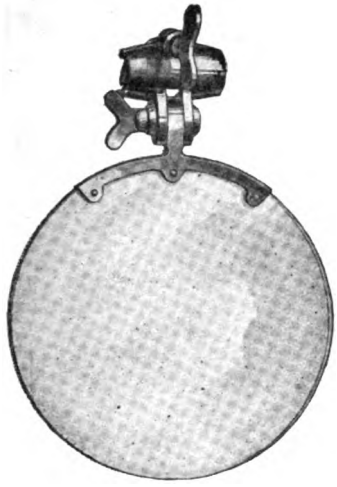
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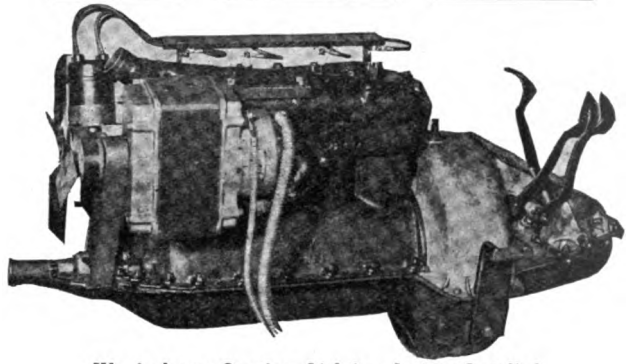
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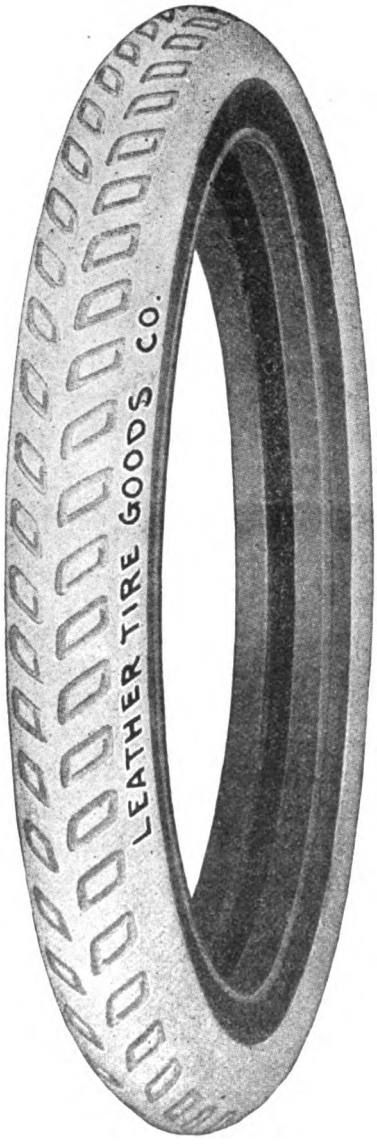
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A JOURNAL OF PRACTICAL MOTORING

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VOL. XIX, No. 5. NEW YORK, JULY, 1915. PRICE { 10c PER COPY / $1.00 PER YEAR

DRY BATTERIES.

Their Evolution and How They Can Be Made to Give Good Service.

BY SYDNEY F. WALKER, M. E.

No. 1.

Dry Batteries for Motor Cars.

In the following articles, the writer proposes to describe the evolution of the dry battery, and to show how it can be constructed to do quite as good service as the accumulator, both for lighting and for ignition. He proposes also to explain the principles on which the connections of dry batteries should be made to obtain large currents from them when desired, and their special construction when large currents or heavy work is required of them. He believes that the dry battery is very much misunderstood; that if properly constructed it would do a great deal of work that is now done by the accumulator. It goes without saying that it would be very much better and easier if a battery of cells could be carried upon a car, that would furnish current for lighting, for ignition, and for starting, in place of the accumulator, with all the requirements in the matter of charging. The accumulator has done very good work, and as it is being steadily improved, the

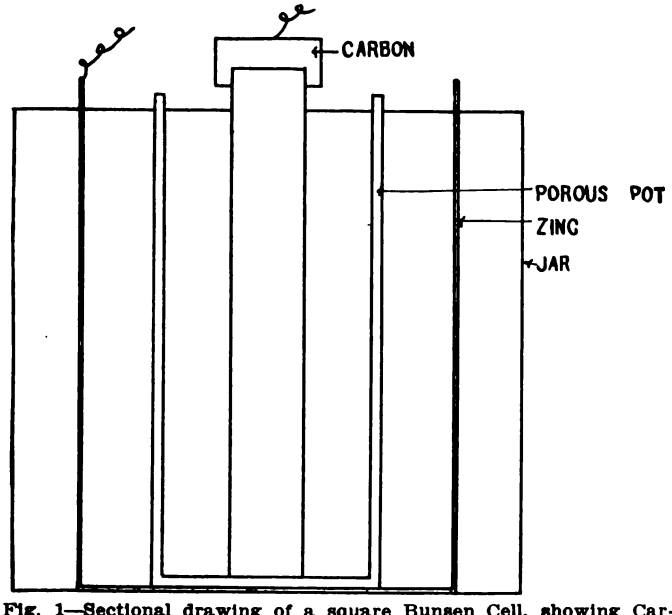


Fig. 1—Sectional drawing of a square Bunsen Cell, showing Carbon Plate, Porous Cell and Enclosing U-shaped Zinc.

work obtained from it is becoming better and better; but at the best it is an uncertain apparatus. At the best the problem involved in charging it from a dynamo carried upon the car is a troublesome one. There is always the chance of overcharging, and again of the accumulator discharging through the dynamo. Provision has been made against both of these contingencies, but the provision has involved a considerable amount of complication. It will be remembered that a "cut in" and "cut out" is necessary; and while modern apparatus for that purpose is remarkably good, there is always the possibility of the moving member of the apparatus sticking, either in contact, or out of it. Those who have employed accumulators will hardly need to be reminded of the troubles arising from their use.

On the other hand, if a battery can be carried on

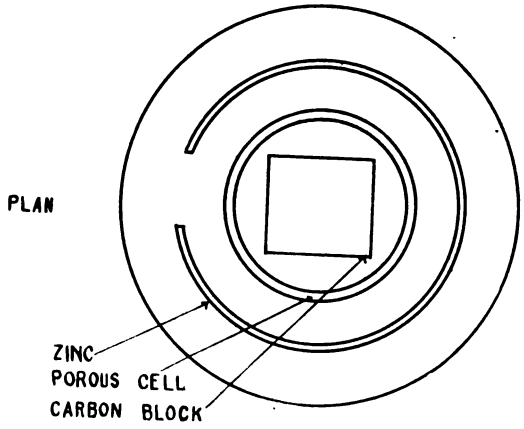


Fig. 2—Plan of Cylindrical form of Bunsen Cell, Showing Carbon Block, Porous Cell and Zinc Cylinder.

the car, that will displace the dynamo, and that will render unnecessary all the complicated apparatus in connection with the charging of the accumulator and the varying speed of the dynamo, even if the cost of renewing the batteries should be moderately high, the writer believes the cost would not be grudged; and that the whole arrangement would be superior to that of the dynamo and accumulator.

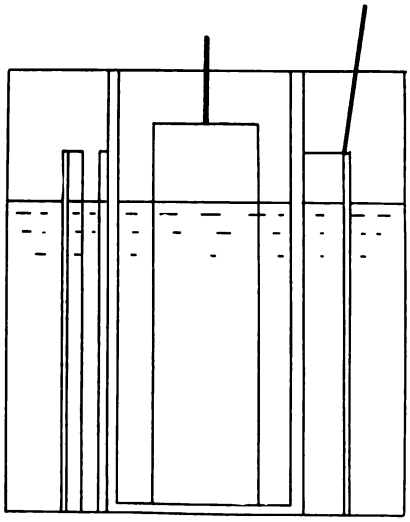
The dry battery, it will be remembered, was used to a considerable extent in the early days of the motor car, for the ignition outfit. It is still used to a large extent, but it has been gradually displaced by the accumulator, and particularly since cars are being lighted by electric lamps and the electric starter has made way. The reason for the dry battery falling into disuse, the present writer believes, is because the principles upon which it should have been constructed were not understood, and because a little extra weight upon the car was shirked.

The Evolution of the Dry Battery.

The dry battery has been evolved from the wet Le Clanché cell; it is practically a Le Clanché cell, in which the sloppy element has been discarded. The present writer has a very long experience with batteries of all kinds. A good many years ago he was responsible for the maintenance of a number of wet Le Clanché cells, and he was obliged to do the maintenance work himself, because the price obtainable for the work was such that the wages of a workman would have quickly swallowed it up. Naturally the performance of the work in connection with the maintenance of the batteries gave the writer an experience of Le Clanché batteries that

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is not often obtained even by manufacturers or by men who are employed in looking after them. He repaired his Le Clanché batteries upon the ground where they were used, keeping material there for the purpose, and for the two or three years during which the maintenance contract lasted, he had the peculiar gratification of knowing that the maintenance cost was practically nil. The batteries used practically nothing, though they were hard worked as batteries went in those days. The only expense in-



ELEVATION

Fig. 2A—Sectional Elevation of Bunsen Cylindrical Cell.

volved was his train fare, and his personal expenses while going to the batteries. As the train fare took him into the district where further work was to be obtained, the whole arrangement was a very profitable one.

When after a few years, the usual thing happened, and the writer's business had so increased that he was not able to give the time necessary to looking after the batteries himself, he put a workman on for the purpose, and the maintenance revenue, which by that time had been increased by the addition of further batteries, was very quickly swallowed. Fortunately he had coached the officials where the batteries were in use, at collieries, how to look after them, and the contracts were closed.

Subsequently to that, the writer conducted a long investigation, and made a long series of tests, to ascertain exactly the conditions for the production of a cell that would stand. How far he was successful will be understood when he mentions the fact, that a good many years afterwards, some of his own cells were brought to him, that had been in use for 10 years, and were then practically as good, so far as giving a satisfactory current was concerned, as when they were made.

The currents which Le Clanché batteries of those days had to supply, were very much smaller than the currents that would be required for lights, or even for the ignition of say a 6 or 8 cylinder engine; but the principles upon which the batteries were constructed are the same, and in his opinion it is merely an extension of those principles, to enable batteries of sufficient capacity to be turned out to perform the work sketched above.

Earlier Batteries.

The Le Clanché battery came as a great boon to the electrical world of those days. Previous to the introduction of the Le Clanché battery, there had been a few forms of battery that could be employed for furnishing current, but none of them could be left for instance in a private house, to ring a bell, or to furnish a current for a telephone. If one wanted a powerful current to furnish an electric arc lamp a battery had to be employed. In those days it will be remembered, the arc lamp was still in the experimental stage. The writer has a vivid recollection of furnishing a battery for a lecturer, who was describing the arc lamp; and of the lecturer's remarking, that something which had required a cessation of the light illustrated the unreliability of the arc. The battery that was employed for that purpose was the Bunsen, which may be found described in text books, and which is illustrated in Figs. 1 and 2. The Bunsen battery employed zinc standing in a fairly strong solution of sulphuric acid, and carbon or platinum standing in a mixture of nitric and sulphuric acids. When the battery was at work, there were strong fumes of nitrous oxide gas coming away from the carbon cell. It will answer very well for a lecture experiment, but is uncertain even for that. One had to be very particular indeed about the connections between the zinc plates and the carbon or platinum plates. A loose clamp for instance would lead to sparking, and to trouble. The Bunsen battery of those days was looked upon as a thoroughly practical apparatus, inasmuch as the inventor of an electric motor designed to drive boats in the water, who informed the writer that he had driven a fairly large boat upon the River Neva, employed Bunsen batteries. His complaint was, not that the zinc was expensive, but that such a large quantity of acid

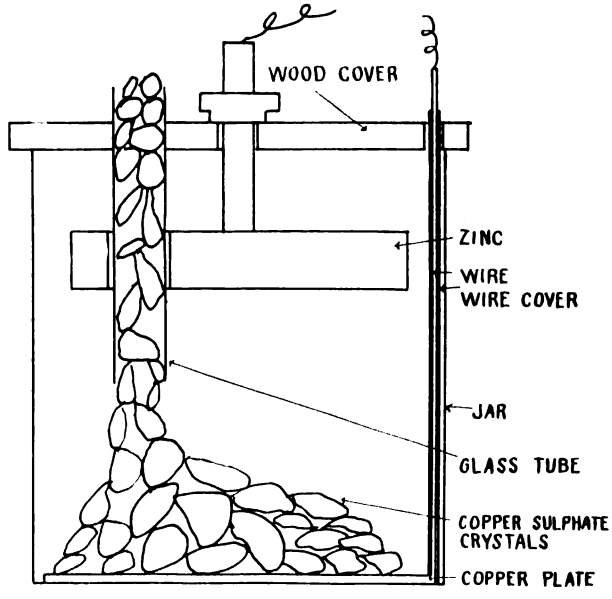


Fig. 3—Sectional Elevation of early form of gravity Daniell's Cell, showing zinc and copper plates with crystal of sulphate of copper on the bottom of the containing jar and in the glass tube leading to it.

was employed, and that the expense generally made it prohibitive. The writer understood that the inventor succeeded in keeping his batteries going fairly well and that he ran his boat for a fairly long distance. Obviously however they were useless for what may be termed commercial work.

The battery which had done the best service at that time was the Daniell. It was the invention of Prof. Daniell of Kings College, London, and was hailed at the time as a great discovery. Previously

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to the invention of the Daniell and of Bunsen's batteries, it had not been possible to obtain a continuous current from a battery cell. Zinc and carbon plates, or zinc and platinum plates immersed in dilute sulphuric acid had been employed to furnish electric currents for a short time, but the appearance of hydrogen at the carbon or platinum plate had quickly broken the cell down. In the Daniell and Bunsen's batteries, the hydrogen was practically neutralized by the liquid in which the carbon or platinum plate was immersed.

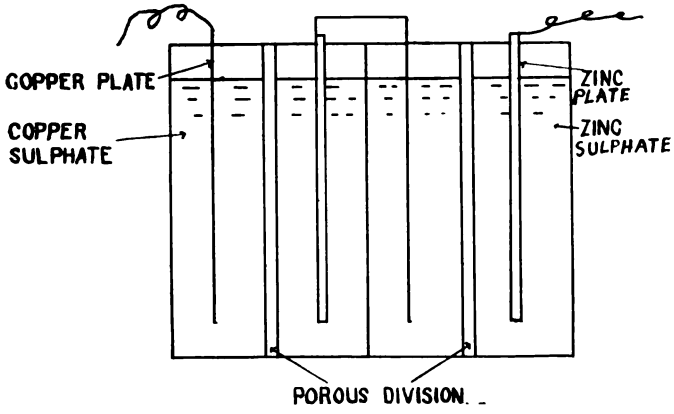


Fig. 4—Sectional Elevation of two cells of trough Daniell's Battery, showing zinc and copper plates and porous divisions.

Action of a Galvanic Battery.

Perhaps it will be as well before going further, to explain the action of a galvanic battery. It is exactly the same for the dry battery of the present day, as for the Daniell and Bunsen and Le Clanché battery of 30 years ago. The energy in every battery in which zinc is employed is furnished by the consumption of a certain quantity of zinc, proportional to the strength of the current passing. The zinc combines with the oxygen of the water in which it is immersed, and with the chlorine, or the acid radical $S O_4$ of sulphuric acid; zinc oxide, zinc chloride, and zinc sulphate being formed. The hydrogen gas which is liberated by the decomposition of the water, and of the salts that are dissolved in it, appears at the carbon or platinum plate; and it would there set up an opposing electrical pressure, unless it is got rid of in some way. In one of the early batteries, it was got rid of to a certain extent by roughened surfaces, platinum deposited upon silver, and a roughened carbon plate; but the result was not a very satisfactory one. In the Daniell battery, and in the Bunsen battery, the hydrogen was caused to decompose a substance placed around the negative element, as it was termed. As mentioned above, in the Bunsen battery, platinum or carbon might be used; in the Daniell battery copper was used. In the Bunsen battery, the nitric acid was decomposed by the hydrogen gas, new salts being formed, and the poisonous nitrous oxide mentioned above given off. In the Daniell battery the solution of sulphate of copper surrounded the copper plate, and the nascent hydrogen, as it was called, decomposed the sulphate, liberating pure copper, which was deposited upon the copper plate, sulphuric acid being formed, which was dissolved in the liquid. If a supply of sulphate of copper was kept in the neighborhood of the copper plate, and the current taken from the battery was not large, the pressure maintained by the battery was fairly constant; but there were a great many drawbacks to the battery. What electrical engineers call "polarization" took place. The action known by this name is also sometimes referred to as local action. The two solutions that in which the zinc plate was immersed, and that in which the copper plate was immersed, were separated by a porous diaphragm. In theory, the copper should have been deposited upon the copper plate and remained there; and the porous diaphragm should have remained porous. In practice it was found that a portion of the copper worked back through the porous diaphragm, some of it being deposited in its pores and some of it being deposited upon the zinc plate. Figs. 3 and 4 are two forms of Daniell's battery that had a great vogue in that time. In Fig. 3 the two solutions were divided by gravity. A copper plate laid on the bottom of the cell and was covered by a certain quantity of sulphate of copper. The zinc plate was in the form of an annular disc, supported from the top of the glass jar forming the containing vessel, by the lugs shown, which rested upon the jar. A glass tube passed down through the hole in the center of the zinc, the tube being kept full of crystals of sulphate of copper. Water was employed only in the solution. In the working of the battery, sulphate of zinc was formed in the upper portion of the cell, and a solution of sulphate of copper was provided in the lower portion. As the sulphate of copper was used up, the small crystals in the glass tube kept up the supply. This form of cell maintained a very constant pressure, though it could only be employed to furnish a very small current. It was very useful as a standard battery. In testing submarine telegraph cables, for instance, the standard pressure with which they were tested in those days, 100 volts, was maintained with fairly practical constancy.

The battery shown in Fig. 4, which was known as the trough Daniell, was employed for post office and railway telegraph work for a long time; and it was a number of years after the Le Clanché battery had quite established itself in work outside of post office and railway telegraphs, before the trough Daniell was displaced. In the trough Daniell battery, a wooden trough, made of teak, and lined thoroughly inside with marine glue, was divided into ten compartments by slate divisions. Each compartment was again divided by a porcelain diaphragm. Zinc and copper plates of the form shown in Fig. 5 were cast together. The copper plate was cut out of a fairly thin sheet copper, with a lug, and the zinc

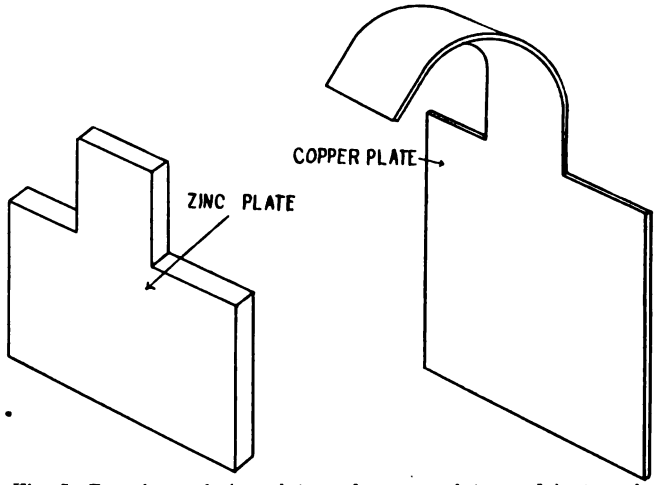


Fig. 5—Drawings of zinc plate and copper plate used in trough Daniell's Battery.

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plate was cast round the lug. The zinc was subjected to a process called amalgamation; it was thoroughly cleaned with dilute sulphuric acid, and rubbed over with a coating of mercury. The pair of plates were bent round, as shown in Fig. 6, and were dropped into the battery, the lug being supported by the division between adjacent cells, the zinc being in one cell, and the copper in the next. Crystals of sulphate of copper were placed in the copper cell, and water only was used for charging them. In the process of working, zinc sulphate was formed in the zinc cell and sulphuric acid was formed in the copper cell, so that the internal resistance of the cell which was very high at the start, gradually decreased. There was the same trouble with this form of battery; the porous divisions were gradually filled up with deposited copper, and copper also was deposited in a very finely divided state upon the zinc plate. The deposit of copper upon the zinc plate caused what electrical engineers of those days again

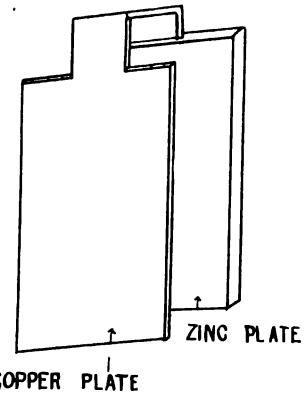


Fig. 6—Zinc and copper plates used for trough Daniell's battery ready for putting into the cells. The strip shown rests on the division between adjacent cells.

termed "polarization," and sometimes referred to as local action. What really happened was, the copper deposit and the zinc plate, together with the liquid held in the pores of the copper deposit, and upon the zinc plate generally, formed a local battery, which was always at work, and consequently the consumption of zinc was considerable; and also the local battery tended to reduce the useful current available. An army of battery men were employed by the railways and the post office to keep these batteries in order, but with a fair amount of attention they did their work very well. Battery men soon got to know how to keep their batteries going, by keeping the zincs clean, and keeping the copper plates whole. The copper plate tended to have holes eaten into it by another form of local action.

The writer has dwelt upon these points, as it will be seen later on, what an important bearing they have upon the action of the dry cell. All of the troubles mentioned above are to be found more or less in dry cells, and are to be guarded against by suitable arrangement.

(To be continued.)

Magnetos give a good spark when the engine is running fast, but for a hot spark when the engine is being turned over to start it the battery-delivered spark is usually the better. It gives even better sparks on slow than high speed, owing to better condenser action.

KEEPING TRACK OF THINGS.

Taking Stock, a Perpetual Inventory and Herding Pedestrians at Indianapolis, Ind.

BY JAMES F. HOBART, M. E.

Mr. Automobile Dealer, how much money have you got tied up in accessories, repair parts and other stock? Do you really know what you have stored away on those shelves? Do you know how many of each accessory you have in stock? Do you know how each thing sells, how they are moving, or whether they are moving at all or remain dead on your hands?

There's a tire pump in the window. How many of those pumps have you in stock? If you should have an order for two pumps right now, could you fill the order? Will you have to look around to see? It seems to me that such a way of selling and of keeping things for sale is not a very good way, especially when you might so arrange things that you could tell at any time, in thirty seconds, just how many tire pumps or anything else you have on hand, how many you are selling from month to month, when you bought the last lot, and you might also know when to order the next lot so as not to get out entirely and still not be overstocked.

Why don't you keep a "perpetual inventory" of your stock in trade, accessories, repair material, and everything you have to buy, use and sell? Then you will know at all times just how much you have on hand, when the supply went, when you ought to buy, and approximately how much will be sold during the year. The perpetual inventory will also enable you to weed out the non-sellers, and to push the things which are selling best.

I can't show up the whole system in this story, but I will try and tell enough about it so you can open a system in your garage and save yourself a whole lot of trouble by keeping perpetual tabs on what you are selling and carrying in stock. To begin with, it will require a little printing, a few loose leaf covers, and the establishment of some system of selling whereby a record is kept of what is sold.

It is pretty hard to even imagine a garage of today, without some system of accounting for the cash received and the stock delivered. Even the old-time day book, in which each and every transaction is entered is better than nothing, but a sales slip of some kind is still better, made out at the instant the sale is made. A pad of paper, carried in the pocket will answer, but almost any large stationer can supply cash slips similar to those used in some of the stores. And you can get them plain, or duplex with carbon slips, so that a duplicate may be given the customer if you wish.

There is another kind of cash slip which is very good for garage use. This is in a machine, permanently located at some convenient point and containing two rolls of paper with a carbon film passing between. A section of the paper, printed if you wish, is exposed through an opening in the machine and here the sale is recorded in pencil and the outer slip is fed out of the machine by turning a roll and this slip may be torn off and given to the customer. The carbon copy of the transaction remains in the machine from whence it may be removed at will for posting by the owner or by his bookkeeper. This system is pretty good. No slips are ever lost before they get to the office, but a loose pad is far better

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than nothing, and will enable the perpetual inventory system to be operated.

The illustration herewith, shows a loose leaf from one very good form of perpetual inventory. This sheet is 6 in. x 9 in., a very convenient size and is ruled and punched as shown. The punching is for holding the sheet in loose-leaf holders. The ruling may be changed to suit the particular business of the garage man and he will have some ideas of his own as regards the ruling and the several headings after he has operated the system for a time.

Procure several of the loose-leaf holders, and also some files in which the leaves may be placed after they have been filled. Go over everything in the garage which is for sale, and sort out things and list them, then make out a leaf for each article in the garage which you wish to sell.

Fig. 1, shows a leaf made out for the tire pumps. We will not bother with those on hand, but assume that you are just ordering a new supply and that 12 came in on the sixth of October, 1914, and it is so entered upon the "In" columns of the slip. Next day, the 7th, the slip shows that two were sold but no more were disposed of until November 4th, and 6th, when one and two were sold. One more was sold on December 6th and two on the 19th. This completed the sales for the year and when inventory took place—that bug-a-boo of all stores and factories which do not keep a perpetual inventory, there was nothing to do but to add the number of tire pumps sold, subtract that number from the 12 purchased on Oct. 6, and "On Hand 4" can be entered under 1915, and the inventory is finished as far as tire pumps are concerned.

With one of these loose leaves for each and every article sold, or on hand, inventory is the matter of a few minutes with the book and there is no hunting over the contents of shelves, bins and drawers. All you have to do is to add two columns, subtract, and post the quantity on hand in its proper place. The value of this system depends of course, upon the accuracy with which sales are reported and entered as they occur. Without this, any system is valueless, and the slips turned in from sales must be entered in their proper place in the "out" column.

There is a whole lot more information upon the sheet concerning tire pumps. The name at the head of the sheet "Power Tire Pump" tells its own story. The next line, "Part No. —, Group No. —, Drawing No.—" is noticed when stock is purchased. Should you manufacture something, then this line will come into use.

The next line is very important. The "maximum" tells how many pumps you feel able to carry in stock. This is of course subject to change as the sales increase or decrease. The "minimum" tells when to order a new supply. This is also changed as the sales vary from year to year. The larger the number of sales, the longer the time required to obtain a new supply, the greater "minimum" number of pumps should be carried. The next two words, "Section and Bin," locate the storage place of the pumps in your stock room. These words may of course be changed to suit conditions, to shelf, drawer, box, etc.

Next comes a very important word: "Page 22." This refers only and entirely to the place occupied by the sheet in the loose-leaf binder. It means that there are 21 other sheets before this one, and when you replace this sheet with a new one in the book, you will number that one also "22" and place it between Nos. 21 and 22. And no matter how many of these loose leaves you use and fill, they will all be numbered "Page 22," for they will always be found at the same place in the loose-leaf book.

The next entry, "From sheet 3 to sheet 4," takes care of the sheets you fill out and remove from the book. The last sheet filled was No. 3, therefore this one will be No. 4 and after it has been filled out, it will be stored away in File No. 6, and a new "Page 22" will be put in the book in place of this one. The next line, "Plated or Unplated" does not amount to much for garage work. It was used by the concern

ARTICLE POWER TIRE PUMP
PART Nº ____ GROUP Nº ____ DRAWING Nº ____
MAXIMUM 10 MAXIMUM 2 SECTION 3 BIN 4
PAGE 22 FROM SHEET 3 TO SHEET 4 FILE Nº 6
PLATED YES UNPLATED ____

IN			OUT			STOCK	ORDER	REMARKS
1914			1914					
10	6	12						
			10	7	2			
			11	4	1			
			11	6	2			
			12	6	1			
			12	19	2			
		12			8			
1915								INVENTORY
ON HAND		14						
			1	7	1			
1	6	10						
			2	5	3			
			3	7	1			
			4	19	3			
			5	3	1			
			5	7	2			
			5	9	1			
			5	26	2			
6	1	10						

A Sample Loose-Leaf for Stock Keeping.

whose blank chanced to be reproduced as in the illustration.

The longer this system is in use, the more valuable it becomes. After you have operated it for two or three years, you can look back and see just how any article has sold—the number per year, the time of year when it is "slow" or when there is a good demand therefor and you can also predict what the probable business should be in that particular article during the next year or six months. This estimate must of course be modified largely by whether or not the times are "good" or "bad."

The filling in of the inventory sheets should be done at least daily. The sales slips are the material from which to post this side of the account. If you are doing some manufacturing, then you may need the column of "Stock" on the "out" side of the sheet. You may need this anyway, for if you equip an automobile which you have for sale, with one tire pump, then that pump should be marked up as put out to "stock." If you have a large enough shop to

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warrant a store room and orders for material therefrom, then the column of "orders" and "remarks" will come into use. But if you have only a small place at present, the column of "orders" will get all the "outs" as it does in the illustration where a simple check mark is all that is needed to tell the story unless there be a numbered order in which case the order number goes into this column. And likewise, if you place a pump in "stock," then by all means place in that column something which will tell what car the pump was placed with. In this manner, you keep data which will be of great value in the future in case of disputed litigation, etc. It takes a very short time to post up the sales upon the sheets. You have no writing to do, only three figures to make, to record each sale and to tell the whole story.

One acquaintance of mine, who has only a small place, finds time to post the inventory slips as he looks over the sales slips for the day. He has a similar loose-leaf system for his sales, and when he posts that, he slips the figures into the inventory blanks also, and so never minds the slight labor called for by this system.

Another acquaintance with a little larger place who keeps a stenographer has her do all the posting. The slips go to her desk and she utilizes the odd moments for posting the inventory, the cash, and all the other necessary bookkeeping. In a still larger place, where there is need for a storekeeper, that official posts the inventory and he has so large a one that it fills 26 or 28 loose-leaf books and makes a shelf of books about 40 inches long. He keeps them in a sectional case on top of his desk and can reach any book easily. He posts the inventory sheets during his odd moments and says he never finds the system tiresome or requiring more time than he has to spare for it.

The "In" side of the sheet is of course filled from the bills and invoices all of which go through the hands of whoever holds the perpetual inventory books and from these bills and receipts, after they have been duly O. K.'d, the "In" side of the sheet is made up. The storekeeper, however, may make up the "In" column from the articles themselves as actually received at the storeroom. Each garage will quickly settle that question according to its own limiting conditions and surroundings. But let it be poorly kept, and the system is almost worthless and not worth the little time which is spent upon it. Faithfully kept, however, the system is worth many times the cost of its upkeep.

Herding Pedestrians.

The police of Indianapolis, Ind., have safely engineered through an ordinance whereby two "cops" instead of one will be stationed at each street intersection, and hereafter they will be autocrats of pedestrians as well as bosses of teams and automobiles. This means that pedestrians must obey the rules of traffic—as they should do—as well as horse drawn and self-propelled vehicles.

This is a much needed reform in Indianapolis—and in many other cities as well—for the manner in which pedestrians rush the street intersections at all times, is without right or reason. Henceforth, the "common people" must come under the yoke and obey common sense traffic rules as well as must automobiles and other vehicles. But it will require an awful lot of talking, cajoling, threatening and diplomatic action to educate them to the point where they will obey traffic rules without trying at each and every opportunity to break or evade those rules.

Women seem to be particularly aggressive in this respect. Probably the same intuitive instinct which leads them, one and all, to get off a street car backwards, is what makes them dodge across the street anywhere and everywhere, in defiance alike, of traffic rules and vehicle-crowded streets.

Why the Magneto or the Battery?

A paragraph in a recent issue of this journal stated that a better spark could be obtained from a magneto than from a spark coil when running at high speed, and that a better spark could be obtained from a coil when starting than from a magneto. This is a fact and automobile drivers will probably be interested in determining why such is the case?

Time is a necessary element in the operation of both magneto and spark coils and it requires a certain length of time for magnetic effects as well as electrical impulses to be transmitted from one point to another. True, the time required is very short indeed, but it is measurable.

In a spark coil, the ignition current is induced by lines of force which radiate, so to speak, from the primary wire or circuit. When contact is made and the primary circuit completed, the lines of force leap out and pass through the secondary winding, inducing a slight but comparatively feeble current in the secondary coils—feeble for the reason that the building up of the outgoing lines of magnetic force are rather gradual and cumulative. But still there is current enough induced in the secondary winding of the coil to give a small spark across the plug terminals, and should the timer permit, this wild current might cause ignition at a most undesirable time. Therefore see to it that the timer be so arranged that these "make" currents cannot get into any of the engine cylinders.

When the primary circuit is broken, the projected lines of force vanish—retreat if we may be allowed that expression—seemingly returning to or into the primary wire of the coil. They seem to return but they don't. They simply vanish. But, vanish as they may, their passage through the secondary winding of the coil causes a very strong impulse or current, which equalizes itself by leaping across the spark plug terminals. The quicker the break in the primary circuit, the greater will be the current in the secondary wiring and the fatter will be the spark.

It requires a certain length of time to push the magnetic lines out from around the primary wiring, to extend them through the secondary wiring and to return them again to the primary. Time must be given for the magnetic lines and the induced current to form, extend and retire. If the primary circuit is broken before the lines have fully extended themselves, they return and set up the second induced current in the secondary wiring before the first current has reached its full strength, therefore, like the baseball player who hit the ball and was thrown out before he reached first base and returned to the bench, we may express the movement of the current same as did the small boy who summed up the batter's movements as: "There goes Bill coming back!" Therefore, if we demand from the spark coil, impulses so rapidly that the coil does not

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have time to fully charge and discharge itself between required sparks, then the strength of each spark will be necessarily reduced and the coil spark does not ignite well at extremely high speeds.

On the other hand, the magneto current is formed by the passage of the armature winding, through the lines of force which flow across the gaps between the field magnets and the armature core. There is no induction here from one current to lines of force and from lines of force to another current. The induction is, if you wish to call it that, directly from the lines of force to the current which leaps across the spark plugs.

The quicker the primary circuit breaks in the coil, the better the spark at the plugs. The quicker the passage of the armature winding through the magnetic field, the better the spark at the plugs, therefore the faster the magneto runs—within certain limits—the better the spark, and as there is very little danger of exceeding the "certain limit" within the speeds required for automobile ignition, the magneto must necessarily do better when the car is running fast while the coil does its best work while the car is running slow or is at rest. Hence the peculiar fitness of the spark coil for starting and the magneto for fast running.

There is a type of magneto on the market wherein the armature coil is "jerked" through the magnetic field between the permanent magnet poles by means of a sort of snap switch arrangement. This being the case, no matter how fast or how slow the car might be running, the passage of the exciting coils through lines of force is always the same and should the engine be moved far enough to work the "snap switch magneto," then an igniting impulse should be given as good and as strong as when the magneto was working at top speed. With satisfactory durable details, with which I am unacquainted at this writing, a magneto built upon this principle should go far toward solving the magneto problem of starting the car from a standstill equally well as a battery can do it.

ANOTHER GREAT HIGHWAY.

A National Road Connecting the Picturesque North and South.

From Felix J. Koch, Ohio.—Cincinnati—the logical gateway between North and South—it makes its way northward toward Hamilton and Dayton, then beyond, until it comes at last to its own end, somewhere on the Canadian border. Southward it extends through the very heart of Dixie, over the old Lexington turnpike, to Lexington, in the Blue Grass country, and then on and on and on to the bottommost south of the republic! It is to be to the North, and again to the South, what the Lincoln Highway means to the East and the West. Already the shippers are contemplating schedules for making best use of it, while the motorists are already arranging to go south the first opportunity, over this new National road.

And what a long, picturesque, delightful jaunt there is in store for him who has the time to tour from end to end of the Dixie Highway. What quaint, delightful sections, many of them well-nigh unknown to the great traveling, touring world, will come in review. What wealth of tobacco, what thoroughbred herbs, what bales of blue grass seed, what flocks of sheep, what hemp, and what other grains will be transported cheaper and faster, than ever before to rail or perhaps sail, as results of the new big road!

You who would "do" the Dixie Highway at its best plan your trip for the early fall—the summer end—when the tobacco cutting season is on. You'll



To the Manner Born.

do well to park your car at some garage near the splendid schoolhouse in Avondale, the aristocratic suburb of the Queen City, the night previous, setting the alarm clock for four, that you may be off with the lark and so come into the interior Kentucky towns at school time and meet with the picturesque pickaninnies. A duster, or raincoat, a cap, the lunch in the box, and you are prepared for as quaint a jaunt as any in all the land. Somewhere in the suburbs you will stop for a cup of hot coffee to warm you, for it is apt to be a trifle chill, before you are



The Wayside Judges.

actually under way. Through aristocratic Avondale, cosmopolitan Walnut Hills of the Queen City, then down into the heart of the city iteslf, the business heart of the town.

On the Esplanade, dozens of automobiles are already "parking." The owners come in over this south and north end of the Dixie Highway to do their day's business in town. Continue on toward the Ohio, and great herds of pigs are encountered, fresh off some river boat and on their way to the distant stockyards. Cincinnati is a "porkopolis"

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still, and these big droves of pigs are seen by every stranger.

By and by you cross the suspension bridge, spanning the Ohio, and enter Kentucky and are in the real south. The toll for an automobile is but 15 cents on this bridge now, and just the view of the river, with the Queen City at the foot of her hills



Mostly Tobacco.

behind, and the five Kentucky cities ahead, is well worth what may be paid.

You enter Kentucky at Covington, the quaint old suburban town, and the comely old Kentucky court house detains you. The squirrels running around on the court house square as they did in old pioneer days.

Almost as old as the history of Kentucky is that Lexington turnpike. Nobody seems to know just when it was built. Jack Roosa seems to associate it with Henry Clay and the early pioneer times in Kentucky. To-day it is a mighty good road indeed.

Every so often signs give word of curves ahead



Stacking the Weed.

where automobiles slow down, thus insuring safety to all passers. Giant curves, in fact, are a feature, as you travel on. The road is oiled and good, the ascents are mild, so mild that sick folk who are taken down the road to Dry Ridge, a health resort, do not mind the journey at all. Now and then some old iron mile post punctuates the way while the shrill chirp of the crickets fall on the ear as you stop to snapshot.

Great asparagus farms put in appearance next. Truck, such as that will be shipped to advantage on the highway. Cattle graze in the orchards, spelling dairy products, and there is fruit traffic as well. Away off at the right a picturesque seminary, up on Price Hill, reminds one of Allen's tales of the Kentucky cloisters, as you catch sight of it through a gap. For dinner you choose Kentucky spring chicken, fresh Kentucky vegetables, preceded by a nip of Kentucky Bourbon, or a justly famous mint-julep.

By-and-by you begin getting a taste of interior Kentucky. The country slopes down from behind the hills, and broad fields of the tasseling corn, edged with the wild carrot and the ironweed, flank the way. Folk tell of side roads to Big Bone, where mastodon finds have been made. Then attention is turned to signs advising of frog fishing, and the broad estates of well-to-do Kentuckians, with summer homes of city folk, and the like. The children are gambolling beneath the trees, while some old darky mammy



Working on the Dixie Highway.

keeps watchful eyes, as she did on their sires before them.

The good, oiled road continues still. Garages offer gasoline at 12 to 13 cents a gallon, Signs come at intervals of each mile, giving the distance, and at one point a toll-gate bars the path with a fee of a nickel.

Soon the heavy foliage of the trees and the fields where the hay and the wheat are being harvested, attract the eye. A wee colt, following the mare, takes fright at the coming of the machine, and as you slow down you note how fine are these Kentucky horses.

Far as the eye can see, the tobacco fields extend, the plants standing very high and the leaves giving Roosa a chance to recall how last year 10 to 12 cents a pound was paid for them. You continue squarely ahead, and consulting your map, discover yourself traveling almost due south till you reach Dry Ridge, the "Spa" of this part of Kentucky.

Farmers, whom you meet, talk tobacco always. The plant grows like a weed down here. Good land for it will bring $85 an acre. Yonder is a single patch 220 acres, all in tobacco. Four old Kentucky farm houses rise from the fields. Little black children are going to school, taking their boxes of lunch

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along, and you halt to snap their pictures. You note how the men here smoke all the time, this black native tobacco. You note how the osage enhedges the pike, with the wild anise beside. You remark then the great fields of timothy hay—a splendid crop—though it takes so much nourishment from the soil that clover in the end pays better in that it enriches the ground left behind.

Then, on and on you go, still into the heart of



Sunflowers and a Southern Peach.

Kentucky. Tobacco and blue grass choice stock, splendid thoroughbreds, fine old Kentucky estates, picturesque negroes, and this is but the beginning. From Lexington on into the deeper South goes the highway, opening up new sections, bringing new opportunity to old, vivifying and revivifying and promoting trade relations between neighbors, until it shall reach its goal in the bottom-most South; a long strip of progress, enterprise, life—a line of trade and of good communication to make stronger the ties between Northland and South.

CYLINDER MULTIPLICITY.

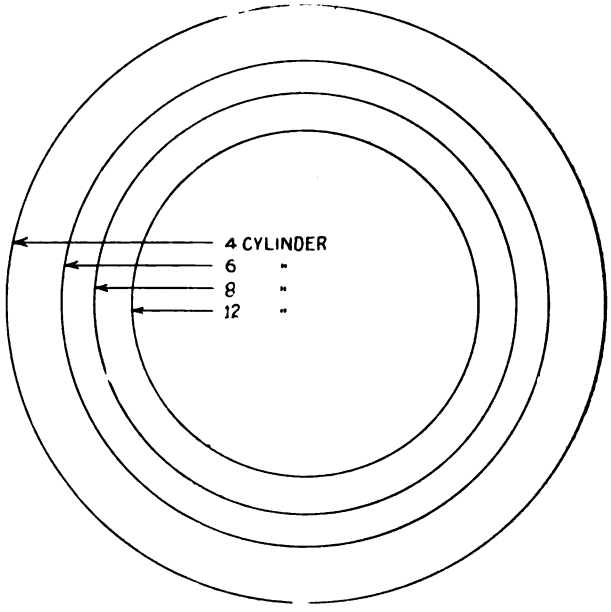
Is It to Increase to Twelve, or Will It Finally Go Back to Four?

The idea of a 12 cylinder motor is not to obtain greater power than in the four-cylinder model or the six-cylinder engine, but only to provide equal power, or even rather less power, though delivered with a much more even torque, with better balance, and better all-round running conditions.

So soon as one begins to enter the twelve-cylinder proposition, a line of doubt is encountered on a primary fact. How are we going to arrange our twelve cylinders? In one long line? Obviously not. In two groups of six á la the eight-cylinder engine? Possibly, it is rather an alluring proposition. How about three groups of four? Yes, that is feasible, as it makes such a short engine. Four groups of three cylinders any good? Well, that would entail lubrication difficulties, to mention merely one of several patent objections. Apparently, therefore, if we are going to have a twelve-cylinder engine, it is to be arranged either in two blocks of six cylinders á la the "eight"—but with the cylinders at 30 degrees from the vertical instead of 45 degrees, or else with four vertical cylinders, and four cylinders each side of the vertical group, at 30 degrees from the vertical.

Some Objections.

It would be quite a long technical treatise if we were to go into all the pros and cons of the two systems, but a few superficial objections may be cited against the three groups of four cylinders, sufficient to indicate a predilection in favor of the two sets of six. In the first place, then, with an engine in which three blocks of four cylinders were employed, carburetion would present a difficulty. Unless a strong case in favor of the adoption of three separate carburetors could be made out, one would hesitate to sanction their adoption as a move in the right direction. Two carburetors might be used, but the idea is not very sound. There remains the alternative method of one carburetor with a common mixing chamber. Under the ordinary system of suctional supply of gasoline, this is not very acceptable. Consequently, there is at once encountered a difficulty in an important matter like carburetion. From a constructional point of view there are also objections, and the designer who commences to lay



Size of Cylinders, 4, 6, 8 and 12 of the Same Rated Power.

out an engine on this principle soon finds that there are a number of designing difficulties to be overcome.

We will assume, then, that, if we are going to have a twelve-cylinder engine, it shall be built up in two sets of six cylinders. It now behooves us to see what advantages are obtained, and whether the twelve-cylinder proposition is likely to prove—in practice—sufficiently superior to the eight-cylinder engine, to become a practical proposition. If we take for an example a twelve-cylinder engine of, say, 30 h.p., and let it replace a six-cylinder motor of the same rated power, we see at once that we can save length. Of course, we are not going to save 50

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per cent. in the length or anything approaching it, and we must not allow ourselves to fall into the childish—though still common—mistake of thinking that a cylinder of, say, 2 ins. diameter, is half as powerful as one of 4 ins. diameter. In order that the different cylinder diameters may be more easily comprehended, we reproduce a diagram which shows in comparison the diameter of a cylinder in a four-cylinder, six-cylinder, eight-cylinder, and twelve-cylinder engine of the same rated power. It is seen, however, if we judge for the moment length of engines by the ratio represented by cylinder diameter, that we get a considerable saving in the eight-cylinder design over a similar powered six, and a serviceable saving in a twelve-cylinder motor over a six-cylinder engine of the same power. This is shown adequately in another diagram which illustrates the saving in length obtained by the alternate choices under consideration when one goes beyond the standard four.

Now, although the twelve-cylinder design is certainly not so good from the length-saving point of view, it is equally certain that it constitutes an important improvement over the six-cylinder motor. In the vast majority of cars, as commonly purchased, excessive length in the bonnet is not desired either by manufacturer or purchaser. There are very few cars with long bonnets in which the harmony of outline does not suffer. Then, again, naturally one wants nearly all the total available "chassis room" for personal requirements as different from the mere housing of the motor. In this respect, then, we find that a good case is made out for the twelve-cylinder engine built in two pairs of sixes, although the writer—an eight-cylinder enthusiast—would draw attention once again to the fact that the "eight" is still better.

The Question of Torque.

With regard to the question of torque, one is bound to admit, of course, that the "twelve" would be better than the "eight." There are 50 per cent. more firing points, and that would naturally tend to improve the running considerably, although in regard to the actual torque diagram it is not easy to notice much difference in smoothness (on an ordinary scale) between the eight and the twelve. The length of the crankshaft in a twelve—even although it is so much shorter than what we are already accustomed to on a six—is a factor against it as compared with the eight. There is something very subtle about the long crankshaft which is necessary for a six-cylinder engine. In general terms one is bound to admit that the theoretical advantages of the six when compared with a four-cylinder engine do not materialize in practice by a long way. In fact, a capable critic is often hard pressed before he can admit any advantage in a six over an equally-made and similarly powered four.

As the twelve-in-two-sixes motor is new for motor purposes it is quite impossible to say how theory and practice will compare with regard to the advantages which a twelve possesses over an eight, on paper. The writer would not expect anything very pronounced in actual use. It might be that on the practice-theory ratio the twelve would show to better advantage than the six has done, but that would probably be all.

The twelve-cylinder is a more expensive manufacturing proposition, entails 33 per cent. more parts, such as pistons, connecting rods, valves, spark plugs and such like, and it is doubtful if it will give anything like a proportionate practical return. On ratio, it would certainly be more expensive to make than an eight. It would have a small advantage to some people's minds in being narrower than an eight, but the writer allows his eight enthusiasm to transmute this advantage into a disadvantage on the score of accessibility. If the eight is not too encumbered in the center, the valves are really quite get-at-able; if the cylinders are too close together (they are 30 degrees nearer in a twelve than in an eight) they would certainly become less accessible.

From the manufacturer's point of view, of course, public demand is the best incentive. Now, however, the Cadillac, Packard, Lozier and King have shown the way, and popular patronage has shown public approval, there are plenty who will follow, and this is rendered easy by the existence of so many specialist houses from whom engines of the new type can be purchased without the expense, trouble, and time necessary to get out new models of their own; in this case of the eight-cylinder engine, the matter is rendered the easier by reason of the fact that so large a number of firms are building six-cylinder cars, and the interchange of an eight-cylinder motor for a six entails no other alteration of the chassis; whilst in many cases where engines of equal power are in question, the smaller bore of the eight renders it possible for it to replace even the four without any chassis elongation being required. This peculiarity, too, presents rather an attractive feature from the point of view of the private owner, who, by changing his engine only, can, if he be enamoured of the new idea, indulge his fancy at a moderate cost without having necessarily to buy a new car.

The expense of making the alteration, either to the manufacturer who buys his engines or to the private owner who desires to make the change, is by no means excessive, if no chassis alteration is required to accommodate the new outfit.

BUYING A SECOND-HAND CAR.

You Can Get a Good Bargain If You Are Careful and Watch Your Chance.

On occasion one may pick up a particularly good bargain in a second-hand car. As with most other things, however, it is necessary to wait the opportunity. Speaking in general terms, the exceptional bargains are not to be obtained by walking into a dealer's to make a purchase. At the same time, at many of the leading second-hand dealers one can generally obtain good value for money in the second-hand car line but to obtain a good bargain with any degree of certainty, one must "know the ropes." As a matter of fact, few of the so-called experts know much more, or do much more when examining a second-hand car, than a reasonably capable amateur motorist. There are, of course, exceptions; men who possess years of greatly varied road experience, who know off by heart the precise points of weakness in almost every car—and every model of every car—on the market. These people, however, are very few, and can be counted on the fingers of half a hand, so to speak. How, then, is the motorist who wants to purchase a second-hand car to proceed?

One may buy a second-hand car from almost any-

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thing up to $3,000, or even more. If one is spending from, say from $300 to $700 on a fairly modern second-hand car of known make, one might be tempted, after a trial run of reasonable proportions, "to take pot luck," although if the latter sum is to be expended, then undoubtedly obtain the services of one of the few real experts—not one of the alleged experts.

In some cases, of course, the man who is only spending a comparatively small sum, may be well

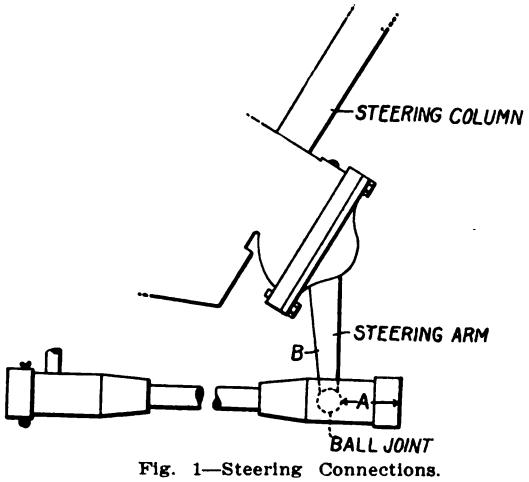


Fig. 1—Steering Connections.

advised to spend an extra $10 or so, if he gets hold of the real expert. Assuming, however, that no expert is to be engaged, how is the motorist to look the automobile horse in the mouth?

It is a broad and difficult subject. I must therefore condense the subject, and, by picking out a few of the inside "tricks of the trade" in addition to the common-place generalities of an automobile examination, hope to illustrate the way the intending purchaser should proceed. We will start with some generalities first.

Never worry much about the body. If there is a body there at all, and it is sound, the condition of the paint is largely a detail. Do not be put off by the appearance of the paint. Many a good bargain has been missed through first appearance impressions. The purchaser comes in and sees, perhaps, a very dirty-looking car, and, with a passing glance, says: "Oh! I couldn't have that." Nine times out of ten the salesman says: "Oh! no. Here's a much better one," quite irrespective of the fact as to whether it is or no. However, the car thus summarily dismissed might be an exceptional bargain as regards the chassis—and $25 (spent at the right place) would make a marvelous difference to the body work. Make straight for the chassis, then. First of all, make a general semi-cursory examination of the whole chassis, so as to formulate a rough idea of its condition.

If it appears that it might suit, then the examination must be carried a little further. Have a careful look at all the wheels. Jack them up one at a time and see if they "hang." Naturally they will—in the real meaning of the word. The technical meaning, however, is the difference between sound and worn bearings. If you can lift the wheel at all, if there is any vertical movement to be obtained without a corresponding lift for the stub axle, then the bearings are badly worn. If there is only a "shake," they are not as they should be.

Now try for lateral movement, and note carefully whether it is pure lateral movement or part vertical; that is to say, a tipping action in conjunction with the lateral movement. The latter is the worse, and means greater repairing expense.

Wheel Alignment.

It is also necessary to note whether or no the front wheels are in proper alignment. If they are not, of course they will have to be; and then comes the question as to whether or no the tie-rod coupling is adjustable. If it is not, and the eyebolts are worn badly, then they will have to be rebushed. An item in connection with the wheels which is frequently overlooked is the condition of the nave plates and spokes. If the wheels are of wood or steel, note whether the nave plates are still securely fastened and whether any of the felloes are loose. A loosely-built wheel is likely to break under a severe skidding strain. See that none of the spokes are cracked, and, finally, see if the wheel spins truly, apart from any bearing wear.

If wire wheels are fitted, study the condition of the nipples, and see that none of the spokes are broken. With regard to the rear wheels, it is, of course, most important to watch for play on the driving square or spline. With experience, one can learn a lot from the study of the road wheels, as they constitute to the trained examiner a sort of stethoscope, which leads to a fairly sound general diagnosis of the all-round condition of the car.

If the road wheels are in a bad condition, one may usually argue that the rest of the chassis will not be particularly good. One must not, however, al-

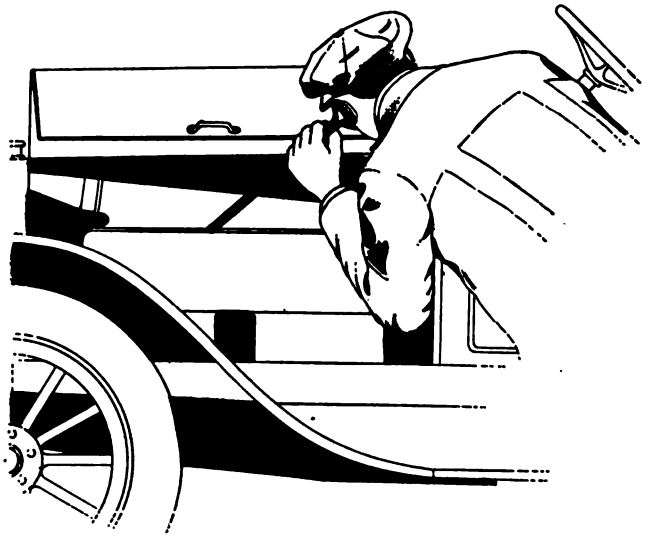


Fig. 2—Using a Stethoscope.

ways argue conversely, especially with wire wheels as they appear to stand an enormous amount of general ill-treatment without themselves exhibiting anything to indicate it.

The Steering Gear.

The steering gear may be taken next. See first of all if the steering gear box is loose in its attachment to the framework. It is advisable to take this point first, as it naturally affects other points. In modern cars it is not likely that much will be amiss with the anchorage of the box, but one finds it loose far more frequently than would be anticipated. Then there is the question of the amount of wear on the worm and wheel or segment, as the case may

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be. It is very difficult to estimate the amount of wear in an encased worm, but for the steering one can usually form a pretty shrewd idea. Some steering boxes are provided with adjustments, and in certain cases the worm wheel can be turned round a little so as to bring the major portion of the work on to new faces.

Then there are the steering connections, rods and eye-bolts. A careful examination must be made of the ball joints, A, Fig. 1, especially on the steering arm, B, and also of the retaining socket nut. As so much depends on the steering gear, one cannot well be too careful in the examination.

The Engine Running Test.

In continuing our general examination, it is now necessary to come to the study of some of the other units. A preliminary opinion of the engine may be formed from running it and applying a stethoscope, Fig. 2. A well-trained motorist, if gifted with the mechanical instinct, can learn quite an appreciable amount as to the condition of the engine merely by listening to its running. If the engine seems in fair condition, leave it at that for the moment and tackle the gear-box.

The Gear-Box Examination.

One needs considerable experience in order to pass a reliable opinion on the gear-box. Of course some defects are palpable. For instance, the teeth of the second or third gear-wheel on the secondary shaft may be badly damaged. They are shown at A, Fig. 3. If so, it is by no means easy accurately to estimate their probable life, if it is not desired to replace them at once. Then, if other things are considered all right, and it is deemed advisable to replace the damaged gear-wheel, it is necessary to note the construction of the shaft. The more recently produced cars have usually got the gear-wheels separately mounted on the shaft, so that a new one can easily be put into position. However, it is common foreign practice to have the layshaft a solid unit. If so, replacing one gear-wheel means replacing the lot, which, of course, is an expensive item. This question of a worn gear-wheel constitutes a good example of the prior knowledge which a real expert should have, so as quickly to locate the places where money has to be expended. The defective

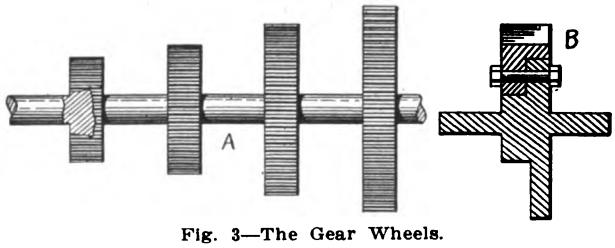


Fig. 3—The Gear Wheels.

gear-wheel is quite a common failing, and on one well-known make suffers badly from this defect. Yet it remains a secret from the ordinary buying public, chiefly because the construction is such that the repair is quite a cheap one.

A more difficult defect to trace is the bent gear-shaft which may lead to all sorts of troubles and noises. Then, again, it has to be noted that the gear-wheels are not too loose a fit on their splines or the square, as the case may be. There is also the question of the bearings, which is a fairly easy matter to settle, though the cost of renewal varies considerably with different methods of building the gear-box. Often the most palpable defects of all are overlooked in regard to the gear-box. I refer to the carrier arms, which must be cleaned and examined for cracks. The mere presence of a crack does not necessarily mean anything serious. It all depends on the nature and "lie" of the crack, though the art of differentiating between a dangerous and a safe crack rather baffles verbal description. I also always make a point of cleaning the base of the box and having a look round. One never knows. I once found a fairly large and neatly wood-bunged hole just near the bottom of a crankcase. The owner

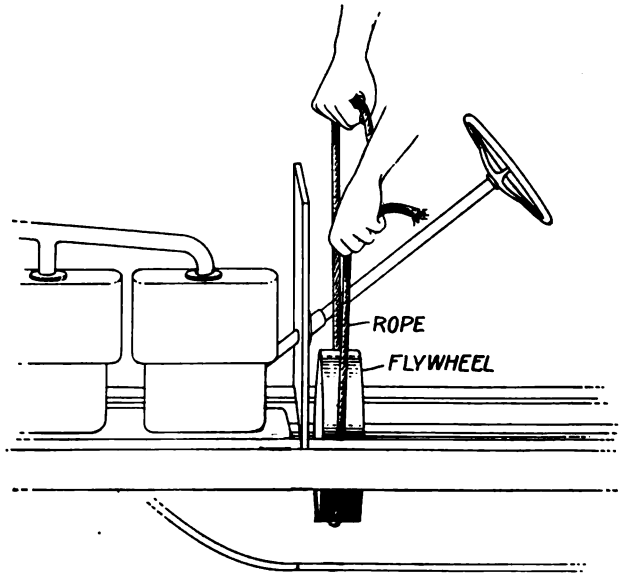


Fig. 4—Testing Crankshaft Bearings.

professed ignorance of this extraordinary repair, and, from all accounts, he was a man whose word could be relied upon implicitly. Goodness only knows how long that weird repair had been doing duty. So much for the gearbox: we will now, turn to the engine.

Examination of the Engine.

Either the engine is in good condition or it is not. It is a very difficult matter to arrange for it to be in temporarily good condition, as an unscrupulous person can do with other portions of the chassis. Of course, the most obvious defects are play in the crankshaft bearings or big-end bearings and knock. The former is, of course, easily traced, but it is not so simple a matter to differentiate between a knock that matters and one that does not; in other words, between a gudgeon pin knock and a carbon one. If the latter is only slight, it can be removed at very little cost, but a gudgeon pin knock means a considerable repair bill. Crankshaft bearings can usually be adjusted fairly easily, so that a little play does not amount to a very serious item in this respect. Standing astride the chassis, one can put a piece of rope round the flywheel, and, if fairly strong, can feel any play in the end bearing by trying to lift the flywheel up, as shown at Fig. 4. It is usually safe to assume that the other crankshaft bearings will not be in a worse condition than the rear bearing.

With regard to the big-ends, one can usually detect any play in these by listening with a stethoscope (often even without) for a little "ping" on the reverse kick as the engine is stopping after being

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switched off. The engine should be fairly warm at the time the test is made.

The Water Jacket.

There are, however, some more subtle defects which should be looked for in an engine. Take, for instance, the question of a cracked water jacket. If this is external it can usually be detected by showing a thin rusty line. Even if this has been cleaned off, an outside crack should be revealed by careful scrutiny. If the metal should be porous anywhere, such defect is usually made noticeable by a little moist patch as the engine is warming up. When starting the engine from cold, notice if there is any undue amount of water or moisture from the exhaust pipe. If there is it is often indicative of an internal crack or porosity, probably adjacent to the valve pocket.

The Valves.

Another thing to which attention should be given in regard to the engine is the condition of the valve guides. Sometimes—especially on certain cars—these wear very badly, and in some cases the work of replacement is by no means so simple as it should be. On most modern cars, however, this is not a very serious item, and in most cases the guides wear much better than they used to.

The Flywheel.

It is now advisable to examine the flywheel. Here, again, the more recent design of flange coupling is not likely to have worked loose, but it is always advisable to have a look. The cone joint, which many people are inclined to jeer at, is—when properly designed—usually found to be in perfectly good condition.

The Clutch.

Disc clutches are not so easy to appraise, but actual road test usually gives one a pretty good in-

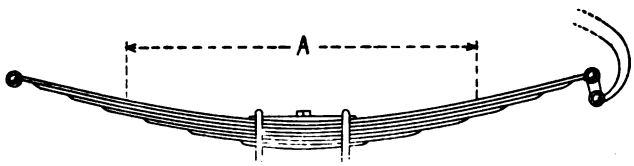


Fig. 5—Half Elliptic Spring. See that the leaves from the dotted lines, A, are broad and thin, not narrow and thick.

sight into the state of health of the clutch. Then come the universal joints, and if these are not found to be fairly well worn, it is the exception rather than the rule. Here, again, construction is an important factor. In some cars if the wear is very bad they can easily be replaced. In others, perhaps the whole back axle has to come down as well. With regard to the back axle, this is a difficult patient for the automobile doctors to diganose. One cannot really say anything very definite in many cases without dismantling the whole affair. Take, for instance, the case of the worm. An opinion may be formulated from road test and observation, but one cannot really tell. In one case on taking down a back axle the differential cage was found in halves! Yet the car had been running perfectly, and no one knew there was anything the matter. If it is possible to examine the differential through an opening in the casing, of course do so.

Examination of Details.

I must draw attention to one or two other points often overlooked. As an example, take the question of a differential brake. If it is badly worn, it only seems a small item to reline it. Yet there are cars on the market on which, before the brake can be relined, half the chassis has to come down. It is just a question of accessibility. The possibility of the chassis itself being cracked must always be borne in mind, and a diligent search should be made. It is rather more likely to be in the center—if anywhere—but by no means sure to be there. Another important point is the condition of the shackle pins. Recent design usually provides a hot-riveted dumb-iron, but many cars have not a separate dumb-iron. If the hole is badly worn, it must be drilled out and rebushed. Rebushing takes metal: see that there is enough left for the work to be done.

Then you must take a sharp look at the springs. See that they are intact, or if they have been mended, note how it was done. As for other and minor accessories, including the ignition system, examine them carefully, and find out whether or not they are of late and standard style. It is true, the replacement of some of them will not be of prohibitive cost but in any event you should know exactly what you are purchasing.

MOTOR STARTERS.

Some of the More Simple and Easier Systems for the Novice to Understand.

BY C. P. SHATTUCK, M. E.

No. 2.

The methods of imparting the energy of the electric motor starter to the engine vary as does the means utilized for obtaining the required reduction between the driving and driven unit. As it is not practical for the armature shaft of the motor to rotate at the same rate of speed as that of the crankshaft of the engine, in that it would necessitate a powerful and bulky unit, a reduction between the driving and driven members is employed. The ratio of reduction, as previously explained, is about 3 to 1, although it varies according to the unit and method of installation.

The operation of an electric motor starter is generally understood as a device that electrically rotates the crankshaft of the engine when a pedal is de-

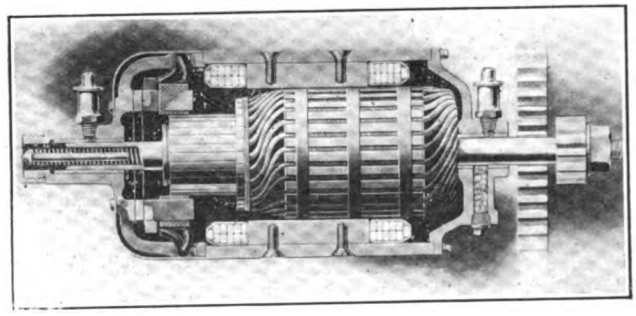


Fig. 14—Bosch-Rushmore starting motor showing sliding armature which moves to the left engaging pinion.

pressed, a button pressed or a switch is closed. This may apply in some installations but not in all for there is more or less mechanical movement in the operation of the starter, and the control and operation of the engaging or shifting mechanism is one of the several interesting features of electric motor starters.

The most simple and easiest form for the novice to grasp is the mechanical pinion shift which is largely employed. With it the energy of the bat-

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tery is transmitted to the motor, causing the armature to revolve. This energy is transmitted through a pinion on the armature shaft to the flywheel, causing the last named member to rotate. The pinion of the starting motor is shifted into mesh with the flywheel gear on starting, and when the engine operates under its own power the pinion is shifted out of engagement. It is accomplished mechanically by a pedal or lever, automatically by a worm shaft mechanism, or electro-magnetically by a combination of electrically operated switch and pinion shift. These methods are employed with the single unit types. No pinion shifting is used with the two-unit types, the motor-generator.

The mechanical or non-automatic pinion shift will be easily understood by referring to the diagrams shown at Fig. 19 which illustrates the operation of the Westinghouse starter. A starting pedal is employed but the system can be operated or controlled by a hand lever. The drawing at A shows the neutral or "off" position of the switch contactor and the shift pinion. This condition exists previous to starting the engine and when it is operating under its own power. When pressure is applied to the starting pedal the latter moves the shift rod first to the position shown at B, closing the motor circuit at P and Pl through the resistance R. The current flows from the battery to the motor causing the armature to turn slowly.

A further movement or depression of the starting pedal moves the shift rod to the position shown at C, opening the circuit, but the pinion continues to rotate slowly due to its inertia or momentum. This permits the pinion to mesh with the flywheel, and upon an engagement being effected the starting pedal is fully depressed causing the shift rod to assume the position shown at D. At the same time

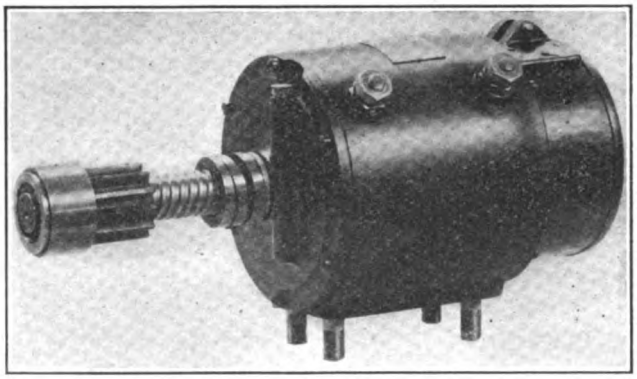


Fig. 15—Remy inertia pinion automatically engaging and disengaging with flywheel.

the electric circuit at Q is closed. This does not take place until the pinion and gear are fully meshed. The engine is cranked until the starting pedal is released or the engine operates under its own power. The Westinghouse system includes an over-running clutch incorporated between the pinion and the motor. Its function is to prevent the engine driving the motor if the starting pedal be not released properly. When the pressure is removed from the pedal, the shifting rod springs return the components to the position shown at A, which shows all gears disengaged and the circuit open. The travel of the switch rod is 3/16 inch for auxiliary contact, ½ for auxiliary contacts open, 9/16 for gears starting to mesh, 1¼ for main contacts and 1⅜ main contacts compressed. In some installations the switch is not mounted directly on the shift rod but is on a separate rod which acts on the gear shift rod by some form of lever.

Motor-Generator Types.

The Delco motor-generator, which is constructed to meet the requirements of different engines, is shown at Fig. 22, and employs a motor clutch operating between the pinion of the armature and fly-

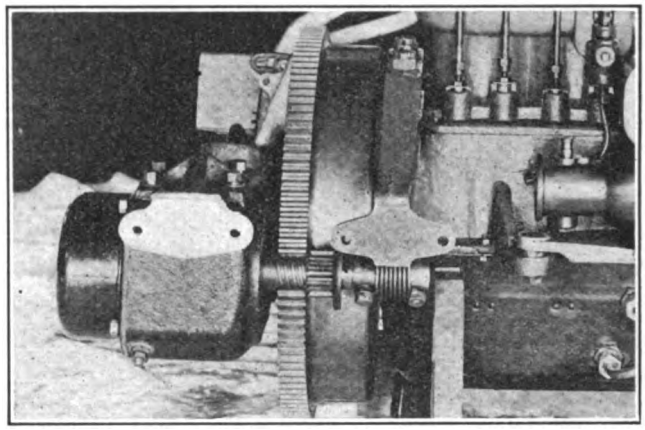


Fig. 16—Bendix drive employed with starting motor on Chevrolet car.

wheel for obtaining a suitable reduction between these members. It also serves to prevent the armature being driven at high speeds during the brief time the gears are in engagement after the engine is operating under its own energy. There is also a generator clutch which permits of rotating the armature shaft at a higher rate of speed than that of the pump shaft during the cranking operation, and at the same time the construction permits the armature shaft to be driven by the pump shaft when the engine is operating.

Both the motor and generator brush switches are operated by the pull rod E which also operates the starting gear. When the magneto or battery button on, the combination switch is pulled out, the circuit between the generator and cells is closed, allowing current to flow through the generator windings, causing the armature to rotate slowly. Depressing the starting pedal actuates the pull rod E which in turn meshes the gear J with the motor pinion, causing the motor clutch to rotate slowly. As the pedal is depressed or pushed further out the gear G meshes with the teeth on the periphery of the flywheel. With the complete engagement of the gears the pull rod E raises the lower generator brush, breaking contact with the commutator. Upon the pull rod E being moved sufficiently by the starting pedal to bring about complete engagement of the gears, it allows the motor brush to contact with the commutator, completing the cranking circuit.

Automatic Pinion Shift.

Starting motors of the single-unit type are sometimes provided with an automatic screw pinion shift such as shown at Figs. 20 and 16. The armature shaft of the motor has a specially threaded shaft which automatically shifts the pinion into mesh with the flywheel when the starting switch is closed. The switch may be operated by the hand or foot or be electro-magnetically operated, and with the last named the circuit may be closed by a push button type of switch located on the dashboard or steering

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wheel. The operation is illustrated at A and B, Fig. 20.

When the starting switch is closed the full voltage of the battery is impressed on the motor, it starting immediately. When the motor is inoperative the pinion is within the screw shift housing and not in contact with the flywheel. The threaded shaft is connected to the reduction gear shaft by a spring which serves as a flexible coupling. As the load is not sufficient to compress the spring upon the motor

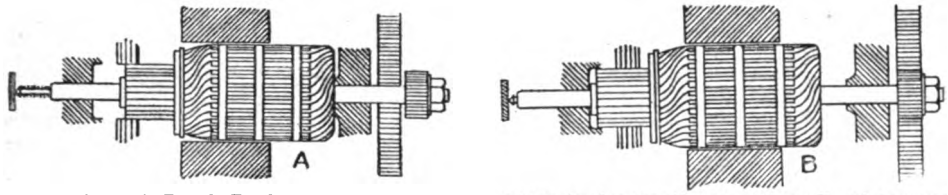


Fig. 17—Illustrating operation of Bosch-Rushmore starter: A, armature in inoperative position; B, pinion meshed with flywheel gear.

starting, the shaft is rotated by the spring in released position. The pinion moves out on its shaft because of the movement or momentum imparted by the rotating threads, and this energy is applied until the pinion reaches the flywheel. If the teeth of the pinion and flywheel meet, that is, are not in a position permitting of engagement, the spring permits the pinion to revolve until a favorable position for engagement is attained. Upon the pinion meshing fully with the flywheel, the spring compresses, and the pinion is rotated by the motor as through a con-

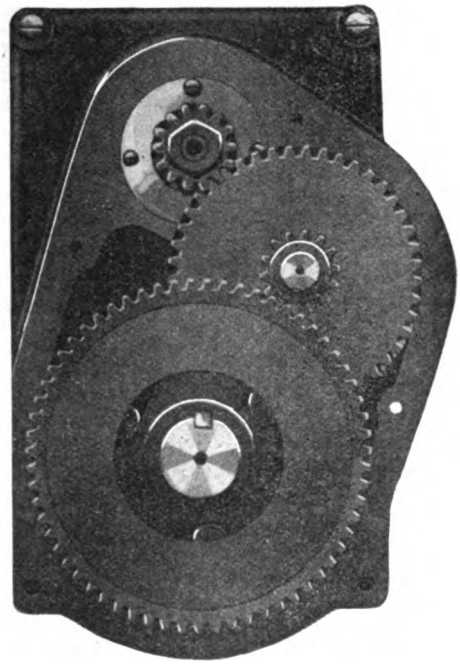


Fig. 18—Reduction gears and over-running clutch of Remy motor-generator.

tinuous shaft. Upon the engine operating under its own power and when the flywheel peripheral speed continually exceeds that of the driving pinion, it forces the pinion out of mesh. The pinion is returned to its neutral or normal position in the screw shaft housing. During the periods immediately after the pistons of the engine have passed beyond any one of the points of the maximum compression, the spring acts as an elastic cushion between the flywheel and reduction gear so that the pinion will not be thrown out of mesh.

The Bendix type of drive is shown installed on a Chevrolet motor at Fig. 16 and as may be noted the necessary reduction between the pinion and flywheel gear is provided by the difference in the size of the driving and driven member. The type of Bendix commonly used consists of a pinion mounted on a helical shaft extension of the armature shaft. Attached to the pinion gear is a disc with a weight on one side. When the starting switch is closed the helical shaft revolves but the inertia of the disc tends to hold the pinion stationary, preventing it from revolving too freely with the shaft. The gear is drawn in by the helical shaft until it is fully meshed with the teeth in the flywheel. Upon the engine starting and running, the tendency of the engine to drive the motor results in unscrewing the pinion on the shaft and disengaging it. Fig. 15 illus-

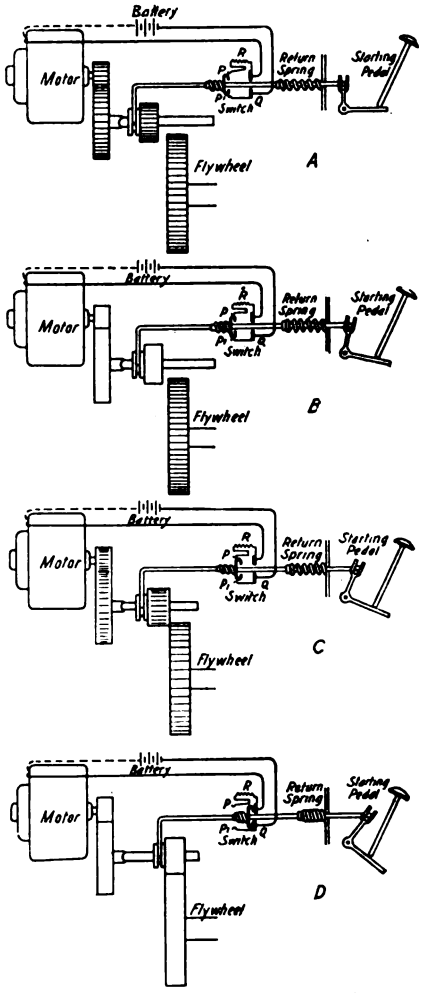


Fig. 19—Electrical and mechanical connections of motor and switch of non-automatic pinion shift, flywheel drive of Westinghouse starter.

trates the Remy inertia pinion, which is of the type that automatically engages and disengages with the flywheel type of drive.

Bosch Flywheel Motor.

The Bosch flywheel starter (system Rushmore) is shown at Fig. 14 and the principles of operation

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are illustrated at Fig. 17. A pinion on the armature shaft of the motor engages with the flywheel. The gear ring may be mounted on the outside or inside periphery of the flywheel. The Bosch starter differs from the designs discussed, in that in the engagement and disengagement of the pinion the entire armature shafts moves. The operation is entirely automatic and is accomplished electrically.

By referring to Fig. 14, which is a longitudinal sectional view of the starter, it may be noted that the armature is so arranged that it can be shifted endwise on its bearings, parallel to its axis. In the normal position, as shown at Fig. 14 and A Fig. 17, the armature is held out of electrical center or out of line with the pole pieces by the tension of a spiral spring in the commutator end of the shaft.

Three cables or wires are utilized in the connections. The positive and negative leads from the battery are larger than the third wire, and one of these leads, the positive, is directly connected to the motor. The other battery wire is attached to the starting switch. A wire leads from an arm of the switch to the motor, and a third and lighter wire, the shunt, also connects the switch with the motor. Upon depressing the switch pedal the current from the battery first passes through the field windings of the motor, after which it is diverted both through the shunt wire and armature of the motor. The passage of the current causes the field coils to become a strong solenoid, its attraction causing a longitudinal movement of the armature, which when in its normal position is out of electrical center. Upon the armature being drawn into a working position the motor functions as a series wound unit. The driving pinion is meshed with the flywheel when the armature is electrically moved to the left, and in the movement an easy and complete engagement of the gears is obtained.

Upon the engine starting to operate under its own power the load is reduced and the current consumption decreases to a point where the magnetic pull of the field coils is overcome by the tension of the spring of the armature shaft, causing the armature and pinion to return to its normal position.

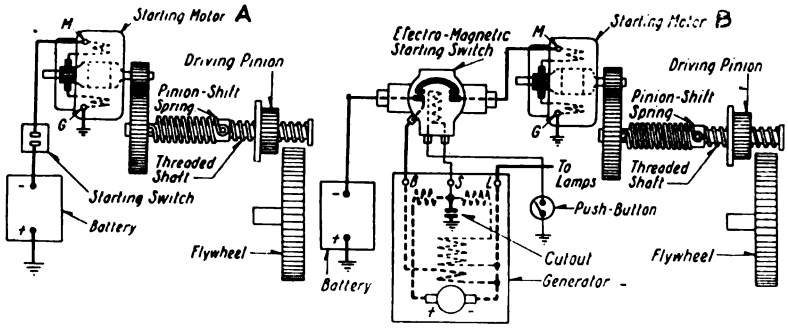


Fig. 20—Westinghouse double reduction automatic screw pinion shift and electro-magnetically operated starting switch.

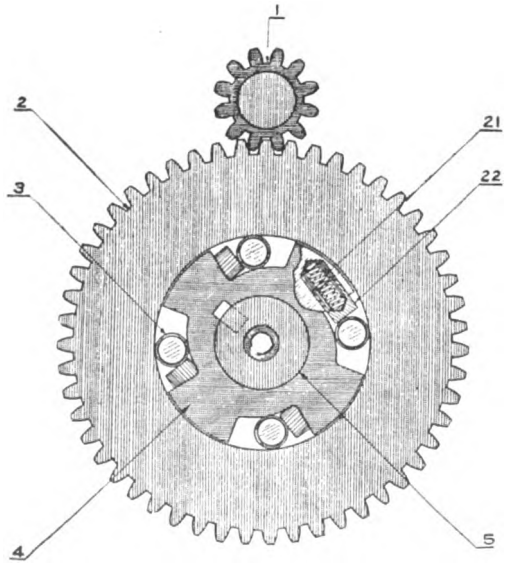


Fig. 21—Components of Gray & Davis over-running clutch.

Reference has been made to the over-running clutch utilized with the motor starter. When employed with the motor-generator utilizing reduction gears as with the Remy starter shown at Fig. 18, it disengages the motor armature and reduction gears which remain inactive when the engine is started and operating under its own power. The over-running clutch employed with the Gray & Davis starter is illustrated at Fig. 21, with its components numbered. It practically provides a connection between the starting motor and the engine when the starting pedal is depressed or operated. In installations where the motor starter is mounted forward of the flywheel, the motor rotates anti-clockwise, facing the driving end. The clutch then operates as follows: When the starting motor pinion 1 is rotated in an anti-clockwise direction, the intermediate gear 2 rotates clockwise, the rolls, 3, turn into the wedge angles between the curved surface of the clutch center 4 and the inner surface of the intermediate gear 2, with increased pressure until the friction is sufficient to drive the intermediate shaft 5 which is keyed to the clutch center 4. The springs 21, back of the plungers 22, keep the rolls 3 firmly within the wedge angles so that they grip as soon as

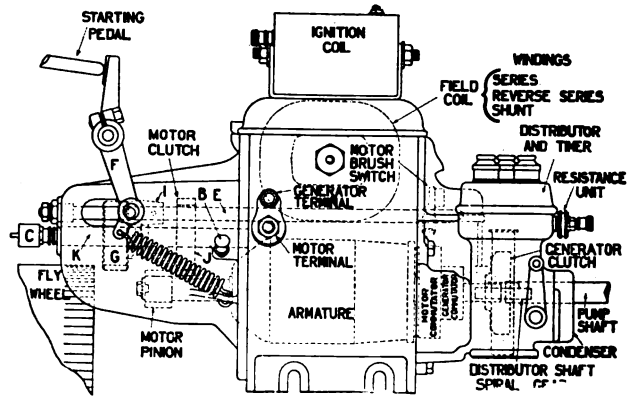


Fig. 22—The Delco motor-generator as installed on the Buick car.

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the motor operates. When the engine operates at a higher rate of speed than the motor, the rolls are released from the wedge angles, obtaining the over-running action of the clutch, thereby preventing the engine driving the motor. Over-running clutches are employed when a chain is utilized to impart the energy of the motor to the engine. A form of planetary transmission, similar in principle to that utilized on motor cars for obtaining changes of speed, is employed in the Wagner motor-generator. The gears are in engagement when the unit functions as a starter, but are locked together by three rollers in a star-shaped clutch when the unit functions as a dynamo or generator. The switch lever operates a brake band in the same manner as the planetary transmission is operated, the band holding the gear box stationary.

(To be continued.)

DEFENDS THE TWO-CYCLE.

And All Are Willing to Sit at the Feet of the Dean of Automobile Engineers and Listen.

From Chas. E. Duryea, Pennsylvania.—Your reply to No. 1588, while correct does not contain the whole truth. I look for the 2-cycle to win as an auto engine in time, but it will be much hindered if the public do not learn the facts about it and so I wish to add for Mr. Fiedler's information a few facts about the 2-cycle, having built both kinds for years.

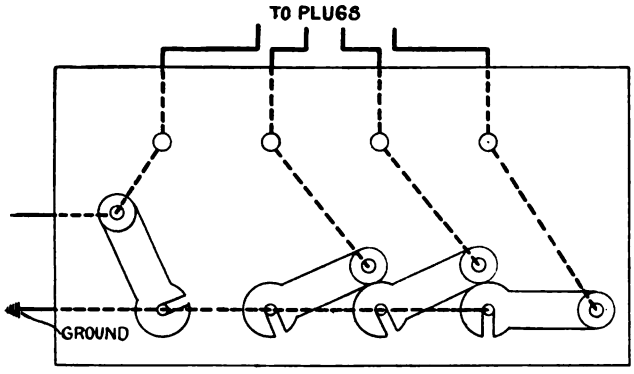
I think the reason why a 2-cycle idles badly is not that the diluted mixture will not fire properly, as you seem to believe, but that the quantity of mixture is not large enough as you correctly state. The assumption implied in your answer is that a 2-cycle must have larger charges than a 4-cycle if it is to fire equally as well when idling. I think this unfounded.

Engine experts know that a compressed charge fires better than one not compressed and so the 2-cycle should and probably does fire better at low throttle than the 4-cycle, because it always compresses since it fills its cylinder from the exhaust if it does not get a cylinderful from the supply, whereas the 4-cycle has very little compression at low throttle. That this compression causes a loss of power is mostly incorrect. The heat of compression is less than the heat of the fired charges and instead of losing heat it is likely that the compressed charge gains heat from the walls and actually gives more power as it expands than it takes to compress it. At any rate the loss is very small, if there is a loss, as can be determined by trial by spinning a hot engine. The faster it is spun the easier it spins. The idling speed is usually faster than one can spin by hand.

That cutting off the spark from half the cylinders makes it run as steadily as a 4-cycle is correct and for the same reason. It then fires the same number of charges as a 4-cycle and does nearly the same work. This would seem to prove that the dilution of the new charges with the old gas does not interfere with firing. Experiments with scavenging carried on largely 20 or more years ago and occasionally since, show that the presence of the hot burned gases is not particularly detrimental. These hot gases heat the new charge making it more perfect and easier to ignite. An equal amount of fresh air is more injurious in spite of the fact that every day or two some inventor bobs up with a new scavenging plan.

Otto on the one side and Crossley and Atkinson on the other, fought this matter out many years ago and Atkinson's theoretically perfect engine is made no more. I feel sure the important matter is the amount of fuel burned and amount of work done. The friction of the 4-cycle engine is much larger than in a 2-cycle because of the double number of pistons for a given number of fired charges and because of the friction of the cams, camshaft, valves, valve lifters and valve springs. All this work requires considerable power and the charges which give this power are certainly much larger and more sure to fire than the small charges needed to overcome the much less friction of the 2-cycle with half the number of pistons as compared with charges fired. But put a light brake on the 2-cycle to give it a load as the 4-cycle gets from its great internal friction, and the 2-cycle at once fires steadily.

All these things point to the friction loss of the 4-cycle as the cause of its steady idling. If people prefer this loss and good idling to a much higher economy and poor idling then makers must supply the friction. The most economical way to do this is to cut off the fuel supply of half the cylinders of the 2-cycle. But cutting off the spark serves very nicely, and this can be done by a large switch on the dash as per sketch. The gaps in this switch must be large. As large as ¾ of an inch is preferable. And the switch must be kept dry. Water on it will carry off the spark. If four levers and posts are provided any cylinder can be cut out. The levers are grounded on a common ground wire. The posts are connected by high tension wire to the plugs or plug wires; one post to a plug. Any maker of switches can supply posts and levers. The base may be of hard rubber, wood boiled in paraffin or thoroughly well varnished with shellac.



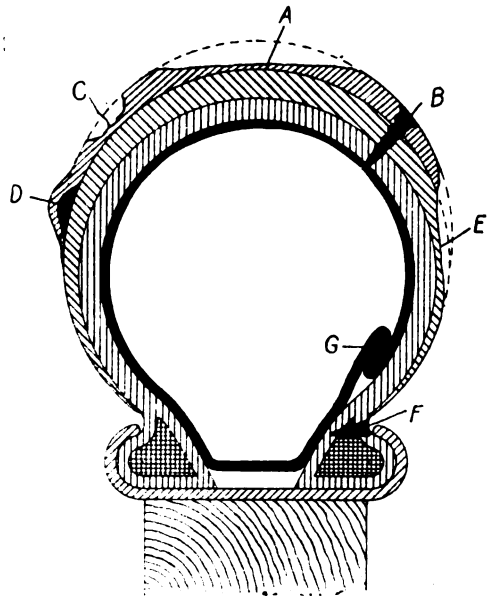
To cut off the spark.

Common Causes of Tire Troubles.

The natural wear of the tread surface of a tire is shown at A, in the illustration. But if a number of the layers of fabric comprising the body of the shoe are cut, this also constitutes a weak place in the casing and a blow-out will be the result, as shown at B, because the few layers of fabric remaining do not have sufficient strength to resist the air pressure. A stone bruise as shown at C, is caused by the removal of a portion of the rubber tread by a sharp stone, glass, etc., and is often more serious than a puncture, because it removes some of the tire surface. A sand blister as shown at D, is pro-

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duced by sand or grit from the road working into a space in the tire, between the tread and the fabric body, through some neglected incision or bruise. The side of the tire is often chafed as shown at E, by running the tires against curbstones, or driving in car tracks. Rim cutting as shown at F is generally caused by insufficient inflation, which permits the rim to cut into the tire and therefore tends to sever



Points to be considered for wear.

the bead from the side of the shoe. The chief inner tube trouble is penetration of the wall by some sharp object, or folding over of a part of the tube as shown at G, when the tire was put on.

The Signal Question.

From Gridley Adams, in The New York Times.—What protection is insurance to me, an automobile owner, after some one has run into me, or I have run over somebody? I have the loudest possible warning signal on my car solely for my own protection. In rainy weather, with the curtains up, it is absolutely impossible to hear some of the electric buzzers which are on some cars masquerading as horns. And as for rubber bulb horns, they are an absolute farce, and even pedestrians in crossing streets now pay no attention to them, because of the laughing stock made of the "honk, honk," on every vaudeville stage.

Recently I was party to an automobile accident which cost me a considerable amount, and yet for which I was in no way responsible. When riding, other automobiles will pass you and come within a foot or less of your car, all without even sounding their warning. I might see a rut in the road and turn even the very slightest in order to prevent my wheel going into the rut. Not knowing that the other automobilist was to pass me, I would, of course, bring about an accident. He might claim that I should have put out my left hand, indicating that I was about to turn, when the real trouble was that he should have sounded his warning signal, and had a warning signal loud enough for me to hear. It is the same with half the car owners when they turn a corner or are about to pass motor cyclists or boys on bicycles. They slide up alongside without giving the boys any idea they are so near, when a good, strong blast on their warning signal, while they were yet 50 or 75 feet away, would certainly keep the boys posted as to impending danger. Half the people who are injured might have saved themselves if automobilists had only thought to have sounded a loud enough warning in time.

I am heartily in sympathy with the Society for the Prevention of Useless Noises, but I certainly protest against any laws that will hamper a man's protecting himself. What they should have is a signal that can be heard above all road noises, and then be compelled to use it.

FOR THE GARAGE MAN.

Little Things Which Make for Success and Satisfied Patrons.

BY J. N. BAGLEY.

Hardly a day passes but the machinist comes up against things in his line of work that require study to meet the peculiar conditions, and the better he is at solving such problems the more successful repairman he is, and the more money he gets for his work. Not only this, but to arrange his tools and machines so that they are convenient often means the difference betwen success and failure.

Not long since the writer had a job which required a great deal of lathe work and to stand at the lathe and watch it would have consumed practically the entire time of the operator. To save watching the carriage as it traveled to the work, I installed an electric bell on the lathe bed, as shown at H, Fig. 1. To the lathe bed a clamp was fastened and the ground wire fastened to it. This clamp, B, could be adjusted along the bed at will and the adjusting point, D, could be moved for a close adjustment. On the edge of the carriage was installed a block of wood fiber, C, which was a non-conductor, and to this was fastened one of the wires leading to the battery. As the carriage, F, moved auto-

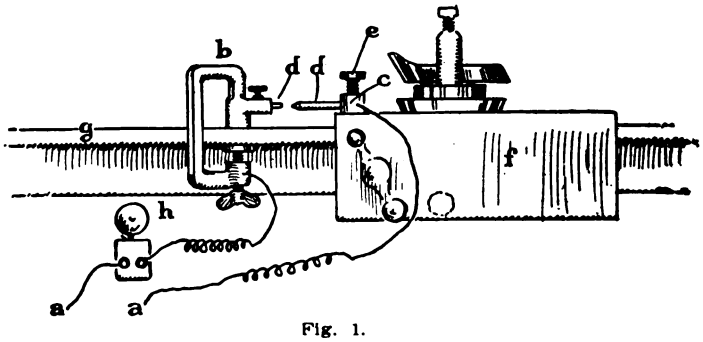


Fig. 1.

matically along the lathe bed, G, it would come up to the point on the ground, D, and connect the point, D, in the insulated block. This closed the circuit and the bell gave the alarm that the carriage had almost reached the end of the cut, and the operator then again started the cut. The wires, A, A, lead to the dry cells which can be placed in some out of the way place or in a box under the lathe.

After setting the lathe the operator could go about something else with no fear of forgetting his lathe, and thus accomplish a great deal of other work. Many times the operator might be absorbed in something else and the carriage could slip over and ruin a piece of work, but with the bell all the danger is eliminated as the minute it rings he will be attracted to his work. This switch should be set in such shape that it will alarm the operator in

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plenty of time, so if he should be a little distance away, or in case he had his hands full he would have time to reach it and take care of it.

In Fig. 2 we have the same alarm applied to the feed of the press drill, which can be used in drilling a number of holes to gauge the depth. I have found

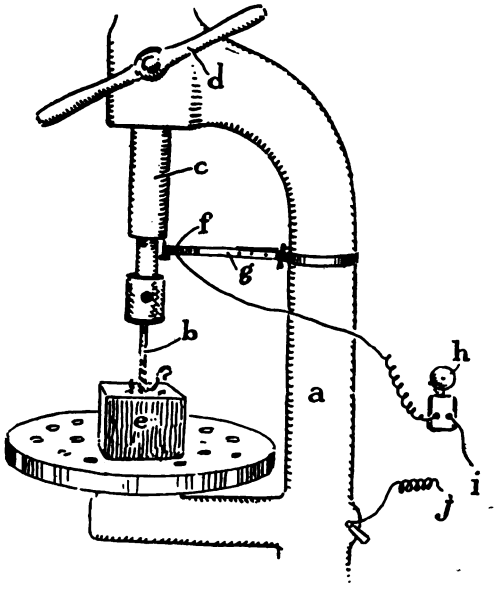


Fig. 2.

it works well and gets the holes near enough for ordinary work. The strap, G, bolted around the frame of the drill, carries on the end a block of fiber which is a non-conducting material and to this is fastened one of the wires. The other wire is grounded to the drill frame where handy and out of the way. The adjusting screw in the end of the fiber block can be screwed back and forth to make close adjustments. This should be arranged so that when the spindle comes down as far as required it will close the circuit by bearing on screw, F, thus ringing the bell. The drill, B, can then be raised from the work, E, and the second hole drilled in the

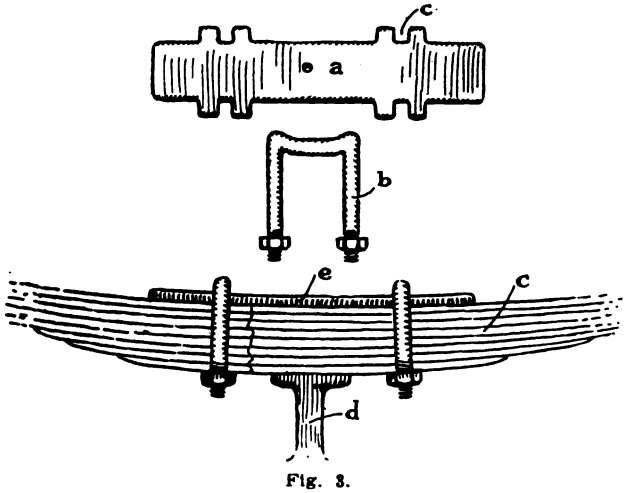


Fig. 3.

same manner. In case the feed is done with the hand lever, D, it can be moved just as little as necessary, and in case the feed is controlled with a ratchet device it will be necessary to release it the instant the bell rings or better still just a trifle before, and make the least fraction of an inch by hand. In case the spindle, C, does not have a shoulder to come against the screw in block, F, it will be necessary to make a small clamp for the ground contact. In case the frame, A, is covered with a heavy paint it may be necessary to scrape a bright spot to get a perfect ground contact. Connect the batteries to wires I and J.

We have in Fig. 3 a handy repair device for use on car springs which can be made at odd times and sold to the tourist quite readily, and many times they come handy for the garage man as well, for a new spring is not always at hand when wanted. It consists of a bar of iron made in the shape shown at A, with glides on the ends to prevent the clamp from slipping out of place. The clamp with bar for securing to the spring is shown at B. At C we have a broken spring with the repair bar, E, in position. D is a cross section of the front axle which in no way interferes with the use of the bar unless it be the small bolt which passes from the top up through the spring, in which case it will be necessary to drill a hole in the bar at A, to pass over the nut and leave an even bearing on the broken spring. There is hardly a tourist but what will be interested in repair bars and they should be made up in different widths so they will accommodate the different width of springs in use on different makes of cars.

In Fig. 4 we have a gear with a broken tooth. This is a common occurrence, especially with the cast wheels used in much machinery. In this instance it is but necessary, in case the rim is heavy

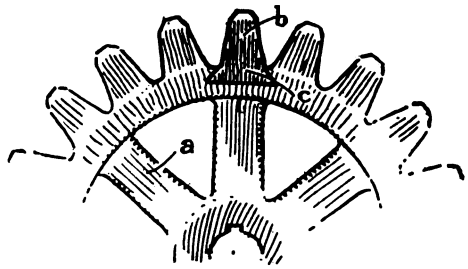


Fig. 4.

enough, to cut a dovetail in the rim and make a steel tooth that can be driven as at B. The notch, C, should be a trifle larger at one side than the other, to allow the tooth to wedge tight as it is driven in. A number of teeth may be put into the wheel, A, providing they are not two together, but in this case this can be done, except it will be necessary to braze them, while with the single it is but necessary to saw the two sides off, leaving them to project just enough to head a trifle, preventing them from creeping sidewise. In case the teeth are inserted in steel wheels they can be brazed; in fact it is advisable, as spelter flows well on steel while it does not on cast iron, unless conditions are very favorable. A tooth placed in a steel wheel in this manner and brazed will in nearly every case last almost as well as the original tooth.

Occasionally there comes a job to the shop which at first glance looks impossible to do without special tools. But it depends on the ability of the machinist to handle work of this kind, for any one can do the simple jobs.

On one occasion a large wheel was brought to the shop. It was to work in a certain place and the face of the wheel was a half inch too wide, and if this face could not be narrowed up it would be necessary to have a wheel made to order or rebuild a cement foundation. The largest lathe in the shop was a 24", and the wheel measured 5'-4" across. This looked like a difficult job and the man who brought

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the wheel suggested we cut it with a cold chisel. We advised him that he could come back in the evening and we would have it ready. We turned the head stock on the large lathe, end for end, and bolted the wheel to the face plate and let it hang along the outside of the lathe, as shown at C. The face plate D, being quite small compared to the wheel, we used a number of bolts to make it secure. We ran a shaft through the head-stock B, and through the head-stock B, and through the center of the wheel, which aided quite a little in truing the work and saving some time. The dotted line G, shows the amount to come off the rim of the wheel, and to remove this we placed alongside the wheel a 13" lathe and fed the tool into the work with the cross-feed of the small lathe. The small lathe E, was so heavy that it did not require fastening to the floor. The tool F, was a little longer than the ordinary tools used for turning as it was necessary to reach it over the bed of lathe E, in order to come to the rim of the pulley. Three hours from the time the pulley was brought to us we had it turned and our machinery all placed back in position. We called the owner and told him he could get his wheel. He inferred from that that we could not do anything for him and in a few minutes came with a dray to

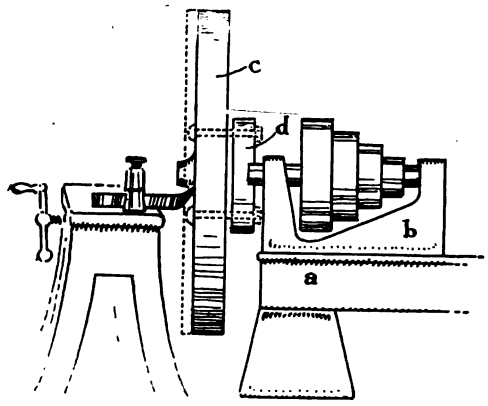


Fig. 5.

take it away. He was a surprised man when he saw the job and looked all about the shop to find the tools we did it with. When he paid his bill in addition to the price we charged him for the work he made us a present of a five dollar bill and while he was a contractor he sent us all his work from other towns near us. These jobs do a great deal in advertising one's business and should be attempted if possible.

Now in case we had been fortunate enough to have a lathe large enough to handle the wheel he would have thought nothing more of it than he would of having a bolt or pin turned, but it was putting into use ideas to meet conditions that attracted his attention, and it nearly always works out in that way. This idea can be worked on large irregular castings as well, or for boring the hubs of large wheels. Of course, if two lathes are not at hand it would be a little more difficult and the tool for boring or cutting would have to be handled in some other manner, but there is hardly a shop but what has some device which can be arranged to do the work, depending on the ability of the workman.

A handy device which comes in play about the garage and can be made at spare times is shown in Fig. 6. This consists of a double box as shown in the drawing at I. The compartment H, consists of a frame which is hinged at the bottom to the box I, and has a plate glass front which covers the instruments which are controlled by switches on the top of the box A, B, C, D, E. The switch E, operates or brings into the circuit the ammeter for testing the amperage of the batteries; D, brings into circuit the voltmeter which indicates the voltage; C connects into the circuit a small light which lights the board for use after night; B brings into the circuit

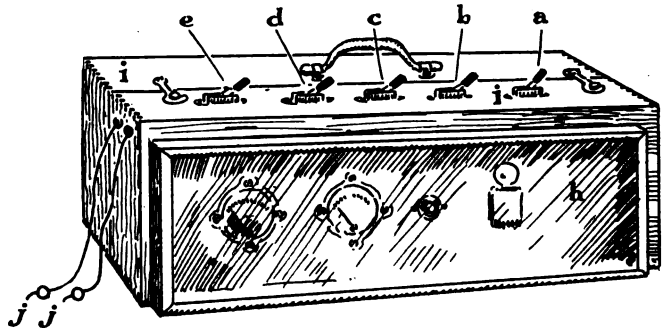


Fig. 6.

the bell which rings when testing wires for an open wire because of a broken wire or a blown fuse. The terminals J, J, lead off to be used about the car. In the back of the box is a set of batteries and by closing the switch A, connects them up in such manner that the batteries can be used independent of the instruments for cranking a dead car. Now by opening the switch A, and closing the switch B, we have the bell in the circuit for testing the wiring out on the car. By taking the one wire J, at one end of the car, say the headlight for instance, and going back to the starting point of the wire, it will immediately show that condition of the line. Now in case we find the line O. K., and yet the lamp will not burn, it will be necessary to test out the globe to see whether or not it is burned out. We now open all switches and close A. This passes the battery current through the wires, and by attaching the wires J, J, to the lamp wires leading to the globe, will tell whether or not the globe is in good condition. If it is all right it will burn, and if not it will remain unlighted. In case we wanted to test the voltage of the battery we would open the switch A, and close the switch D, which when the wires J, J, were connected to the positive and negative ter-

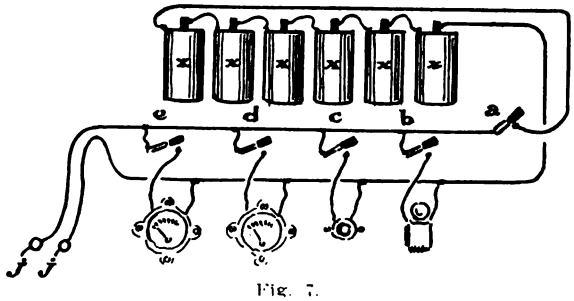


Fig. 7.

minals, would at once show the voltage on the instrument. Any time it is necessary to test out the wiring in the box the switch A can be closed, and any of the other switches closed and the instrument will record the condition of the batteries in the box. At K we have a handle located on the box so as to balance it for carrying it about when wanted from place to place.

In Fig. 7 we have a wiring diagram for the above described test box, X, being the batteries in the back of the box, and the wires J, J, leading from them, except that switch A breaks one of the lines.

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The instruments each being connected with the line above, and one of the wires being broken by the switch, of course enable the operator to cut the instrument out and in at will. If the ammeter used on the board is the ordinary instrument used to test dry cells it should not be connected into the line with a storage battery or it will be burned out in an instant, as they are a higher amperage than the dry cell. In case the ammeter is to be used on storage batteries it should be ordered special. A voltmeter testing up to 30 volts will be sufficient for ordinary service and the lamp should be six or seven volt, 12 to 15 candlepower.

GRADE CROSSINGS.

Every Day Adds Another Case of Foolhardy Narrow Escapes.

J. A. McCrea, general manager of the Long Island Railroad, says it is a wonder to him "that at least a score or more of people have not been killed or seriously injured through the continued recklessness of automobile drivers. Every day we are getting reports to the effect that the crossing gates at this or that place have been broken by drivers who thought more of speed than of safety.

"If one operates a machine he should remember the slogan 'Safety first, safety last, and safety always.' He should never venture over a railroad grade crossing unless he stops and looks along the tracks in both directions. Private chauffeurs should be compelled to follow the same instructions.

"Travelers on highways," concluded Mr. McCrea, "should in case of doubt take a safe course, and thus secure a margin of safety. Rushing over a crossing 300 feet ahead of a train has no margin of safety." Mr. McCrea cited as typical cases the following "near accidents," which have occurred during the days mentioned:

June 24, at 5:15 P. M.—Despite the upraised hands of a patrolman warning traffic on the highways to stop because a train was approaching, the driver of an automobile recklessly drove his machine over the crossing, near Jamaica race track, while the gates were being lowered. Fortunately, the only damage was a broken gate.

June 25, at 5:30 P. M.—Mrs. Curley, of Rockaway Beach, drove her automobile, containing another passenger, over the crossing at Arverne before the gates on both sides of the tracks were raised by the gateman after a trolley car had passed the crossing. The automobile broke off about six feet of the furthermost gate. The front wheel of the automobile came off, and the windshield and one of the lamps of the machine was broken. Neither Mrs. Curley nor her companion were injured.

June 26, at 6 P. M.—Although the gates at the Park Avenue crossing in Far Rockaway were lowered for an eastbound trolley car, a driver jumped off the wagon he was driving, raised the north gate partly, and beckoned to the horse to proceed. The horse cleared the gate, but the top of the wagon came in contact with the gate, breaking off about 15 feet of same. He then led the horse over the tracks, and the approaching trolley was compelled to stop short to avert a collision. After escaping danger so narrowly the driver raised the south gate, passed the horse and wagon underneath it, and quickly disappeared.

June 27—While the gates were lowered at Ozone Park, at 1:25 A. M., because of approaching electric trains from east and west, the driver of automobile ran the machine recklessly into the northwest crossing gate box. The only damage done was to the automobile's radiator, In the machine with the driver were two other occupants.

June 27—Two automobiles almost collided with an eastbound train at the first crossing east of Cutchogue. The engineer sounded his whistle at the prescribed distance from the crossing, but the auto drivers refused to heed the warning of danger ahead. One of them deliberately speeded over the crossing, beating the train by a few seconds. The other motorist drove his machine right up to the edge of the tracks, and, seeing the train practically on top of him, quickly backed onto the highway just in time to miss being either killed or seriously injured.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1638 Starting, Clutch and Lighting.

From H. D. Pierce, New York.—1—I have a Flanders 20 automobile with a Splitdorf low tension magneto. At times it is impossible to get a spark at the plugs with a set of dry batteries. I can start the motor on the magneto with one turn of the starting crank, except in very cold weather, and do not have to advance the spark from regular running position. I have examined the coil and magneto, put in new wires and cleaned and adjusted everything on the magneto, but still have the same trouble. It has acted the same for a year. I am sure the trouble is in the magneto, because when it has been running on the batteries I have cleaned the magneto and then been unable to start on the batteries again. Last Thanksgiving Day I had to shift switch about every three to five minutes from one terminal to the other. The motor would not spark more than five minutes on either batteries or magneto at one time, but would continue to run if I threw the switch before it came to a dead stop. I looked over the magneto, wiped off the oil, tightened the wires and put on some wires. Then it ran for some time apparently all right. Can you tell me where the trouble is? 2—The cone clutch grips too quickly on this car, unless I use lubricating oil and graphite, mixed with graphite on it once a week. Do you think the leather is worn off the face of the clutch? 3—How many cells of dry batteries of 20 to 30 amperes would it take to furnish current for a 15 candlepower 6 volt light? I have not noticed any

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one having the same trouble with a magneto that I have.

Reply.—1—The coil, distributor, secondary wiring, circuit breaker and condenser are working properly, else the engine would not run properly on the magneto, as all these parts are in the same circuit when current is furnished by either battery or magneto. Your trouble must be in the primary battery wiring, or in the switch. It may be that "grounding" the magneto circuit also "grounds" the battery circuit. In the magneto or off position the battery circuit should be open, and in battery or off position of the switch the magneto circuit should be "grounded." You should look to the adjustment of the contact points in the breaker box. Be sure they come together squarely and that all oil is carefully wiped out, and that the insulation to the binding posts is clean. 2—You have ruined the leather facing to your clutch, burning it up with mineral oil. A little neatsfoot oil, or ordinary lard, would have prevented its grabbing. If it would not hold, a drop or two of castor oil should have been used. 3—Four, eight, twelve, sixteen or any multiple of four dry cells. If you are to use but four connect them in series, the carbon of one to the zinc of the next, etc. If a multiple of four connect each four in series and then connect the carbons of each series together and then by another wire the zinc. This will give you multiple-series connection, the voltage being in all cases the same and the voltage increasing proportionately with the increase in the number of series connected cells. Each cell will furnish approximately 1½ volts. You will find that a 15 volt lamp will take a lot of battery energy. With a proper reflector a 6-volt mazda lamp will give good illumination.

1639 **His Engine Trouble.**

From Clarence F. Nelson, Rhode Island.—I would like you to help me out of some engine trouble that I have with my six cylinder Rochester engine. It has been giving me trouble ever since I bought it. I have just overhauled the engine, put in new rings, new cam rollers, and stopped all air holes in the suction pipe and valve cages. I have also had the magneto repaired by the Splitdorf people, which is of low tension type with coil. The valves are set right by the marks on the gears, which is exhaust, closes 9 degrees after center and the intake opens 12 degrees after center. If I set the magneto to spark at or a little after the center the engine will start all right, but will not fire on all cylinders evenly and has no power, but if I set the magneto to spark retarded about three inches, measured on the fly wheel, before the dead center this will give about four or five inches before the center. When advanced the engine will run good and have plenty of power, but of course it is hard to start and gives a bad kick if I don't pull the crank up quickly. Please let me know what you think the trouble is. I have spent a lot of time on this engine trying to find the trouble, but the only place it seems to be is with the spark timing. It works the same if running either on the magneto or the battery. I have also tried a new coil. The firing order is 1-4-2-6-3-5. This is different from other six cylinder engines I have seen.

Reply.—It is well for you that your engine misses explosions with the spark set on center, for there are no conditions of running that should have such setting, else you would soon boil the water in your radiator and waste gasoline. When you set the spark ahead of the dead center you advance, not retard it. Our advice is for you to start the motor with late spark, and as soon as started, advance it, and when running keep it advanced as much as possible without causing the engine to "pound."

1640 **The Ford Car and Gasoline Saving.**

From John B. Scott, Nebraska.—I have a model 1912 Ford roadster that I have run over 15,000 miles and for actual breakage it has cost me $6.50, and that was caused by the carelessness of a garage man. This car to all appearances is as good as when unloaded and in fact it runs much better. I am able to make on an average over country roads 30 miles to a gallon of gasoline. I have made some changes in the equipment. The old coil system was very unsatisfactory—too much jumping, jerking and knocking. I had installed a Splitdorf Ford special high tension magneto and ever since I have forgotten what a skip, jerk or knock is, and she will pull to the last breath and never a knock or jerk on the hill no matter how steep or long. I have also installed a Danver oil system which I find to be a saver of oil and makes a much better running engine. Also a gasoline saver which is controlled from the steering post and this device I find is of considerable benefit, but it is a little difficult to properly adjust according to the amount of gasoline being used. I am using my second set of casings which are good for several hundreds of miles yet. Before starting out I go over the car and see that everything is all O. K. and keep the carbon out of the cylinders.

I noticed a contrivance being advertised for the Ford called the Automatic Gasoline Saver. This device fits between the carburetor and manifold, and the opening and closing of throttle opens and closes the device automatically, claiming this to be the most successful way of admitting air above the carburetor as it always come in the right proportion. This device is sold under a guarantee or money refunded. Do you think this kind of a device would be a success?

Reply.—We see no reason why the device referred to might not be useful. At all events, there would be little risk in trying it, since it is guaranteed or money refunded, something desirable in the case of anything new which has not been fully established.

1641 **Who Was to Blame?**

From F. W. L., Pennsylvania.—I wish you would give your opinion concerning the responsibility for the following accident: Both cars were going the same direction, No. 2 car was ahead of car No. 1, when car No. 2 pulled to the right side of the road. The driver of car No. 1 thought that the driver of car No. 2 wanted him to pass, for the reason he pulled to the side of the road. Car No. 1 then proceeded to pass. At this point the driver of car No. 2 did not give any signal nor look before he turned to cross to the left, in order to get in the private lane to his residence. Car No. 1 then, seeing him turn, also turned further to the left, putting on the brakes, and ran to a 3 foot bank and upset, throwing all the occupants out and striking No. 2 car just a little, the driver of which never stopped but proceeded right into his lane. The driver of No. 2 car

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saw the other car about the time he turned, but did not try to stop or turn off to avoid the accident. Now car No. 1 did not signal before he attempted to pass for the reason that the car in front pulled to the side of the road which was taken as if he wanted the car behind to pass. The occupant of car No. 1, that was upset, had his arm broken, and wants to sue the driver of the other, car No. 2, for the doctor's bill only. He claims that he should have signalled or looked before crossing the road to the left. What is your opinion about it? I wish also to say that the driver of the car that upset has driven cars for eight years. The other driver only about one month. Of course, if the driver of car No. 1 had not ran to the bank he would have smashed right into the other car. Car No. 2 was not going very fast as it crossed the road and the driver could have easily stopped after he saw the car. Car No. 1 was going faster in order to pass, and would have succeeded in stopping also, but the road was a little muddy and the car skidded some distance. No. 1 car tried to avoid the accident, but No. 2 did not.

Reply.—Assuming that your statement is accurate, as you no doubt intended, No. 2 car was to blame for the accident. Although car No. 1 should have given a signal when it attempted to pass car No. 2, car No. 2 was clearly in error in not giving a signal when it crossed the road from the right side to the left to enter the private lane referred to. A car has no right to stop or make a turn in any direction without giving a signal. If this be the case the car is always responsible for any accident that may be caused by the absence of such signal.

1642 **A Question of Contract.**

From Reader, New York.—A dealer in a given town takes the agency for a car and signs a contract in the early part of the year to take, say two in February, two in March, and four in April, paying therefor a specified deposit for each of the cars in advance. The cars are taken for the first two months and the dealer does not send in his order for the third month, four cars, on the time specified. On June 30th the concern from whom the cars were ordered, said concern having State agency rights, lose these rights and therefore the local dealer cannot order any more cars, and asks for the return of the deposit covering the third month. The concern which had the State agency right, refused to return the deposit, stating that the dealer did not live up to his agreement in promptly taking the cars, while they had the agency. Will you please advise us as to what is the custom in the trade? We understood it is the practice with most automobile manufacturers to return such unused deposits if the dealer does not order the full quantity.

Reply.—The rights of the parties involved are to be determined by the terms of the contract between the dealer and the agency. If the contract specifies that time is the essence of the contract and that the failure to order the specified number of cars at the specified times shall be treated as a breach of the contract, and that the deposit shall be liquidated damages, the question as to whether or not the dealer can recover his deposit is an open one. The courts have been very reluctant to enforce covenants for liquidated damages and generally require proof as to the actual damages sustained. If the courts in the State where the contract was drawn frown upon liquidated damages in a case of this character, the agency will only be able to recover the amount of actual damage sustained by the dealer's failure to take the four cars in April. As the dealer has already demanded his money back and has been refused, it will now be necessary for him to consult a lawyer who can bring suit to recover the deposit, when the question, if any, as to liquidated damages, can be thrashed out in court. The practice and custom of other automobile manufacturers to return such deposits has nothing to do with this case, as quite likely the question of rights and remedies are specified in the contract. It may be remarked that where manufacturers return the deposits of dealers, they probably do so from other than enforced or compulsory motives.

1643 **Hard to Crank.**

From E. M. Couch, Nebraska.—I have a Buick, model 27, 1911, 30 horsepower, which has run about 16,000 miles. My trouble for the last year is in being hard to crank up. After it gets started it runs fairly well. I have ground the valves, and also looked for leaks in the intake manifold, but still it is hard to start. If you could tell me where my trouble is, in your next issue, and the remedy, I will be much obliged.

Reply.—There are so many reasons why an engine will start readily and so many little conditions which may be present, that it will be impossible within the limit of this reply to mention more than generalities. Broadly, failure to start readily may be caused firstly by defective ignition, secondly by imperfect carburetion and thirdly by structural defects or faults. You neglected to tell us whether the battery or magneto had shown anything from which to diagnose the possible if not probable cause of your trouble, nor of attempts you have made looking to better your carburetion, or whether during the past four or five years of running it has had a systematic and thorough overhauling by some qualified automobile mechanic. If equipped with the original carburetor this might be one cause, as it takes a better and more modern designed carburetor to vaporize gasoline to-day than in 1911. Your inlet valve stem bushings may have become worn. To our mind your only remedy is to have the motor thoroughly gone over, worn parts renewed and adjustments properly made.

1644 **A Leaking Carburetor.**

From Joseph Pernot, Wisconsin.—I have a Ford model touring car with a Kingston carburetor, which has been leaking gasoline, and would like to have your advice. I first thought it was due to the cork float and I took it apart—that is the carburetor—and examined it. I also had the cork float out and gave it a coat of varnish. I let it dry and then put it together again. I then started the motor with everything working lovely, but afterward it still leaked, and I thought it leaked around the hub which holds the connection of the two different parts. So then I took it apart again and put in a leather washer inside of the bowl, where the two parts come together, and put white lead on the screw threads and also on the bottom of the outside of the bowl, just before putting on the hub. After I got it all to-

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gether again I started the motor and everything went fine, but it still leaked. I took it apart the third time and I had it all apart this time, that is I had all the balls off and cleaned them and put it together again, and it still leaked. I then examined it again and found out it was not due to the cork float nor the hub that holds the connection, but it is inside of the connection. There is a hole the size of a match which goes through the upper connection of the carburetor; that is, this hole is connected to the air current chamber. I am quite sure that the gasoline leaks through this hole, but do not understand how to stop it. I turn or shut the stop cock on the bulb when the car is idle. The carburetor does not leak when the motor is running. As the leak is not very fast you have to watch it for about a minute to see a drop. The motor runs fine and the leaking does not affect it at all. I sometimes think of getting a new carburetor, but the new one may leak as well as this one. I will wait and see what information you will give me.

Reply.—We can't quite understand why your carburetor should leak, owing to the source you refer to. If we were in your place, and your motor runs all right, we should not worry very much about a little leak. It is far better to have the car run correctly than stopping a drop of gasoline a minute, and not have it run correctly. We know very little about the Kingston carburetor, but it seems to us your better plan would be to shut off the gasoline when you stop and open the train trough, letting out what remains. Then you surely would not be bothered with leaking when the car is idle and when you are on the road and want to stop for a few hours, the occasional drop would not amount to much. On the other hand, if you think it advisable you might write to the Byrne Kingston Company, Kokomo, Ind., and explain your trouble to them. The firm has no office in this city.

1645 **His Motor Misses.**

From Dr. H. E. Wilkinson, Maine.—I am writing to find out if you can help me to diagnose my trouble. I have a Cartercar touring car, model 5A, 1912, which is equipped with a Schebler model O carburetor and Briggs electrical system. There isn't any name on the magneto, so I judge it also is a Briggs product. I am having trouble with the motor skipping, especially when it is working hard, as on grades and hills. When trouble first became manifest I had run about 7 miles from home, over a quite hilly road. When it began skipping I regulated the carburetor thinking it was there, and came home without any trouble whatever, but every time since then I have been unable to go any distance without its skipping, and on a hill of any size I have to disengage the clutch to let the engine pick up. After it starts skipping it seems as though it is only one cylinder and sometimes two would fire. By disengaging the clutch and retarding the gasoline throttle the engine picks up, but if there is any grade it will miss again. This happens on all speeds on hills and grades. This trouble is continually growing worse, so that it will sometimes skip right on the level, but by switching on to the batteries for a moment, then back on to the magneto, it will pick up all right for a while, but on hills this doesn't help any. I thought the trouble was in my carburetor, but am unable to get any adjustment that works. I have tried adjusting while running, etc. The engine will not pick up without skipping, by opening the throttle quickly, especially on the magneto. I will get an adjustment that seems to be all right but in a few minutes it will act the same as before. It will pick up better on the batteries than on the magneto. I have taken the carburetor apart and find the float O. K. The needle valve works well. When the motor is shut off it will run quite a while and the carburetor will seem to run over, but it has always done this, so don't think it has anything to do with the trouble. I get a good spark from them when out of the engine; also by grounding the plug wire on the engine. I have cleaned all points in the breaker box and the magneto; also polished connections on wires that go into the magneto. If you are able to give me any insight into the trouble it would be greatly appreciated, as I am a long way from an expert garageman.

Reply.—Your trouble is in all probability due to the carburetor. This model is no longer manufactured by Wheeler & Schebler, Indianapolis, Ind., for the reason that it did not fulfill their expectations. You will find that the model L Schebler is better than the model O, while the very latest model R is still better. At low engine speed the spark furnished by the battery is hotter than that furnished by the Briggs magneto.

1646 **Hard to Start.**

From Harry E. Smith, North Dakota.—I am having trouble with my model T, 1913, Ford runabout. It has run about 5,000 miles and is equipped with a Holley carburetor. My car is hard to start in the morning or when it stands all night. It never did that before. One morning I cranked it and primed and it would not start. Then I found that one spark plug was out of order, the spark coming out of the side of it. I replaced it with a new one and next morning it started all right. The morning after that I had an awful time to get it started again, but after I get it warmed up and started once, I can start it any time of the day the same as I always did. It just seems to be that way when it stands over night. I have put a new timer on and a K. W. master vibrator.

Reply.—A later model of carburetor, one that will vaporize the present heavy gasoline should help you. The older model of Holly carburetor, such as were sent out with 1913 cars will be found not so satisfactory as the 1915 model, especially when starting a cold engine.

1647 **Spark Trouble.**

From G. E. Kinzie, Iowa.—I have a few questions I would like to ask you. On two different Ford cars I have had trouble getting a spark to the plugs after the master vibrator was installed. On the first car it was a K. W. master vibrator and I believe a Kingston coil. They had been put on by another party and I was called several mornings to help start the machine. This equipment had been on for several months but was going to give trouble now. I got an extra good buzz at the master vibrator but no spark at the spark plugs, except occasionally just a thread of a spark and most of the time not even that. This man had these visible sparkers on the top of his plugs and I tried changing the distance of the gap of these visible sparkers and looked the

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wiring over very carefully. The coil was properly shortened on top and the vibrator screwed down, and the batteries, 4 of them, tested about 25 to 28 amperes each. Does a master vibrator have a condenser? I concluded that the condenser in the master vibrator was damaged and put on a new J & B master vibrator, but that did not help matters, so I disconnected the vibrator altogether, and though the platinum points on the coil were in very bad shape, the machine started right off with a "fat" spark. The platinum points on both master vibrators were in good shape, especially on the new one. Just a few days ago I spent some time in hunting ignition trouble on a Ford car, which by the way has existed for four years, ever since the car has been out, though the car to-day is just as good as new, the lady owning it having cared for it like a piano. This car was equipped with a Kingston master vibrator coil, and hard starting was the order of the day. I tried putting platinum points on the Kingston vibrator instead of the material they use for that, but it did not help any. The trouble seemed to be that the magneto did not give forth any spark, when cold, just after standing over night in the summer time. There were visible sparks also on all these spark plugs and when the engine was cold, no spark would appear at the plugs from the magneto, but when warm or hot a spark would jump the gap, though you turned ever so slow. The magneto tests about the same as all Ford magnetos that give good satisfaction. I decided that it was a coil trouble and put on a Splitdorf coil. I knew that was a good one, and I also installed four new dry batteries testing 28 amperes each. The machine worked better, but I thought a master vibrator would improve it still more, so I installed a new J & B master vibrator. Immediately the spark from the batteries only made a mere thread across the visible sparkers on top of the plugs, though an extra good buzz was obtained. On this machine the magneto works all right, but on the other one neither one would spark. Now I have removed the visible sparkers which helps the trouble and it runs real good on the magneto and a little on the batteries. I added two more batteries which made a better spark, but I thought that was too many so I took off one, leaving me five new batteries. I believe that four batteries would only make a mere hair of a spark, and most of the time no spark at all jumps the gap. Now I am used to hunting for troubles of all kinds, but this has got the best of me. Strong buzz, good connection, wiring all new and carefully put on and wired up like I wire all of them up, and yet only a mere thread of a spark and most of the time not even that. No. 1.—What are the volts in dry batteries used for? 2.—What are the amperes used for? 3.—If in connecting the batteries from the carburetor to zinc, and in that way raise the voltage, how does it come that a machine does not use the volts, and if it does, then how does it happen that all our old batteries, without any amperes at all, have just the same voltage as they did when new. In other words, what is the use of increasing the voltage if the engine uses amperes. 4.—How do you connect to raise the amperes; and how the voltage?

Reply.—In general we have to say that your apparent lack of knowledge of the principles of elementary electricity leads us to believe that the ignition of the motors in both cases could have been perfected very easily had you been supplied with and followed correct wiring diagrams, or had studied and mastered the instructions usually supplied master vibrator purchasers. It looks to us as if the wiring were improperly done or that primary wire were used for the secondary leads from the coil units to the spark plugs, although using regular spark plugs, such as are sent out with Ford cars, might have given the desired intensity to the spark appearing at the plug terminals. Outside spark gap plugs, visible spark as they are sometimes called, are much more liable to break down or leak current through the insulators than are regular well made plugs. We believe your first attempt to locate the trouble should have been to use a new plug in each cylinder, after which a set of spark coils from a car which runs properly should have replaced the set of coils being used, for proving whether or not the trouble were due to broken down primary or secondary coil windings. With a good buzz at the master vibrator, which by the way, is supplied with a condenser, it only shows that there is plenty of current. You can make the master vibrator buzz without having the coil in the circuit at all. The mission of the primary wiring in the coil is to set up a surge of high tension current in the secondary wiring as the circuit is broken, and every time the small electro-magnets in the master vibrator attract the armature attached to the vibrator blade it breaks the current at the contact points, which permits the spring in the vibrator blade to carry the released armature end back to its normal position when the circuit switch is open. Master vibrators should be located in the circuit as close to the timer as possible, in order to overcome the inductance of the wire. If the current flowed from the battery to the switch and then to the coil windings, to the timer, and to the engine, to the battery ground, to the master vibrator and to the battery terminal this wiring might not give so good results as if the master vibrator were wired close to the coil terminals which are connected together. Your trouble may have been either in the coil winding, wiring or plugs. As master vibrators are frequently used in hopeless endeavors to correct broken down coils, your experience is not unusual. Motor car owners frequently try to see how long a spark they can "pull." While this is a sort of expensive amusement for inquisitive car owners it is a source of profit to manufacturers and dealers in spark coils, as probably more coils are ruined by this fool practice than from use as intended. Answering your queries in their order. 1.—The voltage of a dry cell is the measure of the strength of the current. 2.—The amperage is the measure of the life of the cell. 3.—From "carburetor to zinc" should probably read "carbon to zinc." Such connection is called in series. The voltage of a single cell is about 1½, and if four cells are connected in series the voltage of the current will be $4 \times 1\frac{1}{2} = 6$, the amperage being only that of the weakest cell. If all the carbons are connected together, and all the zincs, the connection would be in parallel, the voltage being still 1½ and the amperage the total of that of each individual cell. For demonstration purposes the flow of electric current is frequently likened to that of water. If one gallon of water is contained in a one gallon jar, four one quart jars would together hold the same quantity, and if all four are discharging at the same rate they would be emptied sooner than the one-gallon jar delivering at the same rate. No matter how large a cell of battery is made, or how small, the voltage remains the same, but the larger cell would last longer than a smaller one.

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Four cells of dry battery, each showing 30 amperes, if connected in parallel would last, theoretically, four times as long as a single cell, while four cells connected in series would last as long as a single cell but would deliver a current of four times the strength or intensity. The quantity of electric current is expressed in watts, thus four dry cells of 30 amperes each would have a capacity of 180 watts or watt hours. You should be able to make them last four times as long by increasing their amperage through parallel connection as they would last if connected in series, for the sole reason that the voltage or strength of the current in the latter case would be four times as high, or of four times the strength or intensity. You cannot use parallel connection of dry cells for gas engine ignition, for the current will not be sufficiently strong. At least two cells are connected in series as for motorcycle ignition, or four in series for usual motor car ignition.
4.—Already answered.

SPEED MANIA FOOLS.

New Ones Are Born to Take the Place of All Who Die.

From Dr. Will B. Crawford, North Carolina.—Your timely and merited article in your most excellent journal touches a responsive chord in my heart. I have written several articles in regard to such matters, not only the dangers of "Grade Crossing Dangers," but also on speed mania fools and reckless and incompetent negro drivers. Only a few months since, during the session of our State legislature, one of our Eastern representatives took his negro driver with him to our capitol city, and this negro coming from the Country Club and seeing how fast he could drive over the macadamized roads, such as he was not accustomed to, and probably had never driven on before, in rounding a curve near the railroad crossing took the outside, as he was running too fast to keep to the inside, lost control of the big car and it went down the embankment, killing the Speaker of the House, also a very worthy young man, one of the clerks, and maiming the representative from our county, all of whom were in the car.

Now this was simply gross carelessness and all the result of speed mania in a country negro who, in all probability, had never driven on macadamized roads before, and who had not the slightest conception of the markings of speedometer, and cared less.

My observation has been that the average negro driver, in our section, and the majority of the white ones, have their knowledge of motoring limited to only three things, namely—how to start, how to stop and how to accelerate, and labor under the false impression that the faster they drive the better driver they are.

One would not think of getting on the train and feeling at ease if he knew the engineer had not been onto his job long enough to know his engine well, but our people will invest good money in a car and employ a fool negro or incompetent white man to run it when in all probability he knows no more about it than he would know how to drive an airship across the English Channel.

I get so impatient sometimes when I read the daily occurrences of lives being snuffed out by such inexcusable carelessness and fool speed mania that I am, as you say, almost ready to remark that it is what they deserve, but I throw the mantle of charity over it all and try to excuse them, thinking maybe some day the people will be aroused to a sense of their danger and require from every chauffeur the same qualifications which the railroad officials do of their engineers. Not until then will precious lives stop being sacrificed, nor the people along the highways be safe from the reckless, dare-devil driving which is an almost daily occurrence.

Nearly every day cars pass my home, on Central Highway, running faster than the train on the Southern Railroad, and the majority of the drivers who exceed the speed limit are negroes. One passed a few days since driven by a negro filled with white people which was running so fast that two dogs, trying to overtake it were outrun half the distance in a quarter of a mile. My wife remarked: "Suppose that fool negro was to lose control of that car, what would become of them?" I replied that it would not be much matter for them, placing their lives in his careless hands as they did, but that if the car overturned, or went into a ditch, at the rate he was going I did not think there would be enough left of all of them for a first class and decent funeral, unless they gathered up the fragments along the road in a basket.

There ought to be some measures taken to put an eternal stop to recklessness as is daily practiced not only in our small towns and cities but especially in the rural districts where we have no police protection. The very first move necessary would be to require all chauffeurs to stand examination and secure license, and then enforce the law to the letter in regard to speeding. To give you a fair sample of the negro drivers there is one who is doing service here who came to me to be employed to drive my car in less than thirty days after he left the cotton field around his father's cabin.

I asked him a few questions in regard to handling a car and he knew as much about it as he did the rule of three. He had no conception whatever of anything pertaining to the car but how to start, how to stop and how to turn on the gas. He knew how to pump wind in the tires but was ignorant of how to inflate them and thought he could keep it greased as good as could a "waggin."

I told him when he knew more about one than I did I would hire him. I have not yet heard from him.

A New Carburetor Idea.

From Dan A. McConnell, Idaho.—If a motor proves faulty, to find out if the trouble is really in the carburetor, take the carburetor off entirely, fill a teacup with gasoline, prime the engine and start. Hold the cup of gasoline under the intake where the carburetor was. The nearer the cup is to the intake the faster the motor will run if other things are all right.

For Foul Spark Plugs.

From W. T. Thielman, Jr., Michigan.—If you will permit me I want to offer a suggestion for Ford owners that have spark plug troubles. I was bothered with this trouble for a long time, and finally cleaned the screen in the brass cap that covers the breather pipe, which had become clogged with dirt,

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thereby allowing the gases to escape, which are formed by the oil becoming hot in the base. These gases form a pressure and I believe this pressure helps force the oil past the pistons and onto the plug. In fact I have not been troubled with this trouble since.

Rusty Rims.

From Dr. L. W. Hendershott, Illinois.—I would like to say relative to the rusty rims "dope" in the June number, page 52, J. A. Hogg, it is far too thin and the quantity much more than most anybody would use. The way I put it up is this: Gasoline, 4 ounces; beeswax, 6 drams and powdered graphite, 6 drams, more or less, as you want the "dope" thicker or thinner. Shave the beeswax fine and mix in a large mouth screw cap can or container. Mix until all is dissolved, then apply to the leaves of springs, threads of bolts, wheel rims, etc. A party asked you some time ago what to apply to an exhaust pipe to prevent rust and you replied stove polish. Permit me to suggest, after removing rust that aluminum paint be applied, or if black is desired, use engine enamel.

A BLACKMAILING GANG

Which Exacts Tribute or Punctures Automobile Tires and Smashes Gears.

Although it is not of special interest to most of our readers, for the blackmailing of automobile manufacturers has not yet extended beyond the confines of New York City, yet some recent reported developments there reveal the fact that the automobile is a fruitful subject for blackmail, given sufficient moral turpitude and desperation on the part of the criminals and an easy-going acquiescence by the victims.

It appears by a report in the New York Herald, that the Saxon Motor Company has for some time been the vicitm of a gang of blackmailers, and that the local superintendent was badly beaten when payments were finally refused. The blackmailing has been done by what is called the "Gopher gang," a notorious band of loafers, some $10 or $15 a month having been collected for the past two years, not only from the Saxon Company but from a dozen other firms.

Finally it was decided that the crime had continued long enough, and the other day, when the superintendent was about to drive home in his own car, he saw a man jump in one of the company's vehicles which was standing at the curb, shove in a switch plug and start to drive away. The automobile was under headway when the superintendent jumped on the running board and pulled out the switch plug, cutting off his power.

The man in the automobile leaned over and hit the superintendent on the head, knocking him off the running board and causing him to strike his head on the pavement. His assailant then leaped from the car, ran around the corner and disappeared.

Employees of the Saxon service station, who had seen him fall, ran to the street. They put the stunned man in his automobile and drove him home. There a physician after examination said that a blood clot probably had formed and was pressing upon the brain.

Officers of the Saxon Company brought the attack to the attention of the police. As a result that neighborhood, which usually is without special police protection, has been guarded by detectives. It was said at the office of the Saxon Company that payment of blackmail was at an end and that probably another effort would be made to combine business firms in that neighborhood into a league for mutual protection.

Investigation confirmed the statement that the collection of blackmail by the Gophers was on a large scale. Merchants and business men were disinclined to have their names used, but many admitted that they paid the Gophers for immunity in one way or another.

Estimates of the amount collected by the Gophers varied from $5,000 to $10,000 a month. One large firm was said to pay $150 a month in the guise of voluntary contributions to balls and outings. Other firms were reported to pay $50. The rate for a business firm doing other than a purely local business was said to be never less than $10 and more often twice that amount.

Instead of tickets for a dance the shopkeeper may be asked to buy a ticket for a raffle on a gold watch on which no address or date is printed. This is said to be a favorite method of holding up chauffeurs whose business brings them into the Gopher territory. If a chauffeur does not buy he is apt to find his gasoline tank or a tire punctured by an ice pick. Sometimes his automobile is driven a short distance away, to be recovered later with tires slashed and lamps and gears broken.

But the gang promised more. They not only agreed to prevent their members from destroying the property of their "patrons," but according to the statement of one of their victims to a reporter of this magazine, if an automobile demonstrator chanced to get into trouble from fast driving or other infraction of local vehicle rules, they promised to see that he was not arrested, or if arrested to "get him off" in the local court. On the other hand if a policeman "got too fresh" they would "do him up"—all by the same token, so to speak.

A reporter of this magazine interviewed some one who lives in the vicinity of this band of grafters and was told that the "Gopher band" is a powerful organization; it numbers some prominent men and quite a number of much "political influence."

It would appear from the foregoing that the tribute givers themselves are not wholly immune from censure. Why this willingness to pay to secure immunity for the misdeeds of its employees or to have the officers of the law attacked? Yet quite likely if the blackmailed firms were assessed a little more taxation for the purpose of securing more policemen and proper protection against lawlessness they would have made a howl.

The motorists should give special care to seeing that the mud guard beneath the engine and gearing is kept free of volatile oil for the reason that at any time a little gasoline might get in with it and start a fire.

The split sheepskins that are sold for chamois skin make very good dry wipers for car cleaning, but if the least amount of grit or sand gets on them they will scratch the surface badly.

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THE CHEAP AND THE EXPENSIVE.

Buying a cheap car may be a good deal like buying a cheap coat or pair of shoes, or a cheap tool or article of furniture. The cheap article may be the dear article in the end. And not only that but it may give far less satisfaction while being used as well as a far shorter term of use.

That well known proverb, "The destruction of the poor is their poverty," is literally true in relation to their tendency from lack of means to purchase things of an inferior quality. For there is a point in material and construction which transforms intended economy into extravagance and waste.

It is safe to assume that not one person in ten ever regrets purchasing a high grade car at its commensurate cost, and possibly it may be as fair to assume that nine out of ten regret they purchased a low grade car at a fair cost. It should be understood we are referring to the extreme of low-priced cars and the extreme of high-priced cars—or rather to the extreme of inferiority and the extreme of good quality, without special reference to price.

Bear in mind that it costs just as much to machine any part of an automobile made of poor material as to machine it if made of good material. It costs just as much to assemble the parts of a car when made of poor material as when made of good material. And the making of these parts and their assembling constitute the bulk of the cost of the finished car.

We do not say that very good automobiles indeed may not be had at what may be considered low prices, but in the case of well-established manufacturers, price and value correspond more nearly than is generally supposed.

Finally, the greater satisfaction and range of use to be had in a car of good value is not usually estimated for what it is worth. A cheap car, for illustration, may well answer all purposes for driving on smooth roads or in city streets, but it may be totally unfit for driving on rough roads and for long tours in the country. Just how much a car of this sort lacks in adaptation to the requirements of the owner of course depends upon circumstances, but it is well to consider facts of this kind in making a purchase, as well as likewise just how much individual feelings are affected by owning a car that is known to be of inferior quality and that is sure to be passed by every other car on the road when it comes to a good stiff grade.

THE CYCLECAR COLLAPSE.

A writer in Printers' Ink attempts to give the moral—or to use a popular but perhaps less correct word—the "psychology" of the cyclecar boom and its collapse.

He first shows how this boom went up like a rocket and came down like a stick, and then gives the reason for it. He adds that he knows personally of one warehouse that contains a half million dollars' worth of unassembled cyclecar parts, and sums up the reason therefore as follows:

"The costly failure of a whole industry is attributable to one fact: The cyclecar was absolutely out of joint with an equally well advertised and consequently well-known personal transportation market."

What he means, we suppose, is that in view of other well-advertised and satisfactory automobiles at a low price there was no market for an innovation that was not considered as attractive. But there was another reason for the temporary—possibly the permanent—failure of the cyclecar. In cases where its design and construction were correct and it would have met a well-defined public need, it was not handled in a judicious way and where it was handled judiciously it did not meet the public need.

The original idea of the cyclecar was the correct one. This was something far lighter in weight than the regular automobile runabout, and consequently a car that could be run and stored at less expense. With these requirements achieved it did not matter much whether the price was a little more or a little less than that of the low-priced cars of the regulation pattern and use.

Of course there is but one way to secure the essential light weight and the necessary strength and stability, the tread must be made much narrower and the standard of 56 or 58 inches. We believe it might be as narrow as 30 inches. To prevent overturning with such a narrow tread, it would be necessary to use wheels of large diameter, say 38 or 40 inches, and by underslung construction obviate its liability to overturn. Of course this narrow tread would enforce tandem seating for which there was some objection on the part of the public. Yet there is a certain per cent. of tandem seating in all vehicles where there is more than one seat.

But construction of this sort would practically reduce the weight of the car one-half, it would reduce the tire wear one-half, the lubricating oil one-half, the storage charge one-half and the repair bills

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practically one-half. This having been accomplished the automobile would be within the means of a large class who do not now feel they can afford it solely on account of its expensive up-keep. Quite likely this class is as large as the entire class who already own automobiles.

As to the price of the cyclecar, it matters little whether it be more or less than the cheap standard runabout. The main thing for consideration is the cost of up-keep. Between a maintenance cost of $20 a month and $10 a month, there is a difference of $120 a year, or the interest on an investment of $2,400 at 5 per cent.

There has been and will be a demand for a cyclecar built according to the foregoing outline. Any manufacturer who will perfect it and cleave to it, despite the slight objections and difficulties experienced by all who leave the beaten paths, will find a large market ready to purchase it.

IT ALL DEPENDS.

The automobile is like truth—"it needs no ornament." It is at once so useful, so economical, so convenient and so cheap in price as compared to its value that it requires no special plea or favor.

But when some one claims that it is a safer unit of travel than the horse-drawn vehicle he is stating something that car owners and drivers know is not in accordance with the fact. What we mean is that it is not safer when used by the average man but it can be used in such a way that it is much less dangerous than the horse-drawn vehicle with the horse attached. The freedom from accident by the automobile depends wholly and invariably upon care and skill in driving. The freedom from accident by horse driving often depends upon the horse and not the driver; in case of the car it depends upon the person driving it.

But the startling and disquieting fact in relation to careless automobile driving is that it is increasing. Possibly this increase may not be out of proportion to the increase in use of the automobile, but it should be less; the reckless are fast being put out of the question by maiming or death, and this might not be so extremely regrettable except that they are likely to kill or maim the careful users of the automobile, along with their own undoing. This being the situation, we see no method of treating the matter save by continued admonition and warning.

Take this State and city of New York, for illustration: According to figures compiled from the report of the National Highways Protective Society, the fatalities due to automobiles in New York State, including New York city, for the first six months of the present year, increased from 183 for the corresponding period of the year 1914 to 241. In New Jersey during the same months automobiles killed eighty-eight persons, as compared with forty-eight in the first six months of 1914.

In New York State, outside the city, during the last month thirty-six persons were killed by automobiles, seven by trolleys and three by wagons.

In New Jersey during the same period forty persons were killed by automobiles, four by trolleys and three by wagons. This is the greatest number of automobile fatalities in any one month in that State.

In New York city more arrests have been made for speeding than ever before. There have been about four thousand this year, but the offenders seem content to pay the fine imposed and do not hesitate to repeat the offence with impunity, though the magistrates are imposing minimum fines of $25 for the most part. It would help to reduce the evil if maximum imprisonment were substituted for minimum fines.

AFTER A CAR IS SOLD.

Some of the automobile manufacturers are waking up to the advisability of taking better care of the purchasers of their cars after they have been delivered. There is need of it. Indifference in the past seems to have been the rule rather than the exception, although the fault may have been due as much to the selling agent as to the manufacturer.

The average automobile purchaser injures his car during its first two or three months of use far more through ignorance than anything else, but this ignorance might be avoided if the purchaser were given the careful instructions and the general oversight to which a purchase of this magnitude is entitled. Such instruction and oversight on the part of the manufacturer or salesman are both good business policy and good business principle.

What to the demonstrator or the salesman may seem to go without saying, or be assumed without thought or consideration, may need impressing upon the purchaser again and again. Facts or knowledge which to the experienced driver may be instinctive are likely to be overlooked by the novice who has quite a number of things to bear in mind at the outset. Most of us can carry two or three new things in mind quite readily but when the number is multiplied by two or three something is likely to be forgotten and that forgotten thing may be of the utmost importance.

A dissatisfied purchaser is not a good advertisement for any car, and a badly running car or one undergoing repair by the roadside often creates a wrong impression. Either is liable to interfere with future sales.

Practically the same situation exists in relation to repair parts or replacements. The owner of a car values, at far more than its cost to the manufacturer, the ability to get repairs or replacements promptly. But the car owner often assumes a somewhat unfair attitude in relation to the cost of some simple part. It may not cost to produce it, any more than it costs to manufacture a stock bolt or tool that is of general utility, and which is on sale at every hardware store, and he often expects to pay no more for such parts. But of course this is unreasonable. He goes to the hardware store for a common bolt and the clerk hands it out to him as he does to many others. But in the case of the special automobile bolt or part he sends for it by mail; the clerk for the manufacturer goes to the stock room to get it, wraps it up, addresses it and it is forwarded by mail or express. It is thus easy to see there is little comparison between selling articles of general use over the counter and forwarding articles of limited use by mail or express, as stated.

It is a question solely for the automobile manufacturer to decide as to whether he should sell such small parts at cost or less than cost and thus please his patron and possibly gain a "booster" for his firm and his car, or make a purely business cost-and-

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profit transaction out of it, and perhaps thus create a "knocker."

In our opinion, the manufacturer, in consonance with good business policy, should sell parts or replacements at the lowest possible price. We have in mind one firm—not an automobile manufacturer—which makes a very large profit from the selling of replaced parts to the machines they manufacture. But this refers to a machine of far less universal use than the automobile. Possibly in this case their policy may be a good one, although they rest under the imputation, just or unjust, of purposely making parts of poor quality so that they must be renewed frequently.

THE RATIONALE OF SOUND.

Automobile signals should be loud enough to attract the attention of the somnolent as well as the alert, and it is astonishing how many of the first-named may be found in the public highways and streets. To do this invariably, a lullaby is ineffective. The signal should be as striking and forceful as is necessary to meet the desired purpose. Yet it is well enough to understand that it is a mistake to imagine such a signal is only for the protection of the driver using it. If self-protection were the only reason for a law requiring such signals to be used, such a statute would not nor should not have been enacted. It is not the business of the State to protect individuals against themselves but against others.

Many seem to imagine that the signal means, "Get out of the way; I'm coming." It means nothing of the sort. One person or vehicle has as much right to occupy the highways as another. The strongest and swiftest vehicle has a far greater responsibility than the weakest and slowest. The strong and swift almost invariably act upon others, while the slow and weak are as invariably the objects of such acts.

But that matter need not be gone into here. The important fact is that a warning automobile signal should be loud enough and startling enough to invariably attract the attention of those whom it is intended to warn. The quality of the sound has nothing to do with it, one way or another. The screech of a locomotive whistle is not pleasant to the ear, but as it is necessary no one is inclined to find fault with it.

In fact, no necessary sound is offensive to rational and reasonable ears, while any sound whatever that is unnecessary may be offensive. The hum or clatter of machinery, for illustration, means industry—the performance of duty and of necessity—and no one has a right to object to it. If it be offensive, let the offended take himself away from it and not expect that the sound to be taken away from him.

The ringing of church bells is no longer necessary, and consequently this sound may be objectionable. It was instituted when there were few clocks or watches in order to indicate that it was time for public worship to begin. But now that clocks and watches are about as free as water and as common as air, clanging church bells ought to be prohibited. They are often positively harmful to the sick, and there is no more reason why church-goers should be notified that it is worship time than theatre-goers should be notified that it is theatre time.

Although fire alarm bells are louder than church bells, no one has a right to object to them, for they serve a useful purpose in the smaller cities and towns. So likewise, a loud voice is not objectionable when addressing a deaf man, but when addressed to one who has good ears it is decidedly offensive. A loud voice in the pulpit or on the platform is necessary; when used in the home a well-modulated voice—which can be easily cultivated—is the only sort of a voice that should be borne without protest. The whistle of a boy when out-of-doors, and "for want of thought," is pleasing. The same whistle in a business office should cause him to be impelled through the door or window.

Thus it will be seen that sound has its time and place. An automobile signal sounded unnecessarily is an abomination, but at the proper time and place no one has a right to object to it, and its quality must be that which will best answer the purpose for which it is desired.

AHEAD IN EXPORTS.

False impressions are as thick as "leaves of Vallombrosa." Often they are acquired through correct information, but no note is taken of a change in conditions or facts, and soon we are confronted with contrary statements which we do not readily credit.

For instance, it is the prevailing opinion that the exports of this country to South America are a mere bagetelle compared to those of Germany and Great Britain. On the contrary, the United States exports more merchandise to South America than does any other nation. To-day, of course, we export to the Latin-American countries far more than both England and Germany, but our exports exceeded either before the war began. For the year 1913, the latest year upon which figures are available, the exports to South America from the United States were $325,837,345; from Germany, $217,967,202; from Great Britain and Ireland, $322,228,073.

It may be remarked that the export trade of Great Britain has been acquired by high quality and durability, that of the United States by improvements in construction and lightness as well as gracefulness, and that of Germany by cheapness and often at the expense of quality.

UNJUST CHARGES.

There is a crying need here in the East for some good country hotels for automobile tourists in which wholesome and well-prepared food is served, where there is no flunkeyism, and where old-fashioned hotel hospitality abounds at fair prices.

When a man and his wife with a car are charged from $8 to $10 for a night's entertainment, including supper and breakfast, it is altogether unreasonable. There seems to be a feeling in many such hostelries that every man who drives an automobile is a Croesus, and that as he is liable never to see him again, it behooves the doughty "innkeeper" to relieve him of as much cash as possible. We have found that as a rule it is wise to keep out of "inns." Just a plain every-day hotel is good enough, and if there were any in these "up-to-the-minute" days, just a plain old-fashioned tavern would be attractive.

And the same situation prevails in relation to garage and repair places in the country districts. The writer of this has paid 25 cents for making a simple adjustment of a spark plug in one case, and

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$1 in another instance for doing absolutely the same thing. In either case a pair of pliers and three minutes' time was all that was necessary to do the job. In passing it may be remarked that it is well to renew a pair of pliers the moment they have been lost or stolen.

Evils of the sort mentioned are not invariable, but they are so common that it is hoped their victims will not shrink from mentioning them.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

While Racing with a Train.—Two persons were killed and six injured at Columbus, Ga., when an automobile which was being raced with a train was struck squarely in the middle by the locomotive at a crossing. It was hurled 300 feet and totally destroyed. Some of the passengers were thrown so far that they received little injury except bruises and cuts, but two were killed and another probably fatally hurt.

Kills a New Owner.—A man was instantly killed at Caro, Mich., while driving a new automobile across a bridge. He seems to have lost his head and in some way the car speeded up, going from one side of the road to the other until it upset. The victim's neck was broken.

Crashed Through a Barn.—A farmer near Holland, Mich., met instant death when he lost control of his car and it dashed through the side of the barn. It fell some 15 feet to the ground on the other side of the barn and broke the neck of one of the occupants. The other escape with little injury.

Three Men Hurt.—Near Saginaw, Mich., a car struck a hole at the end of a bridge and the driver lost control. It was traveling about 25 mies an hour, and when it left the road it crashed into a telephone pole, snapping it off and turning over three times into a deep ditch. It was completely wrecked and three men were very seriously injured.

May Be Crippled for Life.—While running at a slow rate of speed near Meadville, Pa., a car got too close to the edge of the road and went down over an embankment. Two women and a boy were in the car and they were all very much injured. One young woman may be crippled for life.

The Ubiquitous Cow.—In trying to avoid a cow in the road, which was being led by a farmer, the driver of a car went into a deep ditch, at St. Johns, Mich., and was suddenly killed. The farmer was unable to move the cow from the center of the road. Balky cows are of common occurrence, although probably they have no intention of being recalcitrant.

A New Oiled Road.—Near Watertown, N. Y., a driver of a car failed to see a sharp turn in time to diminish the speed of the car. The newly oiled road caused the machine to skid and it soon turned completely over pinning one young woman beneath it. It almost severed an ear from her head and she was otherwise bruised and injured.

Stalled on the Street Car Tracks.—At Waukegan, Ill.. a big touring car became stalled on the electric railroad when a street car was approaching at high speed. The adult passengers were able to leave the car and the children were tossed upon the ground. The collision was terrific and the touring car was damaged beyond repair, but there was little personal injury.

One Dead and Four Hurt.—A car struck a post on one side of a bridge over a railway track at Echo Lake, Pa., glanced off and plunged through a fence. It overturned and pinned the occupants under it, 25 feet below the road. The owner of the car was killed and the four passengers all more or less injured. The chauffeur jumped from the car and sustained only slight bruises.

Result of Lack of Attention.—Near Warsaw, Ind., two women were injured when their automobile rolled down a steep embankment. One of the women pointed to the spot where shortly before two people were killed, and the driver turned to look and his machine rolled over the bank and landed in the same spot.

Lights Fail on Dangerous Curve.—One man was killed and three injured near Medford, Oregon, when an automobile going forty miles an hour plunged down a steep embankment into a ditch. The accident occurred when the electric headlights on the car went out suddenly while it was rounding a treacherous curve. One man was thrown out and received a fractured skull and jaw from which he died, and the others were injured but will recover.

Defective Control.—One man was killed and another badly injured near East Peoria, Ill., when the driver lost control of the car and it ran wild and turned turtle in the ditch. One man was caught under the car and crushed and the other was thrown to one side. It is said that the steering gear was not working properly when the machine was purchased and was remedied temporarily at a garage only to again develop.

Turned His Head for Instructions.—A man and woman were killed at White Plains, N. Y., and another woman injured when the driver dashed around a curve and went down a 25-foot embankment. The woman received a broken neck and arms and the man's skull was fractured. It is stated that they were driving on an unfamiliar road and the driver turned his head for instructions from the lady, who was directing him from a map, and thus failed to see the sharp curve in the road.

Speeding in Dense Smoke.—Three persons were badly injured near Tulare, Cal., when two machines going at the rate of 30 miles an hour, entered a dense smoke, caused by grass fire from opposite sides, and crashed in a head-on collision.

Turned Too Quick.—A man was instantly killed near Sheridan, Mich., when his automobile went over the bridge into the river. The car was descending a hill at the foot of which was a bridge and when he reached the bend to the approach he turned too quick and sent his car over the embankment and was thrown from the machine with a force that broke his neck.

Struck a Dog and Overturned.—One boy was killed outright and the driver of a car died soon after an accident which occurred at Sacred Heart, Minn., when a car carrying seven passengers struck a dog and overturned. The other occupants of the car were injured.

Due to Reckless Driving.—Near White River Junction, Vt., a young man was killed and three of his companions badly injured when the heavy machine in which they were riding struck a bridge head-on and turned completely over. The occupants

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were thrown from the car and the rear wheel struck one young man, killing him instantly. So great was the impact of the car with the bridge that the engine and radiator were driven back under the front seat. It is stated that before the accident occurred the driver had been reproached by the passengers for his reckless driving and had asked him to let them out but he still continued his terrific pace.

Loses Control of Car.—In an effort to avoid striking a wagon which was approaching, in Johnston, Pa., a young woman lost control of the car she was driving and it struck a telephone pole, swerved to the right and crashed through an iron fence on the top of a retaining wall. The fence gave way and the car dropped ten feet to the street below. A young woman companion was pinned beneath, striking on the back of the skull and killing her instantly. The driver was uninjured.

Result of a Tire Explosion.—At Missoula, Mont., a girl was killed when a tire burst and the car overturned. Although the car was traveling at a moderate speed the sudden collapse of the tire cramped the front wheels and the steering gear snapped. The car plunged into a ditch and turned over. One young woman was killed and several were injured.

AUTOMOBILE ROUND-TABLE.

A New Idea for a Garage That Promises to Result in a Good Investment.

From G. D. Crain, Jr., Kentucky.—For the purpose of supplying storage and maintenance facilities to owners who are either too far from a regular garage or feel that the charges involved in their use are prohibitive, a new kind of garage has been evolved in a number of cities. The one to be described is located in Louisville, Ky.

The building is of concrete blocks, and is divided into eight separate, partitioned stalls for the reception of individual cars. The partitions are of 6-inch hollow tile. Each stall is equipped with electric lights and water, with a drain, and there is sufficient room to enable the owner to carry oil, tools and various supplies. In the winter the building is heated, connection usually being made with the heating plant of some nearby apartment house.

The building in question cost $1,400, and the gross income at $10 a month for each stall, is $960 a year. Taking off the necessary charges for light, water and heat, it is evident that there is enough left in the way of income to make the owner feel that he has a very good investment, especially as alley property, which would not be available for high-grade buildings of any other kind, is used. On the other hand, the autoist who leases a stall in an "automatic" garage of this kind gets good quarters, fireproof—even the roof is of concrete—and facilities for taking care of his machine at a cost which is not excessive.

Altogether, it looks as if there is room for a goodly number of such establishments in every city, especially in the suburban districts where garage service of the usual sort is not always available.

Safety First in Garages.

The report of a fire which not only destroyed the garage in which it was located, but all of the motor cars it contained, as well as several buildings adjoining, included the following paragraph:

"The fire was caused by a spark from a machine which Mr. Brents was preparing to take out of the building, igniting gasoline which had leaked on the floor from another machine. Mr. Brents, in trying to save the machine, narrowly escaped serious injury."

Carelessness about allowing gasoline to leak over the garage floor, in not cleaning up oil drippings, and in not disposing of oily waste and other dangerous refuse in metal containers, usually has a sequel something like the one referred to above. And inasmuch as automobile owners and other property-owners are likely to suffer, as much as the garage man himself, he owes it to the public to adopt every safeguard that offers itself.

The Touring Car That Stays at Home.

The automobile was introduced under conditions which evolved appellations which the current use of motor cars does not justify. Take "touring-car", for instance; would you call a five-passenger automobile, being driven by a contractor, who is incidentally hauling several hundred feet of hardwood flooring in the machine, and who is on his way to lay down the material in a suburban residence, a touring-car? That is what it is called, but the name does not suggest the service it is performing in the slightest degree.

Many an electric contractor and plumber have solved the problem of getting both men and material on the job quickly and easily by the use of a car larger than a runabout. The men are carried on the seats, and the material is scattered about on the floor, or tied onto the running-board, and perhaps stowed away between the fender and the hood.

The "touring-car" of high degree, which was purchased exclusively for pleasure, and spent most of its time on the broad highway, would probably have resented being put to such plebeian and everyday uses; and the business men who are using automobiles for this purpose are admirers of the touring-car for entirely different reasons from those which animated the first purchasers.

The Dealer and His Customer.

The other day an owner drove into a garage, where he was accustomed to have repairs and adjustments attended to, and told the proprietor about an unpleasant noise which the car made at speed above 30 miles an hour.

The dealer made an investigation and drove the car a short distance himself, later reporting to the owner that the trouble was caused by worn push-rods.

"I don't believe I'd do anything about that just now," he advised. "We would have to spend a good deal of time making the change, and the new parts would cost considerable. As long as the operation of the car is not interfered with, and the noise occurs only at a rate of speed which you do not frequently use, I believe I'd let it go until you have a general overhauling made, when the matter can be fixed up with much less expense."

Apart from the question of the correctness of the prescription in this individual case, there is no doubt that one of the reasons for the popularity of this dealer, and the way his customers stick to him, is that he never tries to force a job. If the work isn't really needed, he tells the customer so, and the latter realizes that the dealer is working for his interest as well as his own. That sort of attitude, the desire to be helpful, and not simply to make money out of

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the customer, is the sure way to make friends and permanent patronage for any kind of establishment, from a garage to a department store.

Arrangement of Curb Fixtures.

The garage which installs a gasoline station and an air compressor ought to have these arranged at the curb so that there will be as little congestion as possible among the automobiles which make use of them. Now and then one finds an instance of poor arrangement which so limits the number of those who can get gasoline and air as to seriously handicap the business. Sometimes a car which stops to get air will block the way to the gasoline tank, and vice versa, the result being that a great many customers pass on to the next station because of the delay that is involved.

In this connection it is worth noting that speed in handling gasoline sales has a lot to do with the volume of business taken care of. Inasmuch as the heavy end of the trade develops on Saturdays, Sundays and other special occasions, there is bound to be some kind of tie-up unless special provision is made to prevent it. One big dealer found that it paid him to replace one small gasoline pump with two larger ones, the latter being equipped with features which enabled the fluid to be dispensed much more rapidly than with the old fixture.

Moral Hazard of Autos.

Insurance companies are devoting a good deal of attention to the "moral hazard" connected with writing automobile policies covering fire, theft and various other casualties. The opportunity, or at least the possibility, of fraud and deception entering into the situation has been the subject of considerable discussion. The following suggestions of an automobile underwriter have been submitted to the companies:

"The name and address of every assured having an automobile loss should be reported to the companies, with the data regarding the nature of the loss. This would give a much needed line of information on the rapidly increasing moral hazard surrounding theft losses. There is a growing practice among certain classes of automobilists carrying theft insurance to report the loss of extra tires from their machines when they need a new set, as they would rather have the company pay for them than do so themselves. There is no possible way of establishing losses of this sort, and the word of the assured must be taken in every case.

"There is also an increasing practice of burning a car which has begun to show signs of wear, in order to obtain a new one without extra cost. Investigation of a number of claims shows cases where this method has been consistently practised by some assured. It is probable that in the great mass of detail handled by the companies this fact is being overlooked, but proper reports and checking up of automobile policies would perform the same function that the mercantile agency does for the fire insurance business, and it would seem that such a practice is equally as important to automobile writing companies."

To offset the latter statement, however, it should be recalled that the companies have a regular schedule of values at which automobiles are written, and it is usually well within the market value of the car of a given year. Consequently limiting the amounts written would seem to eliminate whatever moral hazard might be inherent, assuming, of course, that the correct model of the car were furnished to the agent. If it were found, after a loss, to be incorrect, the policy would be invalidated.

Burglar Alarm for the Garage.

This device is so constructed, as to give warning to the car owner in his home, whenever a burglar enters the garage, if by the window or door. In Fig. 1 is a diagram showing the device in use on the

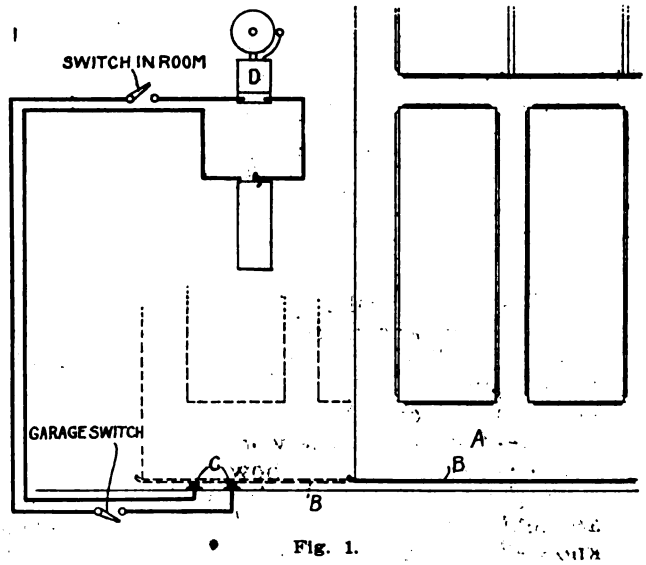


Fig. 1.

door. The door A, has a copper strip, B, screwed to the bottom, and extending the entire length of the door. When the door is opened this strip comes in contact with two copper posts C, and makes a direct electric current, and by doing so rings the bell which has a white letter D, painted on it. This indicates the burglar is entering through the door. In

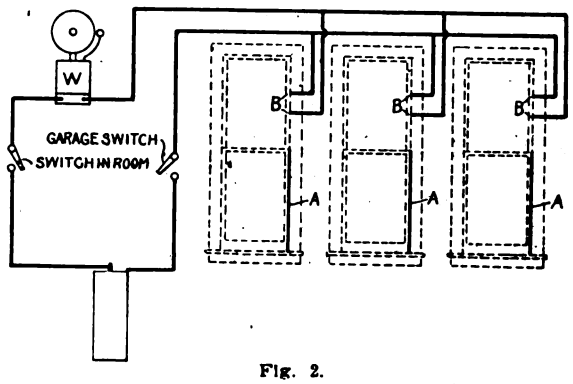


Fig. 2.

Fig. 2, is shown the diagram of the wiring of the windows, the operation being the same as the door. By raising the window the metal strip A, comes in contact with the copper posts B, making a direct current and ringing the bell with a white letter W, painted on the same, to indicate that the burglar is entering through the window. Both bells can be placed in the bedroom. By the slightest move of the windows, or doors, the signal is given, and the owner knows where to locate the intruder. There are two switches in the device in Figs. 1 and 2, to be let open when at work in the garage and closed when leaving.

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WORK OF CHAUFFEURS.

An Open Letter of Advice to Them by a Well-Known Physician.

Dr. A. F. Currier, a physician employed on the staff of the New York Globe, recently published in that newspaper an open letter to chauffeurs in which he said:

"There are many dangers connected with this business, and it is strange that where there are so many reckless and ignorant and stupid drivers, broken necks and broken homes have not been more numerous. It would appear to go without saying that a good chauffeur must be a good mechanic. He ought to know an automobile from A to Z, blindfolded or on a dark night; and as so much good brains is necessary to keep a complicated piece of fine machinery—which a fine car really is—in good condition, I cannot help wondering at the nerve of some men who call themselves chauffeurs and think they are competent to do this.

"I hope the legal requirements for a license will become more and more exacting, for that will be a long step in the way of getting a more highly trained class of chauffeurs. It ought not to be necessary to say that the chauffeur should be one of the most level-headed men in the world—like the engineer on a passenger train; yet how often you see a man driving a car who is so intoxicated that when an accident occurs he is incapable of using even such knowledge as he may have or of doing any mental work in the interest of his passengers and his car. It is equally necessary that his hands should be steady; yet I have seen plenty of chauffeurs who were cigarette fiends to such an extent that their hands were constantly trembling. I have been also told that many chauffeurs are victims of 'dope,' which is the very last thing they should touch.

"I would lay down as a cardinal rule for you that you totally abstain from alcohol and opium in every form and on every occasion; and because the cigarette is so seductive you would be far safer if you foreswore it altogether.

"But you will say, What is a fellow to do after he has had a long run—perhaps has been up most of the night and is wet and cold? Well, he does need something hot, and he ought to change his clothes and take a warm bath if he can; but he does not need whiskey or any other form of alcohol. Hot coffee will stimulate and stir him up far better, and diminish the chances of pneumonia.

"Many times the question has been asked whether the constant motion in a car is likely to cause displacement of the organs of the body. In case the car is not well protected with springs, or in the case of cars which travel over very rough country roads, I have no doubt this danger exists and that the stomach, intestines, liver and kidneys are sometimes displaced; but probably not more frequently than by the jolting of wagons over rough roads.

"The care of the eyes is a matter you are very apt to neglect, and it is of such importance that I feel you ought to be urgently cautioned about it. It does not seem to me that ordinary driving is any worse for the eyes than is driving in a carriage; but if you are going hard against the wind and the air is full of dirt and cinders, you can easily damage your eyes for the time, or even permanently. I would advise you, therefore, always to have goggles in your pocket, ready for prompt use.

"Riding fast against the wind sometimes develops pneumonia and other lung troubles. You ought to have your chest well protected always, and breathe through your nose. If you can't breathe with perfect ease in this way you should have your nose treated by a competent physician until you can.

"I suppose a majority of chauffeurs acquire the speed habit. It is natural, perhaps, as you ride along in safety day after day to accelerate almost unconsciously; but this is the first step to racing—and racing with automobiles is dangerous, very dangerous.

"It appears to me this is one of the things against which a good and steady chauffeur ought to be constantly disciplining himself. Your value depends on your intelligence and your skill. If you have the reputation of being dependable and ready for emergencies, I can think of no occupation which holds out much greater inducement to a thrifty man. And if you are careful always to preserve your health and your faculties, you are pretty sure of steady work throughout the working period of life."

THE LEGAL ASPECT.

Cases in Court That Point a Moral to Car Owners and Drivers.

Relation of Master and Servant between Driver and Owner of Automobile.—In an action for personal injuries, caused by being run into in a street in Providence, R. I., by the defendant's automobile, while it was being driven by one Angell, who was its only occupant at the time, the defendant denied that Angell was in his employ. Evidence for the defendant established the following facts: After the defendant bought the car he arranged with the directors of a Rhode Island corporation, operating mills at Greystone, in that state, of whom he was one, that the car should be maintained and its running expenses paid by the corporation; that it was thereafter used for the convenience of the corporation and its officers; that Angell was engaged by the directors to drive it soon after it was purchased, and he did drive it for four or five weeks thereafter; and that Angell was paid by the defendant, but out of the corporation's funds. The defendant lived in England; most of the stock in the corporation belonged to him or members of his family; he was its president and treasurer; he had come to Rhode Island with some of his family not long before the accident, and returned to England with them soon after it. While here he lived at a hotel in Providence. He bought the car because he wanted to go in it to and from the mills, the bank, etc. It was agreed upon as fair, between him and the other directors, that he should use the car to take his family about when it was not in use for the corporation, and it was used, while Angell drove it, sometimes for the purpose of the corporation, and sometimes when not so used, by him or his family for other purposes. It was held that his ownership of the car and Angell's general employment as his servant for the special purpose of operating it, at least warranted the inference that Angell was running it as his servant at the time in question, in the absence of evidence to the contrary. If, as a matter of fact, Angell was not then so running it, the fact

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should be peculiarly within the defendant's knowledge and the burden was on him to establish it. The question whether the car was being used at the time for the corporation's purposes or for his own private purposes, or by Angell for purposes authorized by neither, was for the jury.—Benn v. Forrest, C. C. A., 213 Fed. 763.

Collision on Private Street Railway Right of Way.—The Pennsylvania Supreme Court holds that where a street railway company operates a double line of tracks upon its one private right of way in the center of a public highway, above the level of the road and protected by a stone curb, it is not liable for injury to an automobile struck by a car while on the tracks at a point where there is no crossing. In its final analysis, the case was held to turn on the answer to the inquiry whether the testimony would sustain a finding by the jury, that the motorman had knowledge, or by the exercise of proper car would have known that the plaintiff's automobile was on the track in time to avoid injury to it. The case was a close one, but judgment for the defendant was affirmed.—Taylor v. Philadelphia Rapid Transit Co., 91 Atl. 631.

Evidence as to Depreciation in Value of Damaged Automobile.—In an action to recover damages for injuries to an automobile resulting in a collision, it was held that where the plaintiff has shown the cost and the expense of putting the machine in good condition, and the amount that he had spent for the use of another machine while his own was being repaired, he cannot be permitted to show by non-expert testimony that a motor car, after a collision, depreciates twenty-five per cent. in value, by reason of the collision. All persons do not have every day experience enabling them to testify as to the construction and repairs of automobiles. Nor do they have such experience enabling them to estimate the percentage of depreciation caused to an automobile by a collision, after the machine has been fully repaired and put in operation.—Stevens v. Adams Express Co., 55 Pennsylvania Superior Ct., 366.

Collision with Street Car at Crossing and Questions of Negligence for the Jury.—In an action to recover damages for injuries to an automobile, the following facts were shown by the evidence: The automobile approached a crossing at the rate of six miles per hour. The chauffeur looked and listened and saw an electric car about 160 feet from him as he neared the tracks. The machine did not take its gas as fast as it should and was struck before it cleared the tracks by the street car, which was going at a rate of thirty to thirty-five miles an hour. The automobile was hurled by the car eighteen feet along the tracks. It was held that the question of the Motorman's negligence and the chauffeur's contributory negligence was for the jury. A pedestrian or person about to cross the street, at a regular crossing, is not bound to wait simply because a car is in sight. If it is at such a distance from him, that he has reasonably ample time to cross, if it is run at its usual rate of speed, it cannot be said, as a matter of law, that he is negligent in going on. Judgment for the plaintiff was affirmed.—Dickley v. Southern Pennsylvania Traction Co., 56 Pennsylvania Superior Ct., 113.

Acts in Emergencies.—The driver of a horse, under the belief that a collision was imminent with an automobile 75 feet behind, jerked suddenly on the reins, causing the horse to fall. There was no misconduct on the part of the chauffeur, reasonably calculated to cause a belief that such action was necessary to prevent a collision, and it appeared that the owner of the horse was unreasonably frightened without cause. It was held that the owner of the automobile was not liable for the value of the horse.—Carter v. Walker, Texas Civil Appeals, 165 S. W. 483.

Evidence of Indemnity Insurance Inadmissible.—In an action for personal injuries from being run down by an automobile, through the alleged negligence of the defendant's chauffeur, it was held that the admission of testimony by the defendant on cross examination, tending to show that counsel appearing for him represented an indemnity insurance company, was error. The defendant's liability would not be affected by the fact that he was indemnified, nor did it affect his credibility.—Watson v. Adams, Alabama Supreme Court, 65 So. 528.

Injury to Automobile Passenger on Street Railway Track.—The driver of an automobile was trying to start his machine, which was stalled on a street railway track. A passenger in the automobile saw a street car approaching when it was 600 feet away; but, as the stalled automobile was in plain sight of the motorman, he thought it would stop and paid no more attention to it. The automobile was seen by the motorman when 600 feet distant, but he did not attempt to stop until it was too late, the car dashing into the automobile and seriously injuring the passenger. In an action for his injuries it was held that the general rule that no one need have warning of an approaching danger, which he sees did not apply here. The court properly submitted to the jury whether the failure to sound or give warning was the proximate cause of the accident, since, if the gong had been sounded, it would have notified the plaintiff that the car would not stop, and he probably could have leaped from the automobile.—Peterson v. United Rys. Co. of St. Louis, (Mo.), 168 S. W. 254.

Rights of Occupants of Unregistered Automobiles.—In Massachusetts, differing from the rule elsewhere, it is held that the occupants of an automobile which has not been registered according to law, are trespassers on the highway, and have no rights against other travelers, except to be protected from reckless or wanton injury. In an action for injuries received in a collision between an automobile and an electric street car, it was held that the defendant had the burden of proving that the automobile was not registered by law at the time of the accident—Dean v. Boston Elevated Ry. Co., Massachusetts Supreme Court, 105 N. E., 616.

Liability for Injury to Unregistered Automobiles.—In an action for injuries to an automobile caused by collision with one of the defendant's street cars, it is held by the Alabama courts to be immaterial to the defendant whether the automobile was or was not registered in compliance with the laws of the state, which required all automobiles to be registered. If the automobile was not registered, the owner might be guilty of a violation of one of the criminal laws of the state, but that fact in no way affected the general duty, which the defendant owed to the law, to so operate its cars as not to negligently injure the person or property of any person. The mere fact that the automobile was not registered had no

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casual connection whatever with the injury of which the plaintiff complained, and that fact in no way contributed to the injury to the automobile.—Birmingham Ry. Light & Power Co. v. Aetna Accident & Liability Co., Alabama Supreme Court, 64 So. 44.

Care Required Under Missouri Statute.—Action was brought for personal injuries caused by being run down by the defendant's automobile, which was being taken home in a damaged condition by his chauffeur, in obedience to his orders. The tire of the left front wheel had been taken off, owing to a puncture, and the wheel was running on the rim. The steering gear was worn. The chauffeur admitted that he saw the plaintiff in a reasonably sufficient time to have warned her or to have stopped his machine before striking her, and he said he did warn her, but did not stop. It was held that under Missouri Rev. St., 1909, ss. 8523, requiring persons operating automobiles along public streets to use the "highest degree of care of a careful person," to avoid injury to pedestrians, a chauffeur approaching a woman walking in the street ahead of him is required to stop to avoid striking her if he has an opportunity to do so and if he cannot safely pass her. Judgment for the plaintiff was rendered on account of the erroneous exclusion of evidence for the defendant regarding the cause and extent of the plaintiff's injuries.—Porter v. Hetherington, (Mo.), 158 S. W. 469.

Improving the Ford Car.

From N. G. Near, New York.—I have often wondered whether or not it pays to equip a Ford car with the many accessories made expressly for the Ford, and so I sought out two owners who have done about all they can do in changing such cars into something entirely different. They have different carburetors, piston rings, ignition systems, spark plugs, shock absorbers and other additions and attachments. If the Ford can be improved, I thought, these men should be able to tell me.

The first man I asked said, "Take it from me, if you buy a Ford, leave it just as it is. Don't change or add a thing. Every time I make a change my car seems to do better for a while, but in time it is worse than ever, and when I run it into a Ford repair shop the repairman blames the 'new device.'" I then asked this man if he was much of a mechanic himself. His reply was, "No, I tinker around a whole lot, but when it comes to making really fine adjustments and doing the vital work I am not there. I am dependent upon the shop repairmen."

The second man's story was entirely different. He found that most of his changes had proved beneficial. The addition of a more expensive and better carburetor and the installation of leak tight piston rings saved gasoline; the ignition system was better; the spark plugs better; and so on down the line.

"Do you do your own repairing, cleaning and adjusting?" I asked. "Yes, every bit of it. I am a mechanic, have a good shop in my garage and seldom need outside aid at all."

To me these replies seem logical and conclusive. Some men can actually better the Ford car. Others cannot do so. It all depends upon the man or the repairman to whom the owner entrusts his car. I do not doubt but that some and perhaps most repairmen give their patrons a "square deal." In other instances, as above, the owner is entirely at the mercy of a crooked repairman unless he himself is an expert mechanic.

PROOF OF IMPROVEMENT.

Mr. Near Comes to the Defense of His Coasting Test.

From N. G. Near, New York.—With reference to F. L. Angier's criticism of my contribution on "The Coasting Test," I wish to say a word about his statement, "the amount of work done on the motor and transmission in taking up the various parts, should have put the motor in such shape that when attempting to coast with the clutch engaged, if the rings were properly fitted and the valves were properly timed and ground it should not have coasted as far."

I do not doubt but that I would have been discharged had I been working on a regular commercial basis because I took special pains with this test car and consumed considerable time just to prove my point. It is well known that cars are usually "tight" immediately after overhauling because bearings are taken up just a little "too much," pistons are "too tight" and rings may be a little too tight. However, when they are all fixed "just right" there will be less friction than before, save in the cylinders.

In the cylinders, though, we have a rather peculiar condition to contend with, namely, by creating more friction and better compression at the same time it is possible to save power, in which case the car will coast farther. But, should this friction be great, as experienced by Mr. Angier, power will undoubtedly be lost and the car will not coast so far.

In cranking a car by hand it feels more difficult with good compression than with poor compression, and it is more difficult up to a certain speed. What that speed is depends entirely upon the condition of the engine. If a flywheel is placed upon the shaft the difference in power requirements is more easily felt, for the retarding force of compression is eliminated after the flywheel is well started. In a coasting automobile the car itself serves as a flywheel.

Experiments have been made on power required to crank motors at speeds from zero up. In one set of tests the cocks were left open, which is similar to the condition of an engine with a leaking, poor compression piston. In the other set of experiments the cocks were closed and compression was good.

At low speeds less power was required to crank the motor with cocks open, as would logically be supposed. But with increase in speed the difference in power requirements became less and less until the speed of 100 revolutions per minute was reached, at which point there was no difference at all. Above that speed considerably more power was required to crank the motor with cocks open. The effect of compression on a coasting motor car is therefore an open question and depends much upon the steepness and length of grade and other conditions as pointed out by the editor of this publication.

Power is always consumed in sucking air through a small aperture and forcing it out again. The greater the speed the greater the power consumption. Roughly, it varies as the square of the speed of the motor. By correctly fitting the cylinders with

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pistons and rings and stopping these leaks, lost power on this account is eliminated.

I beg to call attention to the fact that I said: "I took particular pains to make everything as smooth-fitting and frictionless as possible." The only thing I did to the pistons and cylinders was to lubricate and clean them.

Chauffeurs' Cramp.

From H. G. Scott in the New York Sun.—I desire to obtain, from persons driving their own automobile, from chauffeurs and from members of the medical profession, representatives of accident insurance companies, or others, any and all information possible as to "chauffeurs' cramp" of the leg, thigh or back, induced by the relatively fixed position of the leg when driving.

Details, too, would be valuable of any actual accident where such cramp was known to have caused accident or was believed to have been a factor.

No data on this subject seem available, and as it appears to be of importance I venture to ask the aid of your valued columns in obtaining the desired information from your readers.

(Note by the Editor.—The foregoing is the first we have ever heard of "chauffeurs' cramp" and any reader who has experienced anything of the sort we shall be glad to hear from him with particulars.)

The Hickey Condenser.

In response to an inquiry in our June issue, a publication called "The Ford Family," states that the Hickey condenser is handled by a firm of that name, of 22 Battery Street, San Francisco, Cal. It is stated that this device prevents overheating of the motor and is easily attached to the radiator.

A Ford Car Trailer.

It is well known that the Ford car has power to propel more than the chassis can safely carry. For this reason and the fact that the Ford body has not sufficient room to carry bulky loads a trailer attached to the chassis has been used successfully, and the following illustrations will give an idea of its construction. In Fig. 1 is shown an express body, 9 feet 6 inches long. In Fig. 2 is shown a farmer's wagon, as a trailer on the Ford. The fifth wheel, which is located at the rear of the chassis, is shown clearly in Fig. 3 at A. It consists of a bed plate, B, to which is fastened two bearings, C. A shaft, D, is mounted in two bearings, E, and runs through the bearings, C. The bearings, E, are mounted on two T irons, F. The construction of this designed fifth wheel allows for a rocking motion, which is necessary, as there is a downward and upward motion on the rear springs of the wagon body or trailer. At G is shown the Ford chassis spring, and the chassis frame, H, to indicate the location re-

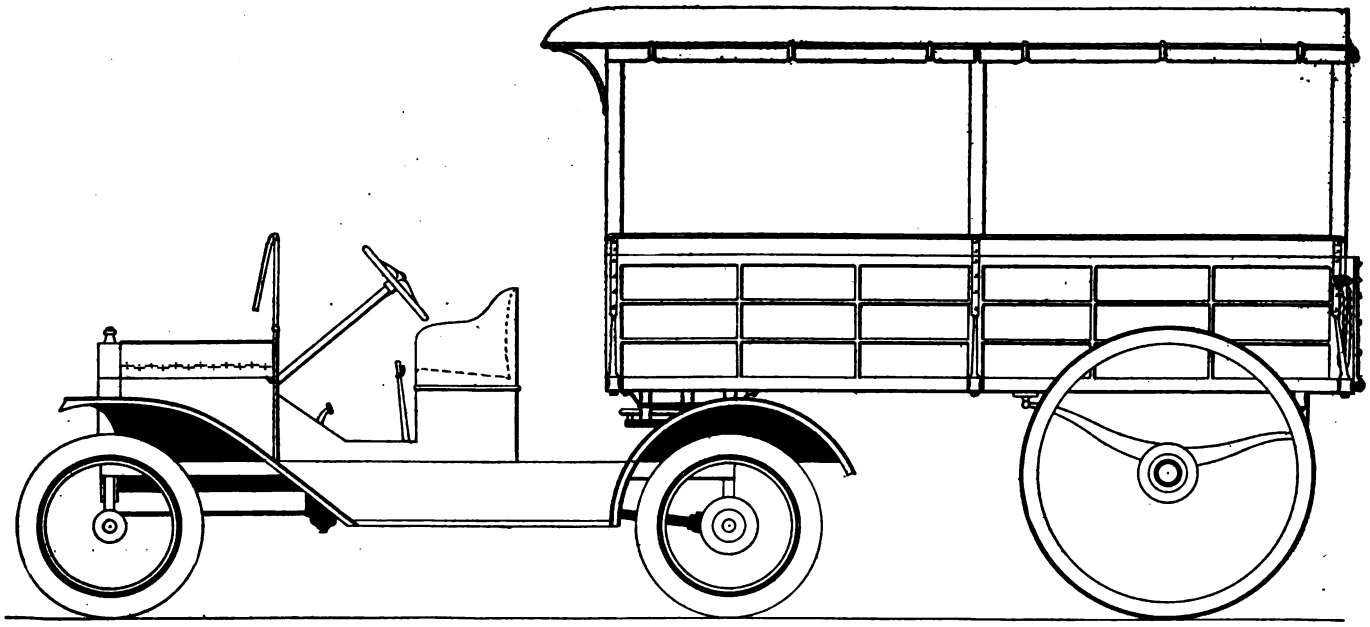


Fig. 1.

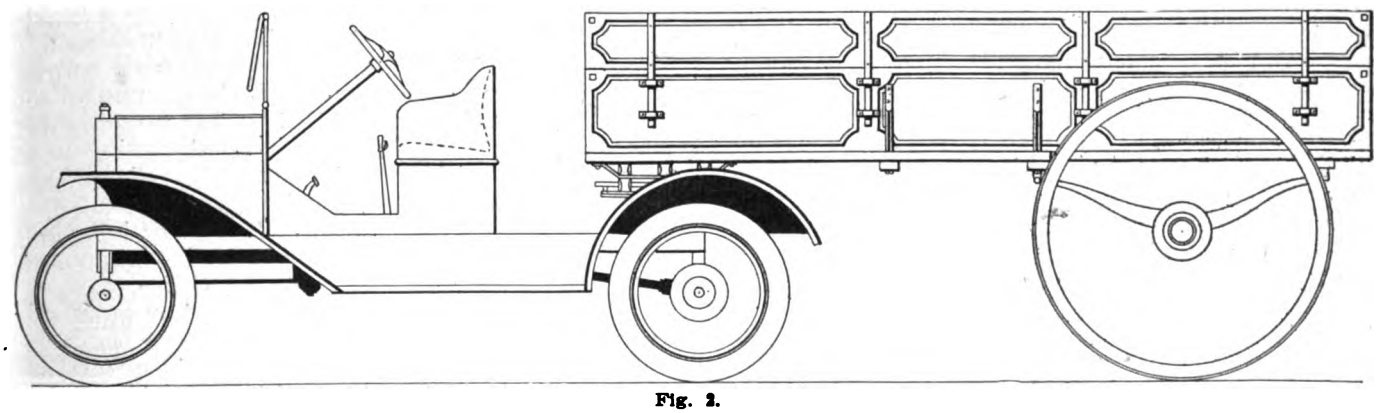


Fig. 2.

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quired in this construction. The seat of the driver must be well forward to allow clearance in turning.

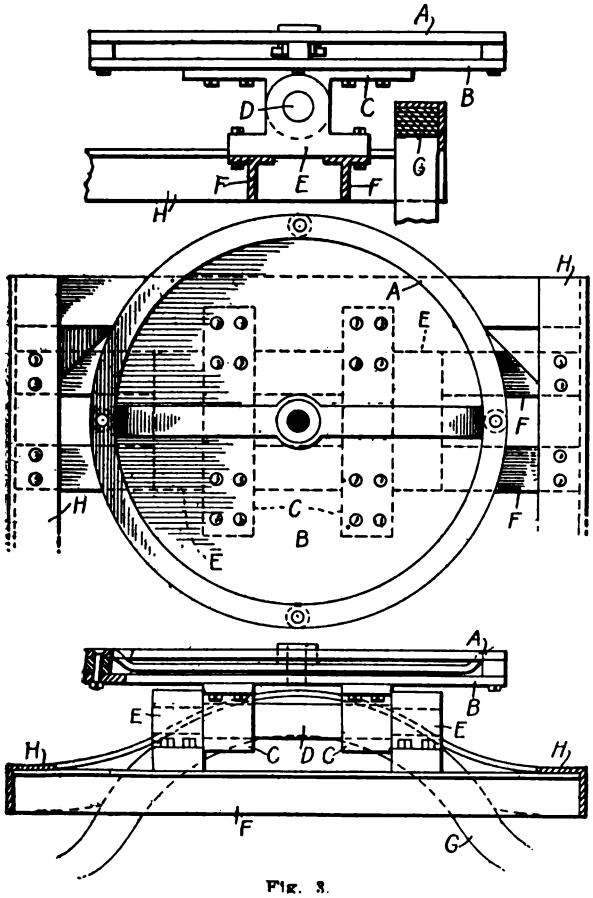


Fig. 3.

In the design shown the Ford chassis can turn at right angles to the body of the wagon.

THE FUTURE MAGNETO.

F. B. Williams Before the National Gas Engine Association.

Several years ago I was studying the engine catalogue of one of our progressive manufacturers. As usual I turned to the very last page to see what was stated thereon, regarding their magneto equipment. Here I found the following statement: "A magneto is a small electric generator that runs at a very high speed and generates enough current to fire the engine. Batteries are used for starting and after the engine is up to speed the switch is thrown over on the magneto. We recommend a magneto as it is a good thing and when it works it saves batteries. We can furnish this magneto for the small additional charge of twenty dollars." This was a step in the right direction, and the type of magneto referred to was superior to the hot-tube ignition, which is now obsolete.

In discussing the present-day magneto, of course, we will consider separately the make-and-break and the jump-spark. We will define the make-and-break as ignition in which the source of current is of such low voltage that the spark must be produced by a mechanical break of a closed circuit; this break taking place at the point where the spark is desired; that is, in the combustion chamber. We define the jump-spark as the development of a current of sufficiently high voltage to jump between two fixed points in the circuit known as the spark gap.

We will not enter into a lengthy discussion of the merits of the two systems. It is not worth while to try to make a Methodist out of a good Baptist, or to convert a good Baptist to the Methodist faith. Note that I have used the adjective "good" in both cases. If the best apparatus obtainable is used for either make-and-break or jump spark, results which are perfectly satisfactory can be obtained.

In analyzing the instrument necessary to produce an electric current, we must consider a few fundamental principles. A current can be produced by generation or by induction. An electric current is generated when a conductor revolves in a magnetic field in such a manner that its coils cross or cut the lines of magnetism. A current is induced when the magnetism of a core around which a conductor or coil of wire is wound is suddenly reversed, or when the core of a coil or armature is suddenly magnetized or de-magnetized.

A magnetic field can be produced by an electromagnet or it may exist in the form of a permanent magnet or magnets. It requires a certain amount of current to form an electro-magnetic field. In the old generator or dynamo form of instrument the current produced by the generator itself had to make its own magnetic field. This is the reason that a direct current "dynamo" magneto has to be driven at such a high speed before it generates enough current to fire an engine. It is like pumping water from the bottom of a deep well when the pump is "run down." You have to pump a long time before the water "comes."

In a modern magneto the magnetic field is in the form of permanent magnets, the use of which make it possible to produce a current at much lower speeds.

To produce a good current in a modern magneto, the parts are so arranged that the armature or the core of the coil has its magnetism reversed or suddenly raised or lowered by a change of its position relative to the magnetic lines which are produced by a field of permanent magnets. This is exactly what takes place when the armature of a magneto of the conventional form is turned one-half or even one-sixth of a turn.

In a direct current generator it is necessary to commutate the current. A considerable number of coils are revolved in the magnetic field, each coil is connected to a separate segment of the commutator. Two or more brushes are applied to the commutator in such a manner as to keep the current flowing in a constant direction; hence, the term "D. C."—direct current. This would appear to be a good feature as such a magneto does not need to be timed; but this advantage is more than offset by the inherent source of trouble in the commutator. Brushes stick or wear out and the commutator becomes coated or gummed up with a substance which shorts between the segments. This condition impairs the efficiency of the instrument. The necessity for high speed and the limited output at low speeds resulted in the introduction of governors, which are a source of trouble. The logical application of this governor was to use a friction drive against the flywheel. The unreliability of this entire system is now so well conceded that the use of the direct current friction drive magneto, except as a makeshift on old engines for which better provisions have never been made, has become almost a thing of the past.

The better and later practice in low tension design

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is what is known as the alternating current magneto. Instead of using a number of coils and commutating the current, a single winding is used. In this there is generated or induced two distinct waves of current, one positive and one negative, during each revolution of the armature. These current impulses are very much stronger in proportion to the armature speed than the current produced by a direct-current magneto. Instead of commutating the current, a permanent contact is made between the armature winding and the fixed collector. The fact that the commutator is not required makes it a simple matter for the skillful designer to make a collector that is entirely free from trouble. There are thousands of these machines in service where the collector is so simple and efficient that it requires no more attention than an engine flywheel.

We stated that this type of magneto produces two impulses of current each revolution. This being the case, there are two positions of the armature in each revolution where there is no current. The cycle of current output of an alternating current magneto is so suddenly built up from a neutral point to the point of greatest current value and then to gradually die down to the zero point; this cycle being repeated every half turn of the armature.

If current was required during an entire revolution of the engine flywheel, this type of magneto could not be used. Fortunately, a spark is required at a certain point only; during each revolution of the engine on a two-cycle motor, and during every second revolution on a four-cycle motor. It is therefore simply necessary to so time the magneto armature that a current impulse is available whenever it is required. This is the reason for driving an alternating-current magneto in timed relation to the engine and it accounts for the familiar term "gear-driven" or "built-in" magneto.

The modern alternating-current "gear-driven" magneto for make-and-break, therefore, consists of the following parts: A substantial housing or structure which supports permanent magnets and carries end plates with supporting bearings for the armature. Permanent magnets properly fitted and secured to this structure. An armature that is mechanically substantial and so proportioned and constructed as to give the best results electrically. The armature winding and means of conducting the current from this winding to a fixed terminal. Marks exterior to the instrument whereby the position of the armature relative to the frame or magnetic field may be determined at a glance.

Simple as these details may seem, there is a great difference in the magnetos offered; each said to be the best that the market affords, and said to last as long as the engine. Some of these differences are apparent to the man of ordinary training, while others can only be determined by special tests.

Take the question of magnets. It is conceded to be possible to make a magnet that is absolutely permanent. It should be made of tungsten-alloy steel, properly proportioned. Its shape should conform to certain established laws; while the heat treatment of this steel is of the greatest importance of all. The first item depends on the skill and the reliability of the steel manufacturers, and the thoroughness with which he is checked by chemical analysis and inspection of the finished product. The proper form can be determined at a glance. The use of straight bars for magnets or U-shaped magnets having a width of span practically equal to their height should obviously be avoided. A magneto may show a high reading on an ammeter or voltmeter and a good spark at the "peak of the wave," but may lack in current range. Such a magneto may have to be timed so accurately that it will give good satisfaction in the hands of the user.

In selecting a magneto it is well to look at the general reputation of its manufacturers and the success that they have attained. In making tests, two important items are: successful operation at low speed and the range or the amount a magneto can be "out of time" without materially affecting its operation.

The perfection to which this type of magneto has been developed and its great popularity due to its perfect success, when used in connection with an igniter of proper design, is one of the striking improvements in stationary engine ignition during the past few years. There are manufacturers who use this type of magneto exclusively on engines of all sizes for starting as well as running. Many are also using, in competition with batteries, magnetos of this type on small engines where it was formerly considered necessary to use coils and batteries in order to keep down the cost.

We have just referred to igniter design, and it may be instructive at this time to mention briefly one important point in this connection. Too much emphasis cannot be placed on the need for thorough insulation of the stationary electrode of a make-and-break igniter. Careful tests have shown that the "kick," when a make-and-break circuit is broken, is about ten times the normal voltage. That is, a battery circuit of six volts will jump up to sixty volts, and a thirty-volt magneto circuit will jump up to three hundred volts. One of the worst failures that has been recorded in connection with alternating-current magneto ignition occurred where a firm attempted to use a high voltage magneto on a kerosene engine with a poorly insulated igniter. Some magnetos of this type were originally used to produce a current of 100 volts. This practice has been changed. The matter of determining the voltage is a compromise between a low voltage that is easy to insulate, but is hard on contact points and the high voltage winding which gives a better spark at extremely low speeds. Current practice is to wind a medium size magneto so that it develops about 30 volts, and some very large magnetos are wound to develop as high as 60 volts.

In designing an igniter, the problem, therefore, is to insulate against a pressure of from 300 to 600 volts. No matter how strong the current is at this source, the quality of the spark is determined by the amount of current in the circuit where it is broken at the contact points. A leakage at the igniter or a partial short may greatly lessen the efficiency of a spark even from a battery; and it is evident that a magneto requires the best of insulation.

There has been a tendency among engine manufacturers to improve their insulation and a considerable number of them have adopted the N. G. E. A. method. This insulation will withstand the current from a high-tension magneto, that is 20,000 to 30,000 volts, and the writer has never heard of insulation trouble where it is used. It is to be regretted that a large number of engine builders hold up their hands at the suggestion of a change of this

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detail, disregard the advantages of standardization and refuse to make this improvement.

We will take up the subject of oscillators as used in connection with both make-and-break and jump spark.

There is nothing radical or new in this method of ignition. Oscillators have been used in Europe for a great many years. In high grade expensive units their history in this country dates back much farther than most people are aware of.

The principles involved are exactly the same, so far as the production of current is concerned, as those used in rotating magnetos; a change is the relative position of parts which causes a rise, a fall or a reversal of magnetism in an iron core around which is wound a coil of wire. Springs are employed in order to produce a quick throw of rotor or inductor. Energy is stored up by a gradual extension of the springs and the instrument is so designed that when the oscillator trips and the parts are thrown back to normal position, a sudden impulse of current is developed. The quick movement that is obtained by this method makes it possible to use an instrument that would be of no value when used as a rotating magneto except when driven at a very high rate of speed. In other words, the oscillator method of generating a current produces the necessary current value independent of the speed at which the motor is driven. It is in this respect that oscillators have a certain advantage on large engines.

I might state that the only excuse for the use of an oscillator is the fact that large engines can be started on them more readily than on a rotating machine unless special means are employed for tripping the igniter by a backward throw of the engine. The apparent advantage carries with it certain inherent weaknesses. The use of springs with the strain and jar which their action involves produces an element of wear much greater than a smooth rotating motion. This is particularly true when the entire strain of the springs is carried on the oscillator itself or is transmitted through the armature or rotor. It is only recently that a new application has been developed whereby the strain is carried on heavy arms and studs that are built onto the igniter. This new detail removes one of the most serious objections to an oscillator and is a long step towards its perfection.

Another feature I might mention in connection with an oscillator is the fact that its current wave is necessarily very sudden and of short duration. In order to utilize this current on a make-and-break igniter, the mechanical connection between the oscillator and the movable electrode must be direct and positive. In order to take care of wear on contact points, it is customary to make this connection adjustable. The current belief that it is easier to time an oscillator than a rotating magneto is a mistake. In fact, the opposite is true. The time element during which the current from an oscillator may be used is instantaneous and unless the contact points open at the same instant, you will not get a spark. This is especially true of that type of oscillator that produces a very short peaked wave. My previous remark regarding the advantage of a low tension magneto having a wide range is very applicable in this connection. A rotating magneto that has an efficient current through a wide range is a superior instrument when used as an oscillator.

The practice that is somewhat current at the present time of using an oscillator on very small high-speed engines, I believe to be a passing fad. There is a speed limit beyond which it is not practical to operate an oscillator. Again, what can be the excuse of using an oscillator on an engine so small that it can be started as easily on a rotating magneto as it can on a battery, when the rotating magneto costs less and is really more efficient than the oscillator usually recommended for this class of engine?

The high tension oscillator is a practical instrument, subject, of course, to the limitation above described. As the circuit breaker is built into, and is a part of the instrument, the matter of breaking the circuit at the proper time is more easily accomplished on a high-tension than on a make-and-break.

Summing up this phase of the magneto question: The oscillator has certain advantages in starting the larger engines. It also has disadvantages which recent developments have largely overcome. A successful oscillator and a well-designed plug entirely eliminate the use of a battery and is bound to grow in popularity. A magneto that is superior when gear-driven, makes a superior oscillator when properly mounted. There is no advantage or necessity of using an oscillator on a small high-speed engine. It is, of course, impossible to cover the entire field with an oscillator. On multi-cylinder work, it would be necessary to have an instrument for each cylinder. On heavy duty engines there is a growing tendency toward mechanical or air starters. These entirely do away with the need for the oscillator starting advantage. Two-cylinder tractors all carry rotating magnetos. For high efficiency, heavy duty work, the alternating current, gear-driven magneto has found a place that it will hold from sheer reliability and merit, even though a battery may be used for starting.

The principles involved in a high-tension or jump-spark magneto are the same as a low tension with the following additions: The primary current is stepped up or transformed into a current of a sufficient voltage to jump a spark gap. This is done by winding a secondary winding outside of the primary winding. A circuit breaker is inserted in the primary circuit and the sudden break in the primary circuit induces the high voltage current in the secondary.

The same relations exist between the high-tension and the low-tension magneto as exist between the jump-spark and the make-and-break coil. A high-tension magneto has the same parts corresponding each to each as a jump spark coil with the addition of the permanent magnets. In the high-tension magneto the instrument itself produces its own primary current and transforms it to the necessary voltage. If the magneto is designed for two or more cylinders, means are provided for distributing the high-tension current to the desired number of terminals. There is a so-called high-tension type of magneto that is simply a low tension with a circuit breaker and distributor, the transformer being a detached non-vibrating coil. These are less compact than the pure high-tension, sef-contained type. The pure high-tension magneto stands out prominently as the best ignition for high speed multi-cylinder work. Its success in the automobile field has established its popularity. This instrument in a certain conventional form, developed first in Europe and copied with minor modifications in this country, has for a good many years served well its purpose.

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Oversize Tires.

From E. F. Smith, Chicago.—Some time ago Dr. W. B. Stine of Iowa, asked about the advisability of equipping his White Thirty with oversize tires. While the writer is at present using oversize tires, and intends to continue to do so, his story is far different from the one told by Dr. Stine, before he put on the oversize tires, 2,000 to 2,500 miles being the average mileage, against about 5,000 now. The three most important considerations are cost, mileage, and convenience, and from any one of these three angles I cannot see where the doctor would profit by equipping his car with oversize tires. 32x4 tires have sold for $22.75 each; 33x4½ for $32.00 each. Counting five tires as the proper equipment for a car, one would have to obtain 6,300 miles on the 33x4½ tires to equal the cost per mile of the 32x4 which are giving 4,500 mile average. With the ever present element of accidental injury, it doesn't stand to reason that a tire can be expected to give practically double the mileage on which adjustments are based by the manufacturers.

The matter of convenience is even more to be considered. In any locality where there are cars using 32x4 tires, and that means nearly any way station in the United States, one can buy 32x4 tires out of stock, without a moment's delay. Outside of the factory branches, there are over 100 tire dealers in Chicago who carry a stock at all times. Not one of the larger dealers at the time of writing could furnish five 33x4½ casings, and only six have any tires of this size on hand. If this is the condition in Chicago, what can be expected in smaller places?

The parties that are obtaining an 8,000-mile average on their tires probably have better road conditions to contend with than Dr. Stine, probably cover double the mileage per season, and incidentally may have tire equipment which has a larger margin of safety in the way of excess carrying capacity than his 32x4 tires afford.

The Oil Throwing Axle.

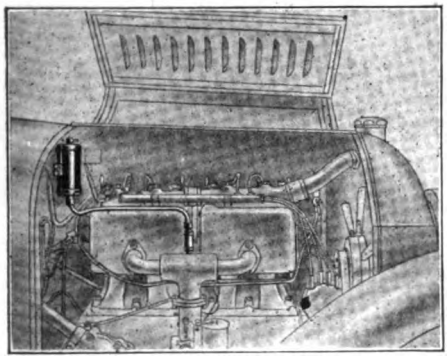
The following may be a cure: Take off the wheels; cut two washers, one for each wheel, out of thick felt, making them a fairly tight fit on the axle; push them close up to shoulder; replace wheel and screw up tightly. Use ordinary oil in the differential and this simple remedy completely cures the oil leakage. It is advisable to tighten the wheel again when the car has run, say, 300 miles. The washers will then be bedded in and should last up to 3,000 miles. As to the trouble entailed three-quarters of an hour is ample time for the complete job. This time he will save on the first occasion he washes his car.

NEW AND INTERESTING THINGS IN MOTORDOM

Starting and Lighting

Prevents Carbon and Saves Gas.

The Triplex Gas Economizer Co., 223 West 49th Street, New York City, has put on the market what has proven thus far to be a most simple and scientifically correct, fully automatic device, for removing carbon from motor cylinders, valves and plugs, and decreasing gasoline consumption. It consists of a brass tank carrying water, which is attached to the dashboard under the head and an automatic valve, set in the manifold above the carburetor where the gasoline vapor passes into the carburetor chambers, and flexible copper tubing connects the two. Its operation is ingenious, positive and effective. The tank construction is a copper tube covered with absorbent material passing down through the center with a water tight valve seat at its lower end. It is held closed by a spring at the top. There are two milled slots at the upper end of this tube, and four round holes in the top cover of the tank through which air is sucked over the water into the mixture at the manifold. This insures a constant supply of air of high humidity or moisture. It is mixed with the gas vapor in quantity proportioned to the speed and pull of the engine. To thoroughly clean the combustion chambers of carbon deposit, the engine is run at high speed until warmed up. By lifting the copper tube in the water tank by a lever in its upper end, and giving it a quarter turn, the valve at the bottom is opened and the water allowed to run to the warm combustion chambers where it is instantly converted into steam. The steam cuts and loosens the carbon which is discharged through the engine exhaust. At the end of this operation, which is not necessary except as carbon exists, the valve in the water tank is closed and the tank refilled. The manufacturers seem to be justified in claiming, after a year's test and operation of their device, that the constant mixture of moist air with the gasoline vapor thoroughly prevents the formation of carbon. No injurious chemicals are used. Moreover that the proportionately increased introduction, automatically accomplished, of air with the gas mixture, cuts down the gas consumption from 10 to 40 per cent. This, of course, increases the mileage per gallon of gasoline and is thus a saving in gasoline bills.



Triplex Gas Economizer.

Master Vibrator for Ford Cars.

Illustrated herewith is shown a master vibrator for Ford cars, made by the New York Coil Company. It will be seen that provision is made whereby the bracket may be shifted higher on the right hand side, which allows screws to find a solid foundation in a wooden sill provided under the upholstery. In this position the vibrator is readily accessible and does not take up any leg room in the car. Wires provided with connections are supplied, which enables the owner to make the proper connections to the magneto to secure the best results from both ignition and the lighting systems. All models put out are equipped with these additions so that they will fit either the old models or the new 1915 model, enabling the dealer to supply all models from one stock.



Master Vibrator for Ford Cars.

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Master Spark Plugs.

The Master Spark Plugs made by the Hartford Machine Screw Co. of Hartford, Conn., are built on the principle of quality first. This year they are featuring their Ford Special, a new model, having carefully taken into consideration the peculiarities of the Ford engine. It is of unusual length—putting the spark way down into the explosion chamber—and should prove a favorite with Ford owners. In addition to this model there is the regular length Master which has



Ford Special.

been on the market for somewhat over a year and is immensely popular, as well as the extra long—a plug designed for engines with extra thick water jackets, either automobile or marine.

It takes only a moment's observation to quickly note the finish, superior workmanship, quality of materials and a design which would serve to bear out the contention of the company manufacturing these plugs that they are absolutely leak proof, soot proof, and that the porcelain is as long lived as the steel shell.

Starting and Lighting Ford Cars.

That well known institution, the Westinghouse Electric & Mfg. Co., make an electrical equipment for starting, lighting and ignition for Ford cars that should appeal to all who want the best of service and the utmost reliability. Either the lighting and starting system, or the ignition system, or the lanterns will be sold separately if desired. The entire system consists of a motor-generator unit, battery and box, switches and everything necessary for installation. Dealers should address the Westinghouse Electric & Mfg. Co., Shadyside, Pittsburgh, Pa.

New Ford Timer.

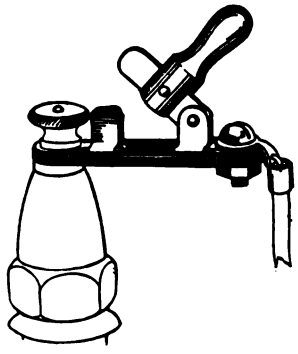
The J. & B. Improved Ford Timer, made by the J. & B. Manufacturing Co., Pittsfield, Mass., is guaranteed for life. It is self lubricating, and automatically cleans the contacts, which insures electrical contacts at all times, eliminating the inconvenience of removing and cleaning the contacts which has always been the case where the trolley rotor principle is used. There is positively no wear to this Timer. There are no pivets, rollers, or moving parts. The rotor is one unit and self-contained. With this Timer you get a wipe contact instead of a rolling contact. The contact is made by a low resistance composition brush which makes a positive wipe contact. There is also a felt wiper which travels ahead of the current pick up brush which positively keeps contacts clean at all times. The price is $2.25.

Connecticut Ignition for Fords.

A. J. Pickard & Co. has been appointed exclusive distributor for a new ignition system for Ford cars which is being placed on the market by the Connecticut Telephone & Electric Co., Meriden, Conn. This is practically the standard Connecticut Automatic ignition system with the necessary brackets and wiring. The dashboard switch incorporates the usual automatic kick-off but has two buttons in place of the usual three where a magneto is used. The system is intended for use only on Ford cars which are equipped with a storage battery for lighting. A feature is that only the switch appears on the dash.

A New Spark Plug Switch.

William J. Bailey, of Newark, N. J., is placing on the market a spark plug switch, which is illustrated herewith. With its use no other tool is necessary



For Testing Spark Plugs.

for testing out spark plugs. One person alone can test any number of cylinders and there is not the slightest danger of an electric shock. It will fit any spark plug and is positive and accurate in its work. It is guaranteed and the price is but 25 cents.

A Reliable Spark Plug.

The National spark plug is the result of both experience, experiments and a combination of the best material for the purpose. It is easily cleaned and practically indestructible. The manufacturers, the National Spark Plug Co., Sedalia, Mo., are looking for dealers to sell this spark plug and offer a liberal discount.

The Lighting Problem Solved.

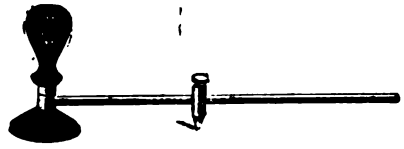
The Carleton generator which gives 7 volts, 49 c. p. direct current, means a steady light for automobiles with or without storage batteries. It has special brackets to attach to the Ford, Saxon and Metz cars, but is applicable to any car, motor cycle, boat or stationary plant. It is of high quality and the price is moderate. It is made by the Carleton Generator Company, 180 Summer Street, Boston.

A Fuel Saver and Lubricant.

The Chandler Sales Co., of Chicago, Ill., make a fuel saver and lubricator which increases the mileage in gasoline and gives a smoother and better running engine. It is a mechanical device and many who have used it have felt impelled to send to the manufacturers their high endorsement. It consists of a small valve arrangement to open into the intake manifold under the high suction existing at closed throttle and does not open on the extreme idle. Those interested should address the firm as above.

Cutting Your Headlights.

The man who has cars to repair can add to his profits if he will cut headlights himself. This has been made easy by special headlight circular glass cutters of the famous "Red Devil" make, as shown by the illustration. With its adjustable round steel rod and head, enam-



Red Devil Glass Cutter.

eled wooden base and handle, and a rubber mat on the base to prevent slipping, it will be found a handy tool, that pays for its entire cost practically every time it is used. It costs only 50 cents postpaid. "Red Devil" are the only glass cutters equipped with genuine hand honed steel wheels. The makers, Smith & Hemenway Co., 129 Chambers St. New York, think so much of the cutting quality of Red Devil Glass Cutters that each wheel for each cutter is individually selected and tested.

Diffuses the Automobile Light.

The use of a new device called Klearglow gives all the power of the lamps without the dangerous glare. It fits in any car and its merit has been proved in Europe where it was first invented. The firm manufacturing it has a business



No Dangerous Glare With This.

proposition for jobbers and dealers which they will be glad to give by addressing H. G. Paro, 743 Michigan Blvd. Bldg., Chicago, Ill.

Garage and Repair Shop

A New File.

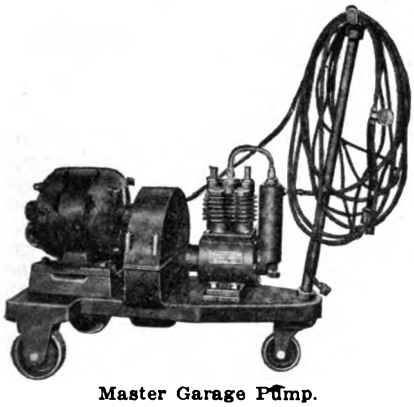
The Grobet vibrator file is well nigh indispensable to the automobile user or repairman. It has a screwdriver end, is of the highest quality and will be sent postpaid on receipt of 15 cents, or with a liberal discount to dealers. The manufacturers are Montgomery & Co., Inc., 105 Fulton Street, New York.

Master Garage Pumps.

Particularly noticeable among the garage pumps on the market this season are the Master Garage Pumps, manufactured by the Hartford Machine Screw Company, of Hartford, Conn. They have added two new models to their already complete line—Models W and Y. A close

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observation discloses a degree of workmanship and finish seldom attempted in the manufacture of machines of this kind, and selling at the low prices at which Master Garage Pumps are quoted. Model W is a two-cylinder pump which may be furnished either on a truck or stationary and is designed for use in the larger public garages where continuous demands are made for tire inflation and quick service must be delivered. It may be used either as a direct pump for supplying air directly into the tires or in connection with a compressed air tank installation in order to maintain a sup-



Master Garage Pump.

ply of air "on tap." This model is driven by a ½ h.p. General Electric Motor.

It is a large and powerful machine designed to stand the hard and abusive service to which a tire pumping machine is subjected in the large public garage and its simplicity and ease of operation make it exceptionally efficient and practically fool proof.

Model Y is a stationary belt-driven pump, built for garages which are equipped with a power unit and shafting. It eliminates the necessity of an extra motor and is a powerful pump, embodying the same sterling characteristics and quality as noted in Model W. The same general methods of construction and high quality of materials and workmanship obtain in every model. Each pump is fully equipped ready for use. The Hartford Machine Screw Company fully guarantee their pumps for one year and their success in marketing these pumps indicates that their quality is appreciated.

For the Motor

Light Pistons.

If you were going to try to most increase the speed and power of your car by reducing its weight somewhere, what would be the best place to do it? This question is easy enough to answer. It should be done by making the pistons lighter. With a given amount of reduction in weight, nothing would begin to so increase the power and speed of a car, and possibly it might not prove strictly accurate, but it would not be surprising if reducing the weight of the pistons one-half would increase the power of the motor very nearly that amount. These being the facts, the new Zephyr pistons ought to be unusually desirable. They are said to be half as light as the conventional type and this light weight is secured by having the material of the piston cut in and making it all hollow, except the head, while it is pierced with holes for further decreasing the weight. The manufacturers claim at least 25 per cent. more h.p. and less vibration of the engine, less tendency to overheat, reduced wear on bearings and less carbon and soot on the spark plugs. These are important considerations and although there is no space to go into the matter fully here, it may be stated that these pistons are being used widely abroad and will soon be in this country. For full information concerning these pistons for Ford or other cars, address the manufacturers, The Wridgway Co., Wilkes-Barre, Pa.

No More Piston Ring Leaks.

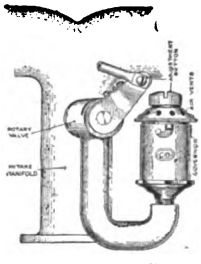
The Pressure Proof piston ring is sure to prevent leaking from any of the common causes, which are not only numerous, but oftentimes exasperating. It is self adjusting, does not wear loose, has an even tension and is guaranteed not to break. The spring expansion takes the strain and the cast iron rings do the packing. It means the highest efficiency on the part of the motor and is guaranteed by the manufacturers, the Pressure Proof Piston Ring Co., 3368 Washington St., Jamaica Plain, Boston, Mass. The company desires some responsible dealers and will be glad to send terms to them if they will write to the foregoing address.

A Guaranteed Carbon Remover.

The Hart-Bell carbon remover is made by the Utility Products Co., Times Building, New York. No chemical or acid is used, and it will remove carbon in less than 15 minutes. It conveys water from the outlet pipe to the inlet manifold and it is here converted into steam. This soaks into the carbon and gets under it, and it is thus worked out by the action of the engine. It not only removes carbon after it has been formed, but prevents it from being formed, and if found unsatisfactory the full purchase price will be refunded.

An Intake Valve Timer.

William J. Bailey, of Newark, N. J., is putting on the market an automatic intake valve governor and primer which will give more speed, a better mixture, and consequently more mileage to a gallon of gasoline. It is claimed likewise



Automatic Intake Governor.

that it reduces the carbonization, owing to the improved mixture, and that it gives more power for hill climbing. The cost is refunded if not found satisfactory. It can be used on all cars.

The Oscillating Valve Grinder.

Formerly, grinding of the valves necessitated having the car out of commission for a day, at least. As the expense was considerable and the inconvenience great, it was ordinarily neglected until the eleventh hour. The Oscillating Valve Grinder reduces the work to a minimum. Any novice can use it easily and quickly, with as satisfactory results as the experienced mechanic. It is a necessary adjunct to the well-equipped tool-kit; otherwise, the valves are almost certain not to be ground frequently enough to keep them gas-tight and the engine up to its highest efficiency. The accompanying illustration will give some idea of the



A New Valve Grinder.

simplicity of this valve grinder and how it is used. It is made by E. S. Michener, New Castle, Pa.

The Running Gear

A New Tire Valve.

Most car drivers are aware of the fact that a common trouble of ordinary pneumatic tires is that air is likely to leak out of the valve. The Henemier valve is said to keep the air in all the time and the valve can be put in or taken out without any tools whatever. It is simple in construction, and the manufacturers have so much confidence in it that they offer to send to the trade a small valve so that they can test its advantages. These valves are packed, 100 in a box and retailed for 5c each. For full information address The Riess Manufacturing Co., 1688 Broadway, New York City.

A Motor-Bearing Reamer.

The Martell aligning reamer is made by the Harding Distributing Co., 40 Court Street, Boston, Mass. This device saves more than half the time of hand-scraping motor bearings and does the work perfectly. It was invented by an engineer who knew just what was wanted and found just what he desired. Two sets are made, one for ordinary motors and another for small motors. For further information write for a new book which the manufacturers will send free of cost, giving information as to how to scrape bearings better and quicker than ever before.

Pulls Both Wheels.

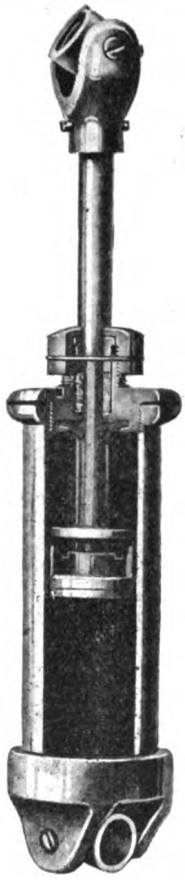
The M. & S. differential, which has recently been put on the market, insures a positive and equal pull on both wheels of the Ford car, and enables one to get out of any mud hole, or sand, or snow if one wheel has even the slightest traction. It likewise insures more mileage to the gallon of fuel and makes a better running car in every respect. The cost is only a trifle more than the regular Ford differential, and yet its advantages are

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so obvious that details are hardly necessary. It takes but a few minutes to install it. The manufacturers, the M. & S. Gear Co., 1036 Whitney Building, Detroit, Mich., are making liberal offers of a sample for use on Ford cars. They are satisfied that this will be the means of selling a good many others.

A Hydraulic Shock Absorber.

The M. S. Company's hydraulic shock absorber is suitable for light as well as heavy cars, and is simple, safe and reliable. There are no springs, or anything else, to break or get out of order, and if a tire blows out when it is being used, the danger is eliminated almost entirely. It needs little attention, will out-last several cars and can be transferred from one car to another easily. With it you can make a better average speed and drive a car better than ever before. The firm make a model especially for Ford cars and when once installed it quickly proves its merit. It is manufactured by the Metal Stamping Co., Long Island City, N. Y.



Simple, Safe and Durable.

The "Ster-A-Ford."

The Ster-a-Ford safety steering device on your car means safety all the time. It gives absolutely perfect control at all times, doing so automatically, without effort or assistance from the driver. You can drive your car with a free and easy mind, no matter how rough and uneven or how sandy the road. If deflected by ruts, bumps or any obstructions, it will return instantly to its proper course with no attention whatever from the driver. It will save many times its cost each year in wear and tear on your car. Prevents all wobbling of front wheels and thus effects a big saving on tires and casings. Your car will last longer, ride easier, cost less for repairs and your mind will never be harrassed by fear of accidents. It is made by the Modern Specialty Co., Racine, Wis.

A Ford Car Safety Steersman.

The Badger Automatic Safety Steersman for Ford cars is an absolute insurance against accident and will keep the car running in an absolutely straight course no matter what the condition of the road. It also relieves the driver from the fatigue of steering. It is sold on a money back guarantee. The price is low and dealers are wanted. Address the Safety Appliance Co., Baraboo, Wis.

A New Tire Holder.

The Auto Parts Company, Providence, R. I., manufacturers of the well known Apco line of specialties for the Ford car, which are sold with the unqualified guarantee of "satisfaction or your money back," has perfected a tire holder for carrying the extra demountable rim, wire or spare wheel. The new design resembles the side tire holder brought out this spring in that it is attached to the running board, a location making for convenience as well as preventing the wheel or rim from being covered with mud, etc. The spare member is supported by two brackets secured to the running board, and the third bracket consists of an ingenious clasp that locks automatically. The clasp may be locked to prevent theft of the rim, and the lock is rubber covered to prevent rattling. One of the qualities emphasized of the new holder is that a rim or wheel can be removed or replaced in five seconds. The Apco holder can be fitted easily and quickly by the owner, comes complete with all necessary screws, etc., and is finished in black enamel. Thief proof qualities are obtained by the clasp covering the screws when closed. The new holder accurately fits the Ford size of rims and wheels and retails for $2.

The Purair Tire Pump.

This does the pumping while you smoke, or read, or enjoy yourself in any other way. It may be installed by any one. It is simple and durable and when it has the tires inflated to the entire pressure, it goes off with a loud noise so that no further time is lost. It does the work in a minute or two, and as it inflates the tires properly, it means more mileage, more wear for the tires and less danger of blow-outs. It is made ready to attach, with single cylinders, double cylinders and a Ford special, or the entire outfit will be supplied. It is made by the Hert Manufacturing Co., 150 South Delaware Street, Indianapolis, Ind.

A New Puncture-Proof Tire.

A new puncture-proof tire called the Woodworth Trouble-Proof Tire is now being put on the market by the Leather Tire Goods Company. The non-puncturable strip in this tire is made of chrome leather instead of metal or other stiff material. It has long been known that properly tanned leather is practically puncture-proof but the Leather Tire Goods Company has succeeded in incorporating the leather in the rubber tire, thus producing a puncture-proof tire that is resilient and non-heating. These tires are guaranteed against punctures for 5,000 miles and the manufacturers agree to pay the cost of repairing tires in case they are punctured. The tires are made of combed Sea Island Cotton and very carefully inspected in the manufacture to prevent any possibility of defects. It is claimed for these tires that under ordinary conditions, they will average much more than 5,000 miles and if used with good tubes the user will be free from tire troubles. A new booklet showing Woodworth Trouble-Proof Tires and a number of other devices valuable to motorists has just been published and can be obtained by writing the manufacturers, the Leather Tire Goods Company, Niagara Falls, N. Y.

A New Outer Tire.

A resilient outer surface for a tire is more valuable and makes the car run easier than the average automobile owner imagines. The O'Neil outer tires cover the whole outside of the old casings, making them look as well as new and insuring against creeping and slipping. Neither sand nor water can get beneath them. They give both a good appearance and long service and the price is low. They are manufactured by the O'Neil Tire & Protector Co., Akron, Ohio.



O'Neil Outer Tire.

A Ford Car Steering Device.

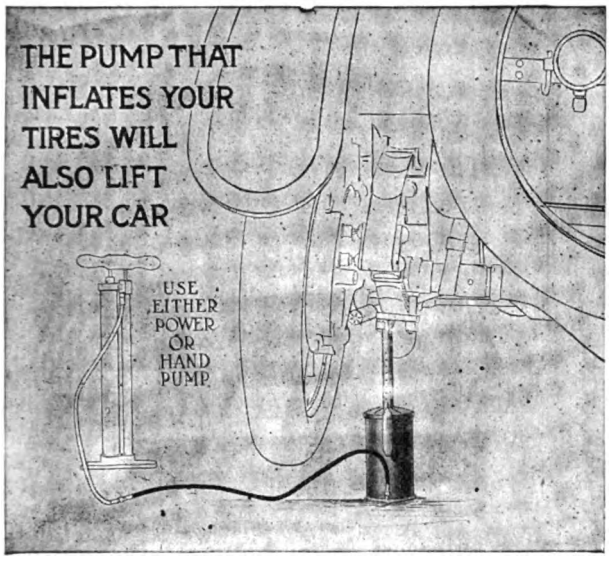
It is generally admitted that Ford cars, being light and having a short wheel base, are difficult to steer over rough roads. The Savidge steering device takes the wobble out of the front wheels, acting as a shock absorber on the steering, and very much increases the comfort and safety of riding. The manufacturers have an interesting proposition for dealers and as the price of this device is low it ought to sell rapidly. Address the Savidge Steering Device Co., 508 Murphy Bldg., Indianapolis, Ind.

More Floor Space.

Although the Kellogg Mfg. Co. of Rochester, N. Y., has been working night and day shifts the past three months, they have recently been compelled to make an addition of 15,000 square feet of floor space. This business, started seven years ago, has been steadily increasing. The entire plant and equipment is built around the demand for their engine-driven tire pumps, which the Kellogg Mfg. Co. has consistently and conservatively advertised. The increase of floor space from time to time, the introduction of special machinery and methods is an indication of the company's ability to take care of its customers. Plans are prepared for a larger plant and equipment, to be ready as needed.

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NATIONAL PNEUMATIC JACK



"JUST WHAT I HAVE BEEN LOOKING FOR"

—Is what people are writing us every day



HERE IS A JACK THAT WILL LIFT THE LARGEST CAR WITH NO WORK, NO DIRTY CLOTHES, NO "GETTING DOWN ON ALL FOURS" (like the man in illustration below).

THE "NATIONAL PNEUMATIC JACK" IS AS FAR AHEAD OF THE ORDINARY LEVER JACK AS THE SELF STARTER IS OF THE OLD CRANK.

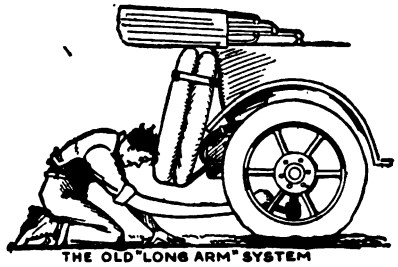
Just slip it under your car, attach either a hand or power pump to the end of hose, and up goes the heaviest car, AND STAYS THERE UNTIL THE AIR IS RELEASED. Has locking device for holding up car in storage. It can't slip. It won't sink in ground on account of its large base. You need not worry about long springs, rear tank, etc., being in the way. Five to ten strokes of ordinary hand pump will lift car. Order one for your old car, or specify that your new car be equipped with it.

Tell the agent he must furnish one with car—and he will.

Ten Days' Free Trial

Will ship one on trial, and if not satisfactory will refund your money. That's fair! Weight only seven pounds. Four inches in diameter, eleven inches high when closed, with six inch lift.

PRICE, by mail prepaid, $6.00

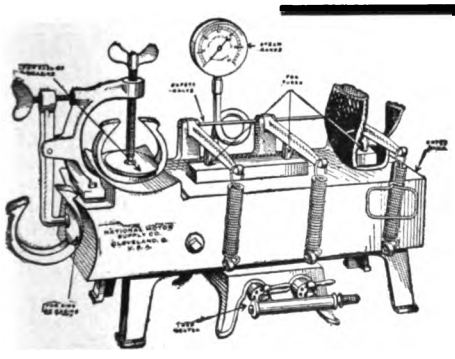


THE OLD "LONG ARM" SYSTEM
IS THIS THE WAY YOU WORK?

Garagemen

This is the jack for you. Just stick on air line hose, raising car instantly, with no slipping, skinned knuckles or hard work. Earns its cost in time saved. Nothing to wear out or get out of order.

Get the agency in your town.



GARAGE AND REPAIR MEN, LOOK!

Thousands of garage men all over the world are making big profits with the

NATIONAL GARAGE STEAM VULOANIZER

Vulcanizes three tubes and two casings at a time. Heated by either gas or gasoline. We have made this machine without any change for six years, which shows how satisfactory it is. You might as well have the big profits for vulcanizing in your vicinity. The National is the easiest and cheapest machine to operate on the market.

LIST PRICE, $60.00

Write for full details and discounts. A card will do.

MANUFACTURED BY

THE NATIONAL MOTOR SUPPLY COMPANY

Main Office and Factory
5637 Euclid Avenue, CLEVELAND, OHIO

TRADE HIGHEST QUALITY MARK NMS CO

Branch Office
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New Era Shock Absorber.

It should be understood, and probably is understood, tnat the New Era shock absorbers are made suitable for use on all kinds of automobiles, as well as for Ford cars. No matter whether the car is light, medium or heavy weight, they are sure to give satisfactory results. They have been before explained in these columns and it is unnecessary to refer to details. By the way, the New Era Spring and Specialty Co., with main sales office at 864-878 Woodward Avenue, Detroit, Mich., desires the trade to be advised that all mail and matters pertaining to New Era shock absorbers should now be addressed to the Detroit office, from which point all shipments of shock absorbers are being made, instead of from Hempstead, L. I., N. Y. Their arrangements for their manufacture at that point has been ordered forwarded on to the Detroit office.

A New Model Vulcanizer.

Lee C. Mapes, 16 Fulton avenue, Rochester, N. Y., has brought out a "Baby" Superior vulcanizer with a mould six inches long and six inches wide, which with complete equipment, is listed at $9.00. The base of this vulcanizer is 8¾ inches wide by 11 inches long and with stove, clamp and pressure brake weighs only 23 pounds.

Two-Speed Axles.

The two-speed rear axle used in the Cadillac 1914 model, is an infringement of the patents on this type of construction held by Walter S. Austin, of Grand Rapids, Mich., according to the decision of the United States Circuit Court of Appeals for the Sixth Circuit, sitting at Cincinnati, O. The decision of this court affirms the decree of the United States District Court for the Michigan district, handed down in favor of Austin in January of this year, and ordering an accounting and damages, estimated by Austin at $500,000.

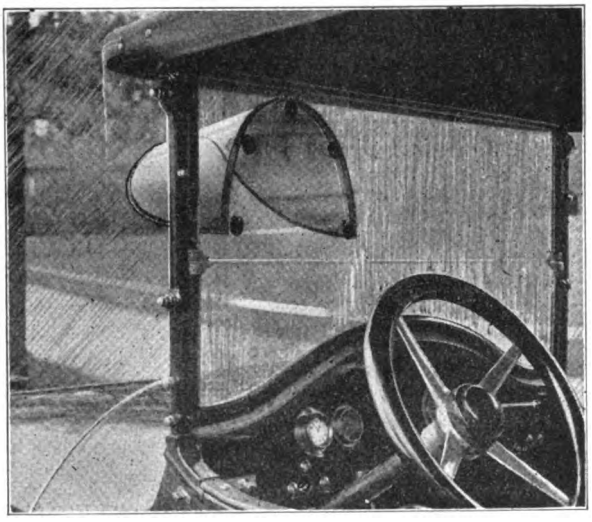
Body and Top

Heat Proof Paint for Automobiles.

A new heat-proof paint has been placed on the market by E. R. Stowell, of Oden, Mich., and it is guaranteed that this paint will endure the heat and adhere to the exhaust manifolds, exhaust pipe and muffler on automobiles. This paint was first tested out for this purpose by William Remington, of the Stevens-Duryea Co., Chicopee Falls, Mass., and after a daily use of over six months was pronounced entirely satisfactory. It has been used on many other cars since and with perfect results. This paint is retailed at $1 per pint prepaid to automobile owners anywhere in the United States, and one pint is enough to paint the hot parts on any car. To dealers and repairmen a substantial discount is offered, and there is no doubt but that a good trade could be worked up in this article by many dealers. Inquiries should be addressed direct to the manufacturers.

A Real Rain Shield.

Herbert H. Frey, inventor of the spark-plug tire pump, Magneto type electric horn, and a number of successful automobile and other devices, has recently developed an accessory which is proving of pronounced interest to the automobile driver. Frey's U-Can-C Rain Shield is constructed of a flexible, transparent sheet of pyralin, easily arranged in any desired position like a visor or bonnet and held in operative position on the front face of wind shield by five vacuum cups. These cups hold with such force that the manufacturers guarantee that no wind can pull them off, although readily detached by pinching the thumb-nail under each cup. Water is prevented from entering the protected vision portion by a rubber sealing strip attached to the rear of the rain shield. The front edge of it is bound in such a way that water cannot drip off. It is manufactured by the Frey Manufacturing Company, 1514 Michigan Avenue, Chicago, Ill., and sells at $1.50 each.



Frey's U-Can-C Rain Shield.

The Jiffy Polishing Cloth.

This is a new article which has been placed upon the market by the Chemical Polishing Company. The manufacturers guarantee that this polishing cloth will make both the metal parts and the bodies of automobiles and motor boats shine so that they will actually dazzle the eye. Every housewife, jeweler and automobilist who has used the Jiffy polishing cloth, is ready to recommend it highly and good agents are wanted for this article throughout the country. The trial size of this cloth sells for only 10 cents. Inquiries should be addressed to the Chemical Polishing Co., sales room 426, 30 E. 42nd Street, New York.

Business Notes

For Maine Visitors.

The Maine Automobile Road Book for 1915 was issued this week and is now being sent out to members of the Maine Automobile Association and to tourists all over the United States. The new road book undoubtedly is one of the finest which has been issued by any State Association in the country. It contains 166 routes, covering every part of Maine and most of New Hampshire, much of eastern Massachusetts with the border routes in New Brunswick and the principal highway between the New England States and the city of Quebec. In addition the book contains the latest automobile laws of Maine, including those passed at the last session of the Legislature, which go into effect in July; the new fish and game laws of the State, the new forestry laws, rules for campers, a complete summary of notable facts about Maine, a list of the standard through routes of travel in the territory covered by the road book, including statements regarding some of the work which will be in progress during the summer, as well as the best ways to go from place to place; the new regulations for automobilists entering Canada, including the special war tax now in effect, the announcement of the opening of Mt. Desert Island to automobilists, and a scientific statement on the reason why the Maine coast is cool, a complete description of the points of interest along the routes contained in the book, as well as many other features. The book is being distributed through the Maine Automobile Association Touring Information Bureau, 12 Monument Square, Portland, Maine.

Dyke's 1915 Automobile Instructor.

A new edition, greatly enlarged, of Dyke's Automobile and Gasoline Engine Encyclopedia, has 640 pages, as against 596 formerly, and, in addition, a supplement of 32 pages devoted entirely to the Ford car. It contains 1750 illustrations and diagrams, as against 1,200 formerly. The subject of Electric Starting, Generating, and Lighting Systems is up-to-date in every respect. The subject begins with the elementary principles and step by step advances to the more complicated systems, as the Delco, Entz-Chalmers, Non-stallable, and other leading systems, which are all simplified. There are 67 pages and 142 illustrations on this subject alone. The ignition system deals with the first principles, and then advances to the modern systems, as Atwater-Kent, and other leading systems. Valve timing in degrees, ignition timing and repairing are simplified so a boy ten years old can understand. The author of the book is A. L. Dyke, of St. Louis, who has the distinction of being the originator of the first automobile supply business in America; publisher of the first practical books on automobiles, and manufacturer of the first float feed carburetor.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Mosler Spit Fire Plugs



Get this book now!

"Mosler on Spark Plugs" is the new Mosler guide which tells at a glance just which kind, type and size of plug is *right* for each engine. We are telling **Four Million** people a month to ask for a free copy at their dealer's. If you'll tell us how many copies you can use we'll send them to you prepaid. Your customers will be glad to get copies and you'll find it useful yourself.

And make sure you're stocked up with the full Mosler line, especially

Spit-Fire
Vesuvius
Superior

The line which is being advertised vigorously in the biggest national papers—The Saturday Evening Post, The Literary Digest, Collier's, Leslie's, The Scientific American, etc., etc. Always the best plugs to use, they're better than ever to sell. "If you don't supply your trade with Mosler Plugs, some other dealer does"—so runs the saying. Don't let him beat you to it—stock up now!

A. R. MOSLER & CO., **New York, N. Y.**

Vesuvius



$1.00

Spit Fire

RED TAG

$1.25



THE RED TAG
GUARANTEES
EVERLASTING
IRIDIUM PLATINUM
POINTS

WE GUARANTEE
THAT THIS PLUG HAS A GENUINE
PLATINUM POINT

1915

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New Auto Supply Firm.

The W. E. Pruden Hardware Company of New York City is an example of a firm which after 40 years of business in other lines has, during the last decade, branched out successfully into automobile supplies. The fact that they also carry a large quantity of metals, general hardware and electrical supplies, all used at times in the automobile trade, has gained them the reputation that "If Pruden hasn't got it no one has it." Their policy has been to push the best quality of each line, along with high grade specialties of their own. Among the latter may be mentioned the Wepco Spark Plug, Pruden



Wepco Spark Plug.

Valve Grinding Compound, Atlas Brake Lining and Wepco Brake Lining. Among their standard lines are Leak Proof Piston Rings, Sootless, Red Head, Champion, Benton, Rajah and Splitdorf Spark Plugs, Whitney Chains, Lunkenheimer Specialties, Starrett Tools, etc. Their catalogue of over two hundred and sixty pages is most comprehensive and is regarded as the reference book of the trade.

An Automobile Electric School.

The Arsenal School of Automobile Electricity, 401 25th Street, Rock Island, Ill., gives a six weeks' course of lectures and shop work that will enable a man to become an expert not only in starting systems and storage batteries but in all electrical work that a repairman is called upon to do. There is a great demand for experts in this field. Students are now being enrolled for the fall term.

The Most Car for the Money.

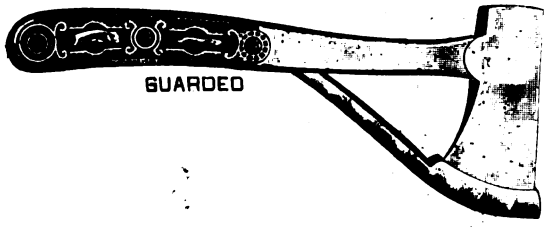
The above is what all car purchasers have the right to want, and they certainly seem to be getting it when they buy the Auburn car for 1916. Their four-cylinder car with ample room for five passengers, has all the improvements and accessories of the highest priced cars and the materials and construction are of the highest quality. The following are the specifications of this model which sells for $985: Four cylinders, T-head cast en bloc, 3⅞ x 5. Unit power plant. Three-point suspension. Cantilever springs. 114 inches wheel base, with standard 56-inch tread. Left side drive and center control. Electric lights and electric starter. Crown fenders, enclosed front and rear. Full U doors, with invisible hinges. New style electric head-lights, with small auxiliary lights, useful in city driving. Two-piece clear vision ventilating windshield. One-man top. 34 x 4 tires, demountable rims. Fully equipped without extra cost. Purchasers who have no money to spend for inordinate profits or slip-shod workmanship, and dealers who are looking for a car that "does its own talking," should address the manufacturers, the Auburn Automobile Company, Auburn, Ind.

The Harriman Engine.

It should fill every American with pride to know that a more dependable and efficient and really better engine is being built in this country today than in any other country on earth. And the factory where it is being made is in the little town of South Glastonbury, Conn. The 60 horse-power Harriman model weighs but 240 pounds, and it gives this power while running 1,350 revolutions per minute. These motors are four-cycle, water-cooled and have the valves situated in the waterjacketed head. The intake and exhaust valves are on opposite sides of the head and operated vertically. The valves are operated by an overhead cam shaft of nickel steel, which carries the water pump and magneto driving gear. Both intake and exhaust valves in each cylinder are operated by a single cam through the rocker arms. Cylinders are cast integrally with water-jacketed head. The barrel of each cylinder is machined inside and outside, insuring flawless metal and equal distribution of heat. The water jackets are of steel, welded to the grey iron cylinders by an autogenous weld. There is nothing freakish or untried about this motor. Those using it can be sure they are getting the most tried and approved construction and the best material. If any one is looking for a motor for an automobile or for a flying machine, and wishes to feel confident as to its unusual simplicity and permanent reliability and effectiveness he should address the Harriman Motors Co., South Glastonbury, Conn.

A Little Axe for Motorists.

The Marble Arms & Manufacturing Company of Gladstone, Michigan, is making a small axe which can be easily carried in the pocket and must be of great value to touring motorists. It is of course especially valuable where one



wishes to camp out and make a fire for tea or coffee. This little axe is provided with a shield which keeps the axe sharp and prevents the party carrying it from getting cut. Don't get it into your mind that this is anything like a big axe for chopping wood. The illustration herewith shows just how it looks. The manufacturers, during the quarter of a century or thereabouts that they have been in business, have established the reputation of making the very finest goods and this axe can be depended upon for doing the work required of it. Write for catalogue and price.—Advt.

Princess Motor's New Plant.

The Princess Motor Car Co., of Detroit, has leased the old plant of the Saxon Motor Co., at Bellevue Avenue and Frederick Street for a period of ten years at a yearly rental of about $39,000. The company makes a light car to sell at very low price.

New Tire Company.

The Monarch Stitched Tire Co., formed recently in Maine, has just purchased the Munroe-Eastman Co.'s plant at the border line between Newington and New Britain, Conn., in which the company will manufacture its product. The carcass of the tire is both stitched and cemented into the tread and a guarantee of 6,000 miles without the adjustment clause will be given by the makers.

Ford to Make Tires.

The Ford Motor Co. will build its own tires in the new plant the company is to erect. An output of 2,000,000 tires the first year is anticipated, valued at $20,000,000. It is stated that the $5-a-day wage minimum will apply to all Ford workmen. It is also stated that the tractor will be sold with any style of wheel demanded by the soil to be worked.

New Branch Office.

The Ahlberg-Bearing Company have established a new branch office at 2831 Locust Street, St. Louis, Mo., which will take care of the Southwestern trade of this well known company.

Apco Price Reductions.

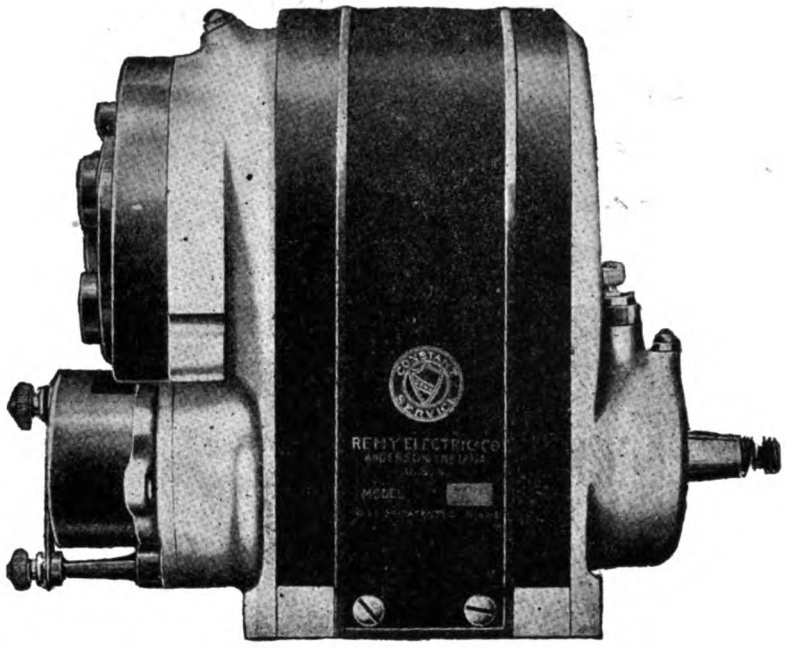
A reduction in the list price of two of its products is announced by the Auto Parts Company, Providence, R. I., makers of the Apco specialties for the Ford car. The valve stem adjusters now retail for 20 cents the set and the cut-out for 45 cents.

Touring Book Free.

Motorists contemplating a transcontinental trip the coming year to the Panama Pacific expositions in California can secure upon application to the Premier Motor Manufacturing Company, Indianapolis, a valuable book bearing on the subject. It is the record of the Premier owner's tour from the Atlantic to the Pacific. Besides giving one-day routes, the book tells the motorists what equipment should be carried and other valuable touring information. Frank E. Smith, head of the Premier, has ordered that the publication be distributed to all persons who expect to make an overland trip, upon their application direct to the Premier Motor Mfg. Co., Indianapolis.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

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NEW DEPARTURE BALL BEARINGS

American Made for American Trade

Are used throughout this Magneto

THIS *guaranteed* ball bearing, designed to carry light loads at high speeds, facilitates assembly, simplifies construction, and enhances the quality of any mechanism in which it may properly be installed—New Departure magneto bearings are now used extensively in American ignition, starting and lighting apparatus.



Front



Balls, Separator and Cone



Back

Perhaps we can render You the same prompt and expert service that we have and are rendering other manufacturers. Write us.

THE NEW DEPARTURE MANUFACTURING CO.

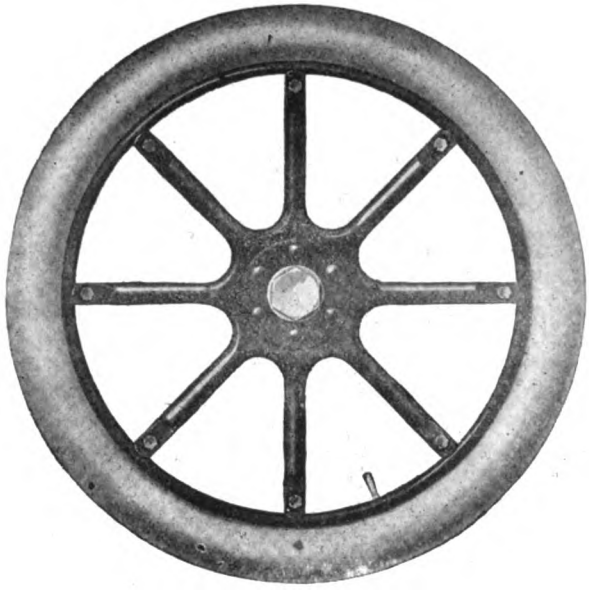
Distributors in Trade Centers Throughout the United States

BRISTOL, CONN., U. S. A.
Western Branch: 1016-17 Ford Bldg., Detroit

Sole British Agents Brown Bros., Ltd., London and Manchester

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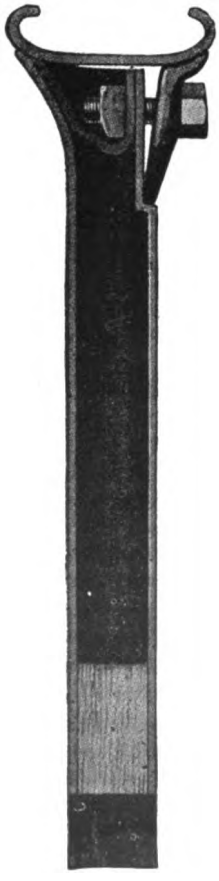
PARKER-HYDRAULIC
PRESSED STEEL WHEELS For Ford Cars



STRONGER than WOOD or WIRE WHEELS

CHANGE TIRES and be running again IN TWO MINUTES

Forty pounds lighter per set than wood wheels with demountable rims
Carry your spare tire inflated on extra rim which we furnish



Note these facts: You get—

1. More mileage due to less weight and ability of steel to conduct heat from tires.
2. Quicker acceleration on account of the lighter unspring weight.
3. Greater mileage per gallon of gasoline.
4. Greater durability. Steel will not dry out like wood or break like wire.
5. Better appearance. Enamel is baked. It retains its lustre and does not crack off like paint.
6. Prompt service in mounting Parker-Hydraulic wheels. They can be put on at your garage in two hours.

OPERATION

To remove the rim: unscrew each bolt about three turns. The loosened clips may then be turned to release the rim. To put on new rim with tire: set rim on spokes having the upper position with valve stem between any two spokes and the rim will swing into position.

Write for prices and full particulars

MANUFACTURED BY

THE HYDRAULIC PRESSED STEEL CO.
CLEVELAND, OHIO

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The Studebaker Line.

Greater standardization of the parts and further attention to production make it possible for the Studebaker Corp. to bring out its new models in large and more powerful form at reduced prices over those of the previous models. The price cut is more emphasized in the six, which is to sell at $1,050 as a seven-passenger touring model, and $1,000 as a roadster. For the previous seven-passenger six, the price was $1,450. In the seven-passenger touring model on the four-cylinder chassis, the cut has been $100, making it $885; while the new roadster is $135 less than previously, or $850.

The bodies are practically alike on the four and six chassis, and most of the difference in wheelbase is taken up by the engine. The cars are made to conform to the same general design throughout. In fact, they are much more similar this year than ever before, and practically the only difference in addition to the difference in number of cylinders, are the wheelbase, rear axle gear ratio, and rear spring size.

Novel Pump Connection.

Stevens & Co., 375 Broadway, New York City, have brought out an instantly attachable pump connection for owners and garages which does not require turning to apply and is secure from the possibility of slipping. This connection, which is listed at 35 cents, will secure a grip under almost any circumstances and will not blow off at high pressures. An air-tight joint at the valve is provided and the rubber valve seat insures long service.

Ford Postpones Payment of Dividend.

The $48,000,000 dividend of the Ford Motor Co., of Detroit, will probably not be paid for two years, as the difficulties in the Michigan corporation laws are complicating the proposed capital increase of the company from $2,000,000 to $100,000,000. It is the intention of the Ford company to advocate the passing of a law in the Legislature of Michigan, permitting the incorporation of the company with $100,000,000, a proceeding impossible at present because of the arbitrary limit of $25,000,000 placed on corporate stock by this State. Rather than incorporate under the laws of Delaware, Maine or Arizona, the Ford Motor Co. contemplates withholding the stock dividend until the necessary change in the law can be effected.

More Interesting Velie News.

With the announcement last week of the new Velie "Six" at $1,065, it was assumed that this car was to be the Company's entire offering for 1916, but such is not the case. The larger and well-known Velie "Biltwel" Six, Model 15, will be continued in both five and six-passenger models at a reduction of nearly $200 in price—namely, $1,400.

The model 15 has a wheel-base of 124", 34 x 4 tires, on the five-passenger size, and 35 x 4½ tires on the six-passenger. The latter model has disappearing seats, which entirely fold away into the back of the front seat. The motor is a Continental, 3½ x 5, with Gray & Davis starting and lighting systems and Atwater-Kent automatic ignition; multiple disc clutch, spiral bevel drive and every feature and appointment usually associated with a car of much higher price.

The quality and finish of the new models have not suffered in any way through this price reduction. Real leather and curled hair, the wonderful "mirror" body finish, careful fitting and workmanship, and thorough testing and inspection are all well-known Velie attributes which are looked for and are expected as a matter of course in Velie cars. The Velie Motor Vehicle Company at Moline, Ills., have planned a large increase in production, many new representatives have been secured and their well-known service plan is, therefore, brought even closer to the individual buyer. With the continuance of the larger car the buyer may secure a Velie in any size he prefers.

A Book for Ford Owners.

"The Ford Car" has recently been published by the well known firm of Norman W. Henley Co., 132 Nassau Street, New York, and the price is $1. Ford car owners should not be without it. It contains over 100 specially made diagrams and half tone ilustrations, two large folding plates, and in fact is by far the most complete and practical instruction book ever published on the Ford car. The book is easily understood and it is written by a man who has a practical as well as a theoretical knowledge of the subject. It is divided into five special chapters, grouping the various subjects in relation to the mechanism of the Ford car, including how to drive it, repair it, and care for it. The chapter on the repair and overhauling alone is worth many times the price of the book.

Ford Engine Chart.

This is for locating Ford engine troubles. It shows clear sectional views depicting all portions of the Ford power plant and auxiliary groups that are apt to give trouble, detailing all derangements that are liable to make an engine lose power, start hard or work irregularly. It can be carried in the tool box or pocket. It enables the owner or operator of a Ford car to locate derangements by systematic search, guided by easily recognized symptons instead of by guess work. It makes the average owner independent of the roadside repair shop when touring. Size, 25 x 38 inches. Printed on heavy bond paper. Price, 25 cents. Published by The Norman W. Henley Publishing Company, 132 Nassau Street, New York.

All Will Share the Patents.

Peace and co-operation in patent matters, rather than ruinous litigation, is being chosen by a preponderance of the members of the National Automobile Chamber of Commerce under a cross-licensing agreement that is calculated to be an example of importance to every large manufacturing industry. No less than 69 automobile companies, members of the N. A. C. C., have already entered the agreement, by which some three hundred patents, owned separately, will be thrown open to them all. It is expected that ultimately nearly all of the 93 companies having membership in the Chamber will come under the operation of the cross-licensing plan.

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

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Classified Advertisements

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We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete
$25.00 Models

Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

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Jones,	Klaxon,
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Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00.
Odometers reset to zero, 25c.

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Formerly 20 years on Chambers St., N. Y., now located at
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Tires and Supplies, inside prices.
Our only store. Low Expenses, Low Prices.
Mr. Manufacturer, anything you have, let me know.
SPOT CASH PAID.

Fore Doors for Open Front Cars
Prices right. A postal will bring particulars. ECONOMY SERVICE CO., 2714 Boulevard Place, Indianapolis, Ind.

WRITE for our great bargain sheet showing auto axles, steering devices, forgings, transmissions, etc. Borbein Auto Co., 2109 N. 9th St., St. Louis.

Auto Accessories

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If you are not buying from us? Do it now; compare our prices with those of your dealer or jobber and you will become one of our 30,000 satisfied customers.

Standard Speedometers, all sizes	$6.25
E. Presto Tanks	10.00
Tool Boxes	1.25 up
Tire Trunks	4.00
Lap Robes	1.25
Summer Lap Robes	1.25
Steamer Rugs	2.25
Brown Jr., Spark Plug Pumps	4.10
Swivel Searchlight	5.50
Racing Seats, per pair	18.00
Electric Headlights, per pair	4.50
Side Lamps, per pair	3.00
Tail Lamps	.85
Mechanical Hand Horns	2.45
Summer Gloves, per pair	.75
Magnetos—complete Dual System	17.00
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Carburetors, all sizes, kinds and styles and thousands of other items.

If you don't see what you want, send for our "Price Wrecker." It contains a list of over 3,000 bargains and you are bound to find what you want.

We have a separate department for special parts for used cars that can be obtained nowhere else. Let us know what you require; we will furnish it.

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Miracle Tire Repair Shop
All Makes Tires Vulcanized, Auto Casings, Inner Tube and Bicycle Tires. Auto Accessories, Non Skid Repairs, Curing Promptly Done. Workmanship Guaranteed.
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New Catalog and Lists ready July 15th.
Send for copy. Wholesale only.
Special prices on Piston Rings, Brake Lining, Grease Cups, etc. Send us your list of wants for special quotations.
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ALL TYPES OF BEARINGS
The New Departure Service Station
THE GWILLIAM COMPANY
ENGINEERS
Specialists in Bearings
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Auto Accessories

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Get Our New Catalog before placing your orders.

New York & Brooklyn Auto Supply Co.
1717-1719 Broadway New York
Established 1905

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

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FOR SALE.—25 Lincoln milling machines; $35 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

FOR BARGAINS in Screw Cutting Engine Lathes write South Bend Lathe Works, 625 E. Madison St., South Bend, Ind.

LIGHT CAR PARTS—Motors, Transmissions, Rims, Wheels, Steering Gears, Front and Rear Axles. Catalogue free. Palmer Brothers, Coscob, Connecticut.

U-KAN-PLATE—The polish that silver plates. Easily demonstrated on your car; unusual side-line opportunity. Infico Company, 431 Presser Bldg., Philadelphia, Pa.

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FOR SALE—Stanley Steamer, 20 H. P., 5 Passenger. Good as new. Price right. H. K. Lefever, 352 Lancaster Ave., Lancaster, Pa.

FOR SALE—One set Velvet Shock Absorbers for rear springs. Heavy car type for 2¼ three-quarter Eliptical springs only slightly worn. Price, new, $35.00. Will sell for $10. Send inquiry to Box 464, Fayette, Iowa.

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Tires

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CUT YOUR TIRE BILLS

BY USING

Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

We pay express charges on receiving your old tires and return C. O. D. subject to inspection.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

For all other sizes write for prices,

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN

27A East 110th St. NEW YORK CITY

Branch: 205 W. 48th St., New York City

DOUBLE TREAD TIRES

All sizes up to 38x5½
Guaranteed for 3500 Miles

Size	Plain	Non Skid	Pure Gum Tubes	Red
30x3	5.00	5.50	2.04	2.64
30x3½	6.00	7.00	2.55	3.20
32x3½	7.00	8.00	2.70	3.44
32x4	8.00	9.00	3.35	4.14
33x4	9.00	10.00	3.46	4.14
34x4	9.00	10.00	3.58	4.36
35x4	9.00	10.00	3.68	4.56

These tires are Absolutely Puncture Proof.
Be sure to state whether regular Q. D. or straight bead.

WHY PAY MORE?

Will outwear any make of tire at a saving of 75% of your tire bills. **Send us a trial order today.**

THE DOUBLE TREAD TIRE CO., Inc.

'Phone, Col. 8681 **116D W. 52d St., New York City**

SQUARE DEAL TIRE EXCHANGE

GET A

PUNCTURE PROOF TIRE

with a guarantee, at a reasonable price.

Some of our prices:

	Plain	Non-Skid	Slightly Used Tubes
30x3½	$6.00	$7.00	$1.75
32x3½	7.00	8.00	2.00
36x4	9.00	10.00	2.00
37x5	11.00	12.00	3.00

You will save money by giving my tires a trial; let me prove it to you by your order at once.

WRITE FOR OUR CATALOGUE

247 West 49th Street New York City

TIRES TIRES TIRES

Automobile Dealers Take Notice.

We now offer for sale our Henschel Special tires in al sizes and types. **Write for our special dealers' proposition**

HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

Tires

TIRES - - - TIRES

Special sale for July & August

to sell out Double Tread Stitched Tires and introduce Double Tread Stitchless Tires.

A few of my prices on Double Tread Stitched and Stitchless Tires:

STITCHED TIRES

Size	Plain	Non-Skid
30 x 3	$4.00	$4.95
30 x 3½	4.80	6.30
32 x 3½	5.60	7.20
34 x 4	7.20	9.00
36 x 4½	8 00	9.90
37 x 5	8.80	10.80

STITCHLESS TIRES

Size	Plain	Non-Skid
30 x 3	$5.00	$5.50
30 x 3½	6.00	7.00
32 x 3½	7.00	8.00
34 x 4	9.00	10.00
36 x 4½	10.00	11.00
37 x 5	11.00	12.00

I also manufacture New Reclaimed Tires for light cars which I guarantee 3500 miles and sell them at 40% off the United States price list in the following sizes:

Size	Plain	Non-Skid
30 x 3	$5.40	$6.42
30 x 3½	6.96	8.40
32 x 3½	7.99	9.60
32 x 4	10.95	13.38
33 x 4	11.44	14.08
34 x 4	11.64	14.37

Adjustments make according to the United States price list.

I also carry a full line of tubes, reliners and slightly used tires of all makes.

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Branch

5019 Euclid Ave., Cleveland, Ohio

Factory and Salesroom

Fifth and Cross Streets, Harrison, N. J.

Not connected with any other Jaffess.

Terms: 10% deposit, balance C. O. D.

Tires

EMPIRE TIRES

Slightly Blemished.

CAR OWNERS: Note the low prices below, of the best tires made.

Size	Our Price Plain	Our Price Non-Skid	Dodge Red Guaranteed Tube.
28x3	$5.50	$6.00	$2.10
30x3	6.00	6.50	2.25
30x3½	7.50	8.00	2.50
32x3½	8.00	8.75	2.75
32x4	11.00	12.00	3.50
33x4	11.50	12.75	3.75
34x4	11.75	13.00	4.00
35x4	12.25	13.50	4.25
36x4	12.50	13.75	4.50
34x4½	15.75	17.35	4.75
35x4½	16.25	18.00	5.00
36x4½	16.75	18.50	5.25
37x4½	17.25	19.00	5.50
36x5	19.00	21.00	6.00
37x5	19.50	22.00	6.25

DODGE RED GUARANTEED TUBES are made of the best possible material and equal to any tube produced at any price. Fully guaranteed by us.

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1610 BROADWAY NEW YORK CITY

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SAVE 75%

ON YOUR

TIRE BILLS

BY USING OUR

DOUBLE TREAD TIRES

ALL TIRES GUARANTEED

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS

MAIN STORE

1319A Fifth Avenue, New York

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34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
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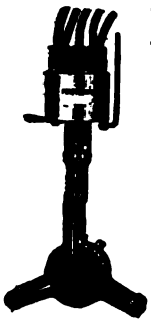
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The Joseph Dixon Crucible Company, of Jersey City, N. J., is distributing among motorists, on request, lubricating charts that show where and how to lubricate a car. They suggest that owners and drivers hang this chart in their garage where they can easily get at it every time lubrication is necessary. The chart is very easily read. It shows a plan-view of a chassis with each part, where lubrication is necessary, marked with a number; and below the suggested lubricant is given opposite this number. The Dixon people are anxious to alleviate the lubrication troubles that most motorists have and have placed these charts in the hands of Dixon dealers for distribution.

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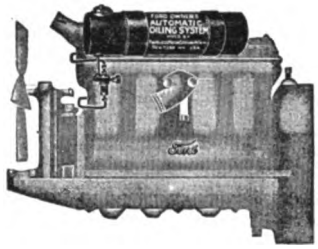
Among the numerous works of value in relation to the automobile, this book deserves a place in the up-to-date repair shop, and it might likewise be owned by every car owner. It not only makes the construction of the automobile easy to understand, but it gives a good deal about its care and repair. It is brought up to date with matter concerning electric lighting and starting and touches upon nearly all the new things that have appeared in the accessory line during the past year or two. It has 217 illustrations and contains 506 pages, which are clearly written and concise. It is divided into five sections. Section one relates to the construction of the parts of an automobile, together with their use and repair; section two is devoted to the material and supplies used in running a car; section three is devoted to electricity; section four to electric lighting and starting, and section five to ignition. The book is published by Laird & Lee, Chicago. Repairmen, owners, drivers, salesmen and students will find it both useful and instructive. The price is $2.50, and it is bound in flexible leather.

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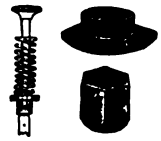


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If you purchase your advertising in this practical, business-like and fair way, you may be sure it will pay you, provided you have something to sell that those want to whom you appeal.

Maxwell Earnings $3,000,000.

The fiscal year of the Maxwell Motor Co., Detroit, Mich., will end July 31, and indications are that net profits will run close to $3,000,000 after liberal charges for depreciation, compared with $1,505,467 in the preceding year.

Patent Issued on Spring Leaf Spreaders.

The trade, and car owners as well will undoubtedly be interested in the fact that a United States Patent No. 1,142,280 has been issued to the Spring Leaf Lubricator Company of Ann Arbor, Mich. It is stated that this patent covers all spring spreaders with wedges no matter how operated. The patent is issued to Frederick Knowlson, manager of the Spring Leaf Lubricator Co., and we understand that it is the intention of this company to institute prosecution against several alleged infringers.

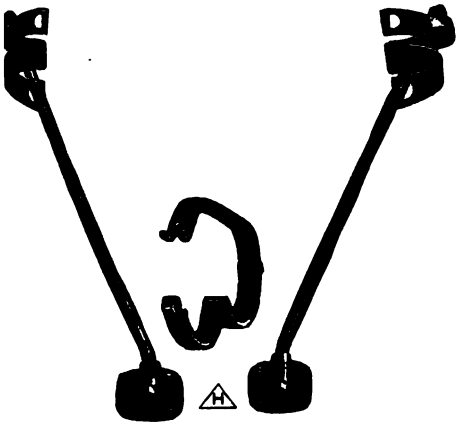
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Attempt to Destroy Cars.

An attempt recently was made to burn a shipment of the motor cars destined for Russia while in the Northern Pacific yards at Tacoma, Wash., awaiting the vessel to carry them to Vladivostock. Oil soaked waste had been ignited under the boxes holding the machines. The guards have been doubled about the long lines of cars in the Tacoma yards.

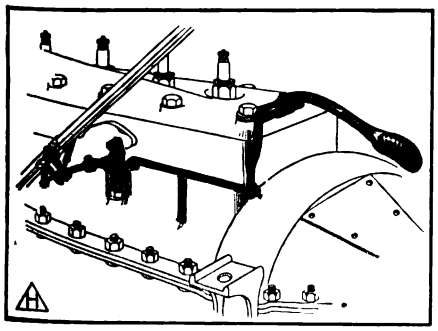
New Ford Car Accessories.

Illustrated herewith will be seen two new accessories for Ford cars. The tire holder will fit tires up to 3½ inches in diameter. Holds one or two tires firmly.



Running Board Tire Holder.

Fastened to the running board by means of four bolts to each arm. The most notable feature of this tire holder is that it is supplied with a strong locking device, as shown in the cut. The foot accelerator is applied within 20 minutes



Foot Accelerator.

without boring holes or otherwise marring the car. Permits a perfect foot control, independent of steering wheel control. Both these specialties are manufactured by the Humboldt Machine & Stamping Company, 81-83-85 Tenth St., Long Island City, New York.

Diamond Tires.

John F. Lanier, in charge of the sale of Diamond tires in the Southwest, with headquarters at St. Louis, has severed his connection with The B. F. Goodrich Co., to accept a responsible position with the Norwalk Tire & Rubber Co., of Norwalk, Conn. Lanier is one of the "war horses" of the tire business. At various times he has been in charge of the sale of Diamond tires in Kansas City, St. Louis, Buffalo and New Jersey. In his new connection he will have entire charge of the sale of Norwalk tires for the central part of the country. Lanier says that he has seen a wonderful change in the tire industry in the many years that he has been selling tires.

Corbin-Brown Speedometer.

A red hand which indicates maximum speed and which cannot be set back to zero without the use of a special key has been added to the speedometer manufactured by the Corbin Screw Corp., New Britain, Conn. The hand, which by reason of its distinctive coloring, cannot be confused with the regular speed indicating hand, remains set at the maximum speed and the fact that it is locked there until released by the key makes it useful as a check on drivers of commercial cars.

Why An Eight?

In "Why An Eight?" the Cole Motor Car Co., Indianapolis, explains the reasons for its adoption of the eight-cylinder motor. It is a pocket-size booklet that tells clearly and in quite elementary and plain language the course of development of the eight. The advantages of the motor are fully given and the disadvantages not quite so much so.

Improved Body for Marmon.

The Nordyke and Marmon Co. has had a sample of its 1916 six on view at the factory during the last week. In specification, the new car is almost the same as the present type, but the body is a little wider and more care will be taken to insure the high class character of finish.

Garage $69.50



10x12 feet "Steelcote" Edwards ready-to-use garage. $69.50 complete. Factory price. Fireproof. Portable. Quickly set up. All styles and sizes of garages and portable buildings. Send postal for illustrated catalog.

THE EDWARDS MFG. CO.

423-473 Eggleston Ave., Cincinnati, O.

FORD OWNERS,

Here's a TIP for you.

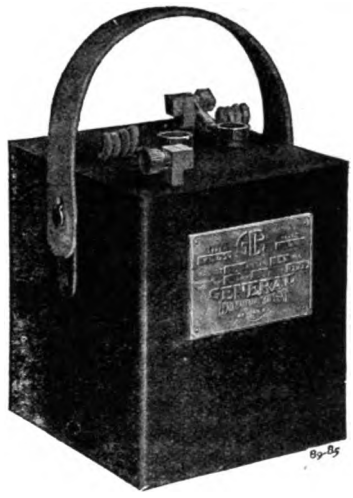
The manufacturers of **Pres-To-Lite Ford Starter** will be ready to ship the 1916 improved model about July 15th. This model employs a compound geared lever, giving such power that a seven year old boy starts the motor with ease We advise Ford owners to write at once for particulars to

W. ROBERTSON, Greenwood Place, Buffalo, N. Y.

GLB Solve GLB Ignition Troubles

Dry Batteries are always a source of trouble. The expense of constant renewals at present prices (75% higher than usual) is extravagant when you can buy the **T. W. L.** Storage Battery, absolutely correct in quality, durability and capacity, for

$8.00 to $10.00 each



With a storage battery on your car you can also have a brilliant light at all times with minimum expense and trouble. The T. W. L. battery will last for years, as it is made up of thick separators and plates with a high ribbed jar.

Write for booklet No. 6.

SPECIAL DISCOUNTS TO DEALERS

GENERAL Lead Batteries Company

CHAPEL ST. and LISTER AVE., NEWARK, N. J.

DON'T KNOCK

Your "FORD" when you have timer troubles apply

PEDERSEN "UNITED TERMINALS"

and smile. Only 50 cts. at all dealers or

PEDERSEN LUBRICATOR CO., NEW YORK, N. Y.

"Hercules"

ONE-MAN-TOP

EQUIPPED WITH

JIFFY SLIDING CURTAINS AND DUST HOOD

FOR ALL CARS

ALSO RUNABOUT AND 4 POST TOPS

Made of Silk Lustre Mohair, Imitation Leather or Khaki Twill.



LIBERAL DEALERS' DISCOUNT

Send for General Price List

Ford $30.00 Hup $33.00

Overland $35.00 Chalmers $38.00

(Mohair) Complete with Jiffy Curtains and Dust Hood, F. O. B. MICHIGAN.

HERCULES RUBBER CO.

ONE-MAN-TOP DIVISION

2 Hudson St., New York, N. Y.

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A Starter for Ford Cars

Genemotor

(Trade Mark)

Stands in front in sales—and behind it stands the

General Electric Company

$75 F. O. B. LYNN, MASS.

A. J. PICARD & COMPANY

Sole Distributors

1720-1722 Broadway, New York

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W. E. Pruden Hardware Co.

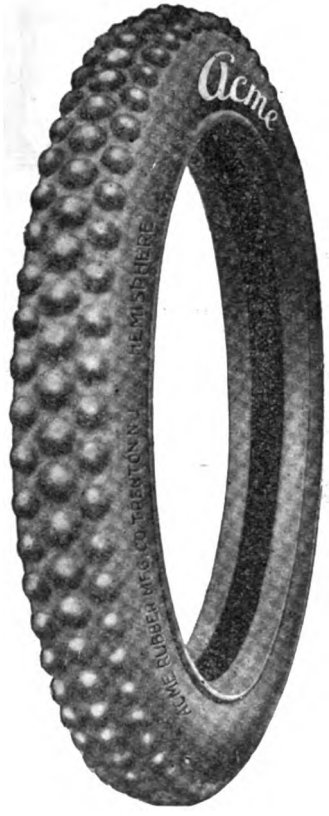
864-866 EIGHTH AVENUE **260-262 W. 52nd STREET**

NEW YORK

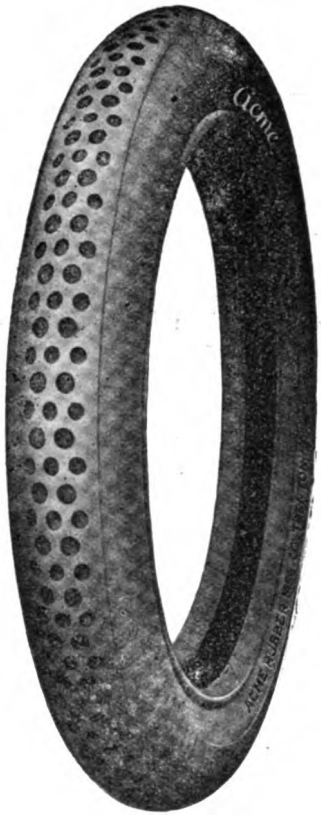
JOBBERS OF AUTOMOBILE SUPPLIES

The Most Varied Stock of Automobile, Garage and Repair Supplies in New York.

Sole Agents for ACME RED LETTER Tires and Tubes



ACME
Hemisphere Tread Casing



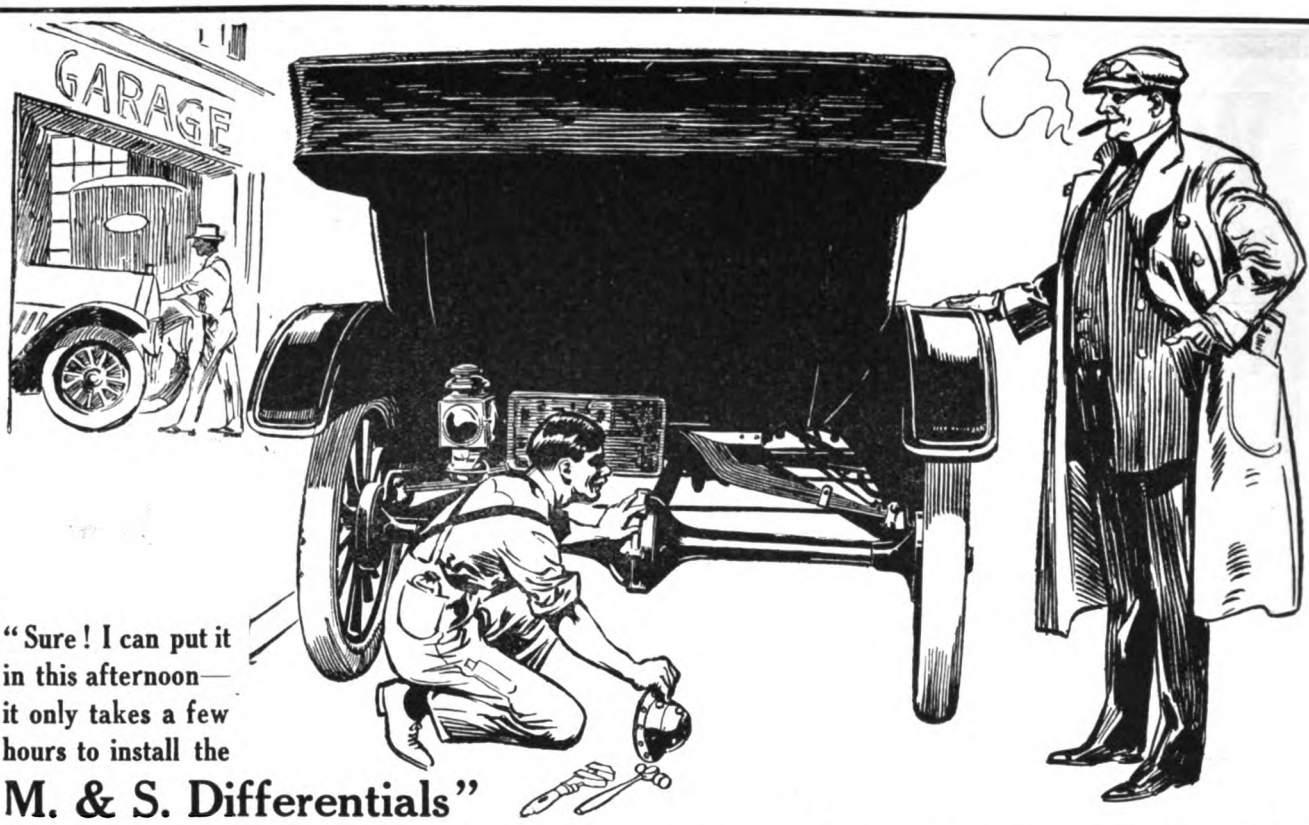
ACME
Dimple Tread Casing

DISTRIBUTORS OF

Sootless Spark Plugs
Pruden Valve Grinding Compound
Atlas Brake Lining
Ever Ready Flashlights
Leak Proof Piston Rings
Wepco Spark Plugs
Klaxon Horns
Elephant Brand Phosphor Bronze
Wepco Brake Lining
Victor Gaskets
S. A. E. Cap Screws and Nuts
Whitney Chains

Two hundred and sixty page Catalogue for distribution to the Trade

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"Sure! I can put it in this afternoon—it only takes a few hours to install the

M. & S. Differentials"

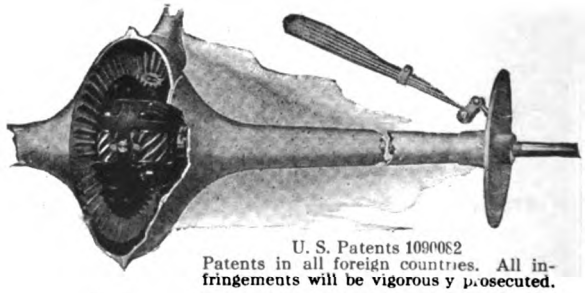
That's the reason Ford dealers and accessory houses are flooding us with orders for the M. & S. Differential—Special Type for Ford cars—fits in the Ford housing, using the regular ring and pinion gears. Think of it! The M. & S. Spiral Gear Differential at only a trifle more than the ordinary Ford Bevel Gear Differential.

Every Ford owner is glad to make the change after he has once driven a Ford equipped with the M. & S. We can furnish special 3½% nickel steel Ring and Pinion Gears—4 to 1 ratio at $6.50 per set, if desired.

M&S DIFFERENTIAL

Special Type for Ford Cars

The M. & S. Differential is standard equipment on the Jeffery "Quad."



U. S. Patents 1090082
Patents in all foreign countries. All infringements will be vigorously prosecuted.

"Pulls Both Wheels"

Made for us by the Brown-Lipe-Chapin Co. of Syracuse—the largest makers of differentials in the world—from the same nickel steel and embodying the same principle used in M. & S. Differentials for the high-priced, high-powered cars.

The M. & S. Marks the Biggest Advance in Automobile Building Since the Electric Starter.

The M. & S. Differential insures a positive and equal pull on both wheels at all times. If one wheel has traction and the other does not, the wheel without traction can revolve no faster than the one with traction. In other words, the M. & S. is really an automatic differential lock which operates when a lock is necessary, yet differentiates wheel traveling in turning corners.

All the Power in the World Is No Good if You Have No Traction.

The M. & S. enables you to get out of any mud holes, sand or snow if one wheel has even the slightest traction. By insuring this positive and equal pull on both wheels, you save anywhere from 500 to 1000 miles' wear on the rear tires. You get more mileage to the gallon of fuel and you utilize all your engine power for work and not for idle spinning. The M. & S. transmits the power to the wheel or wheels having traction at **all** times, thereby minimizing the danger of **wheel skidding** and lessening the possibility of serious accidents, due to **loss of traction** by the rear wheels.

The M. & S. Is a Certain Moneymaker for Dealers.

Every Ford owner is a prospect. Every demonstration practically means a sale. You have no competition and it's so easy to sell M. & S. Differentials to Ford owners that you can make more money with less expense and effort than you can make selling cars. The cost is only a trifle more than the regular Ford Bevel Gear Differential, yet the advantages of the M. & S. are so obvious that no Ford owner will be satisfied with his present differential when once he has driven a Ford equipped with an M. & S.

To Ford Dealers--- We want every Ford Dealer to install an M. & S. Differential in a Ford Car and then drive it in sand and mud and over slippery pavements. To Ford Dealers we make a liberal offer on a sample Differential for your Ford.

To any one financially able to handle large territory in a big money-making way, we have an exclusive proposition. It will pay you to investigate.

M. & S. GEAR CO., 1036-1042 Whitney Building, Detroit, Michigan

Formerly KANSAS CITY, MO.

DISTRIBUTORS: M. & S. Sales Co., 429 So. Ervay St., Dallas, Texas; **M. & S. Sales Co.,** S. E Corner Race and Broad Sts., Philadelphia, Pa.; **Hill-Smith Metal Goods Co.,** 88 Pearl St., Boston, Mass.; **M. & S. Sales Co.,** 936 Woodward Ave., Detroit, Mich.

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The Most for the Money

Auburn Motor Cars for 1916 Announcement

$985

Money Talks

Four cylinders, T-head cast en bloc. 3¾ x 5. Unit power plant. Three point suspension.
Cantilever springs.
114 inches wheel base, with standard 56 inch tread.
Left side drive and center control.
Electric lights and electric starter.
Crown fenders, enclosed front and rear.
Full U doors, with invisible hinges. Flush latches.
New style electric head-lights, with small auxiliary lights, useful in city driving.
Two piece clear vision ventilating windshield.
One man top. 34x4 tires, demountable rims.
Fully equipped without extra cost.

$985

The 1916 demand of the dealer and consumer are both met by this new Auburn—it makes money for the dealer, and gives the consumer more for his money.

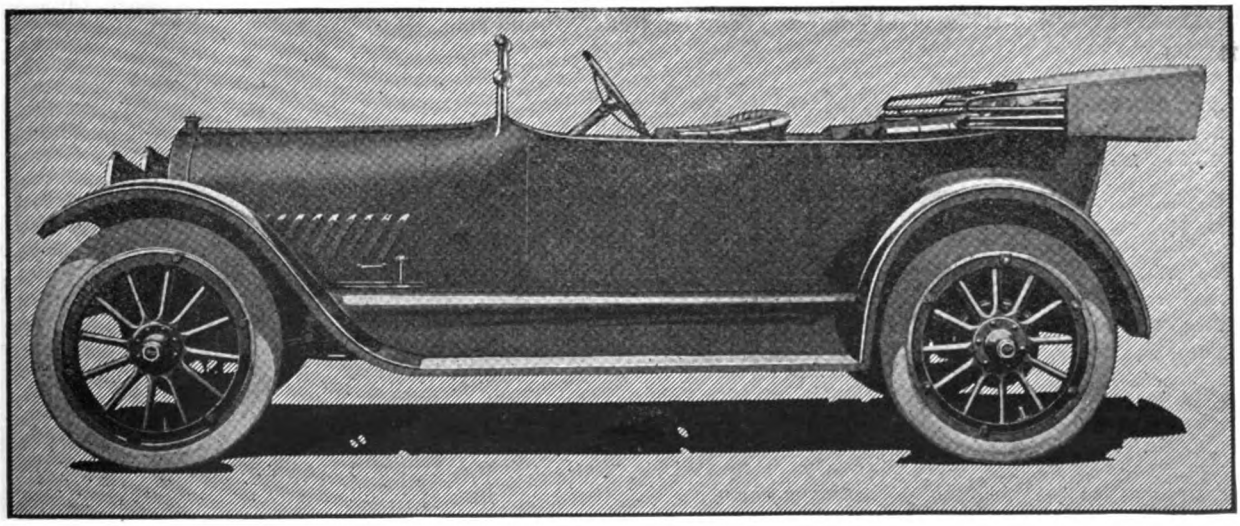
The Auburn's performance is what makes its price low. It isn't a skimped car, but more actual service is added. The wonder is that the price has not been raised instead of lowered. Already this new car is a favorite in small towns as well as metropolitan cities. It is a credit to the Auburn's sixteen years of successful experience.

Six cylinders—3½x5.
A new and improved series of a successful and popular car.
Center control — left side drive.
Electric lights—electric starter.
Cantilever springs.
Roomy, comfortable and beautiful bodies.
Upholstery of selected stock.
One man top. 34x4 tires, demountable rims.
Crown fenders. Streamline bodies.
126 inches wheel base.
Spacious tonneau—folding and disappearing extra seats.
Ample room for seven passengers.
Full equipment without extra cost.

$1550

We have an attractive dealer's proposition for the right man, **no matter how small your home town.** It costs you nothing to find out.

AUBURN AUTOMOBILE COMPANY
AUBURN, INDIANA, U. S. A.



The Most for the Money

The Most for the Money

The Most for the Money

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THE CAR FOR ALL CLASSES

BROOKS NO COMPETITION

1916 Mecca

$695

LOW-RACY TRIM-JAUNTY

POWERFUL-EFFICIENT RELIABLE-DEPENDABLE

SURE FIRE MONEY-MAKER

WILL SCORE SUCCESS FOR WIDE-AWAKE DEALERS!

NEVER IN MOTORDOM'S HISTORY has a car, equipped with electric lights and self-starting outfits complete and including every possible up-to-date feature of any automobile selling at twice the cost, been offered at such an EPOCH MAKING PRICE. It is bound to be the SEASON'S SENSATION SELLER.

A car for both sexes—all classes—all ages—all needs. The car for the most exacting. Its appearance on any sales-floor will prove a veritable magnet in attracting trade and producing sales.

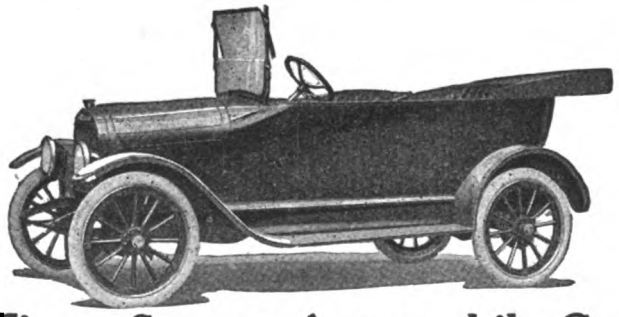
In size, appearance, quality of material, workmanship and finish it compares with most high-grade, more expensive cars. In its sphere it brooks no competition. It is the crowning achievement of three of the brainiest engineers in the business. It is assembled of the best parts known in the industry and carries with it a guarantee so broad and liberal that it is almost like a purchaser writing his own.

It has power—efficiency—reliability—always dependable.

The "MECCA 30" will create its own demand, insure business and make friends for your concern.

Join the money-making throng for 1916. Dealers wanted in every state. Write for special proposition. Look over a few of the special features not found in cars found selling anywhere near the price.

Gearless Differential,
Stewart Vacuum System,
Streamline Body,
Genuine Leather Upholstery,
One-man Top,
Clear Vision Ventilating Windshield,
Electric Lights,
Electric Self-Starter,
Crown Fenders,
Left Hand Drive,
Speedometer,
Light Weight,
Unit Power Plant,
Motor 3¾" Bore x 4¼" Stroke, "L" Head Type.



Center Control,
Transmission. Selective Type (3 speeds forward and 1 reverse),
Force Feed Lubrication,
Low Center of Gravity,
Safety-first Brakes (Internal expanding on 12" drums; External contracting on drums),
Schebler Latest Improved Carburetor,
Atwater Kent Ignition,
Semi-elliptic Springs,
Road Clearance 10 in.,
Speed: 3 to 50 m.p.h. on High Gear.

Times Square Automobile Co.

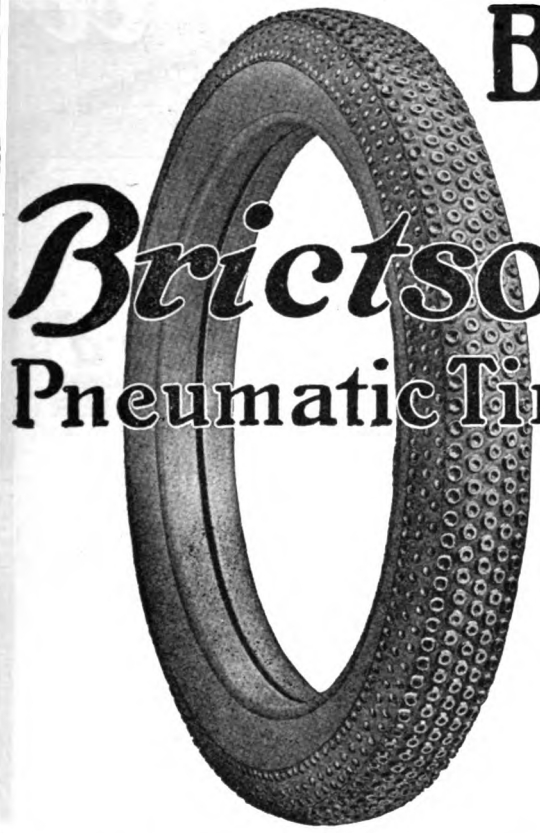
World's Largest Dealers

56th St. and Broadway, New York

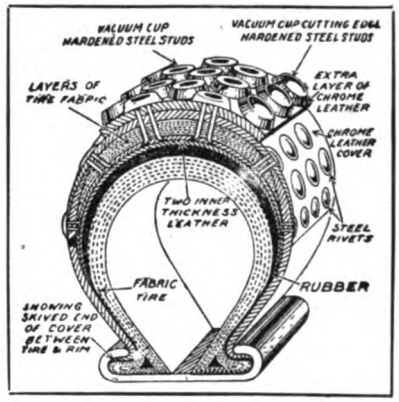
1210 Michigan Ave. Chicago, Ill.

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10,000 MILES GUARANTEE BACKS THIS TIRE



TRY Brictson Pneumatic Tires at our expense. Don't pay until you are satisfied. At our risk find out for yourself what wonderful service Brictson Tires give—how resilient and easy riding they are. Get rid of punctures, blowouts and rim cuts. Brictson Tires are rut proof, oil proof and gasoline proof. They are sold under a specific 10,000 mile written service guarantee.



Read What One User Says

"Several months before beginning my trip from Detroit, Mich., to Detroit, Fla., I thoroughly investigated tires of several well advertised kinds. I finally decided for my trip that the Brictson was the most economical and durable tire that I could find.

I am daily asked if I have many punctures. I reply that I do not know what a puncture is. I am driving on all kinds of roads under all kinds of conditions and never have a thing to worry about.

I have been on the road since the 8th day of last October, and if all goes well will begin my Florida trip again about October 1st next. I consider the tires worth almost their weight in gold. I would not do without them at twice the price.

W. J. BREWSTER,
236 Jefferson Avenue, Detroit, Mich."

August 10, 1914.

Your Tires Rebuilt the Brictson Way

If the fabric in the tires you are now using is in good condition, we can take them, make them proof against rim-cutting, punctures, blowouts, side-wall breaks, skidding, ruts, oil, and give thousands of miles of additional service.

Sign and send back coupon for full information and details of our liberal Free Trial Plan.

THE BRICTSON MFG. CO.

175 BRICTSON BLDG., BROOKINGS, SO. DAKOTA

Mail Back This Coupon

Brictson Mfg. Co.,
175 Brictson Bldg.,
Brookings, So. Dak.

Please send me full particulars about Brictson Tires, explain your free trial plan, also explain how my own tires can be rebuilt the Brictson Way.

Size of Tires.....

Name.....

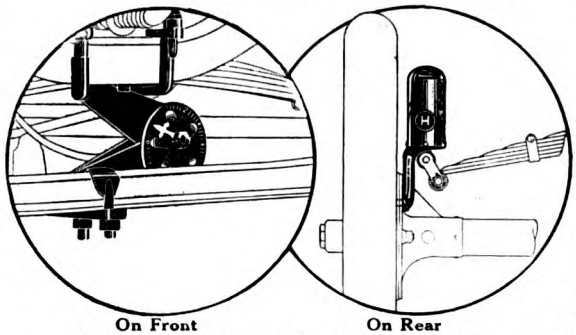
Address.....

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STANDARD Hartford EQUIPMENT } FOR Ford CARS

A Perfect Ford Shock-Absorption Equipment

The Hartford Comfort Combination for Ford cars—



On Front On Rear

On the front of a Ford ***Hartford SHOCK ABSORBER**

Hartford CUSHION SPRING On the rear of a Ford

The weight of the engine at the front of a Ford contributes to excessive spring action, here, when the road is rough. The Hartford Shock Absorber modifies or softens this action and eases the front of the Ford comfortably over bumps and ruts.

With less weight at the rear, the springs of a Ford, inclined to ride stiff and hard at this point, are given the needed resiliency to carry their load buoyantly and gently.

PRICE One Hartford Shock Absorber, Two Hartford Cushion Springs, **Fittings Complete, $12**

Ford "Gas" Bills Clipped One-Third

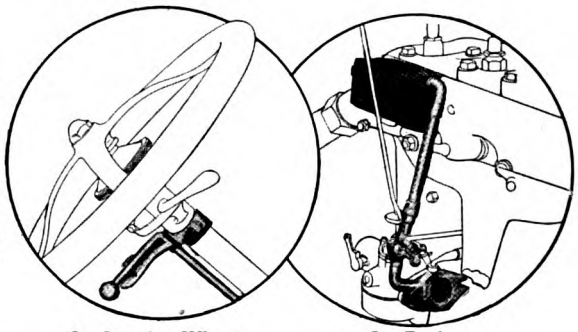
Those who are using the

Hartford Economizer

on their Ford cars say that it is **the most important Ford Accessory produced in a decade.** How true this is you will appreciate when you realize that it actually effects a saving of 15% in gasoline. More, it gives added power to a Ford engine and makes it run smoother.

By warming the air in its air stove, which gets its heat from the exhaust manifold, it feeds the engine **more** air and **less** gas. In fact, it produces **the** ideal mixture for a Ford engine. Figure a third off gasoline bill nd the Hartford Economizer looms as a mighty attractive buy at

Price Complete, $6.00



On Steering Wheel On Engine



Hartford Bumper

Insurance That Protects

When a ***Hartford Bumper***

is attached to a Ford car it improves its looks perceptibly. Gives the effect of a longer frame, of longer lines. When collision comes, no harm can come with it to lamps, mudguards or radiator. Two spring-steel, frictionally-absorbing arms rob every blow of the power to hurt foreparts of car and car itself. Bolts on without drilling.

Price, Complete, $10.00

Ask us to send you interesting data on Standard Hartford Equipment for Ford cars.

HARTFORD SUSPENSION CO., E. V. HARTFORD President **141 Morgan St., Jersey City, N. J.**

Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper

BRANCHES: BOSTON, 319-325 Columbus Avenue; CHICAGO, 2637 Michigan Avenue; NEW YORK, 1846 Broadway and 212-214 West 88th Street; NEWARK, N. J., 273 Halsey Street; INDIANAPOLIS, 425 North Capitol Boulevard.

DISTRIBUTORS: Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; L Mastrangel & Co., 117 South Beatty Street, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 180 Grand Avenue, Kansas City, Mo.; Charles Rubel & Co., 1312 Fourteenth St., N. W., Washington, D. C.

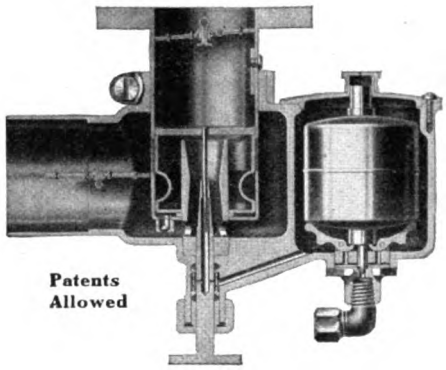
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Try It 30 Days Free

The best carburetor ever invented will be sent to Ford owners on 30 days free trial, backed by the most remarkable guarantee ever issued by a responsible firm. Try it on your car. Send it back at our expense if it fails to give you *5 extra horsepower—10 miles more speed—and carry you further and faster on 3 gallons of gasoline than you now travel on 5 gallons.*

New Model for Ford Cars

Brad-Kent



Patents Allowed

Carburetor

5 Extra Horsepower

The *Brad-Kent* will add 5 horsepower to the working power of your car. It will carry you up hills and through deep roads that you cannot make at the present time. It will start the car more quickly and get you out of many a tight place. No matter what your present carburetor, we guarantee to beat it by at least 5 working horsepower.

10 Miles More Speed

No carburetor made can equal the *Brad-Kent* in quick get-away and average speed. We agree to give you at least 10 miles more speed than you now have. And you can secure this extra speed—when you want it—on even less gasoline consumption than now.

Saves 2 Gallons Out of 5

The *Brad-Kent* Carburetor gives a better and more uniform mixture than others. Both air and gas are automatically regulated by the motor speed. Just one adjustment and one moving part aside from float. Lighter, simpler and easier of regulation than other good carburetors.

Replace your carburetor with a *Brad-Kent* and we guarantee to save you 2 gallons of gasoline out of every 5 gallons you now have to use.

In a recent official test conducted by Mr. F. E. Edwards, Official Observer for the Chicago Automobile Club—a Model "T" Ford Touring Car was driven at an average of *33.12 miles per gallon.* This record was made in a run of 102.01 miles between Chicago and Milwaukee on country roads.

Can you get this mileage with your present carburetor? Then why not try a *Brad-Kent* for 30 days and see what it will do for you?

Shipped on 30 Days Free Trial

The complete Ford outfit includes a *Brad-Kent* Carburetor, manifold, hot air tube and stove. It fits any Model "T" Ford car and can be easily installed. Try it at our risk. $15 at your dealer or direct if no dealer near you. We positively guarantee the extra power, the extra speed and the gasoline saving claimed in this advertisement. Mail the order blank and make us prove it to you.

Dealers: Write today for our attractive dealer proposition. The *Brad-Kent* sells to every Ford owner who tries it. We will help you sell them in your territory. Write for full particulars.



The Frost Mfg. Co.

684 Fremont Ave.

Kenosha Wis.

30-Day Approval Blank

The Frost Mfg. Co., 684 Fremont Ave., Kenosha, Wis.

Enclosed find Personal Check or Money Order for $15.00, for which please ship me a *Brad-Kent* Carburetor and complete outfit for a Ford car. My repair dealer is

---

Ship to .....

Address .....

I understand that I may return these goods to you within 30 days, at your expense, and get my money back if I wish to do so. (4)

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Boxed Assortments

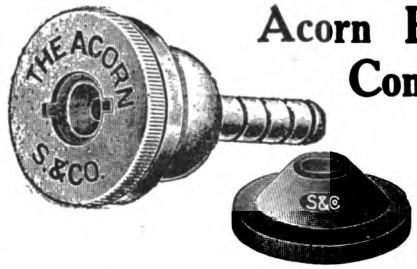


Standard Quality Full Count

A great convenience for the car owner. Special Large Assortments for the dealer.

Cotters	Machine Screws
Lock Washers	Wood Screws
Bolts and Nuts	Taper Pins, Etc.

Acorn Pump Connection

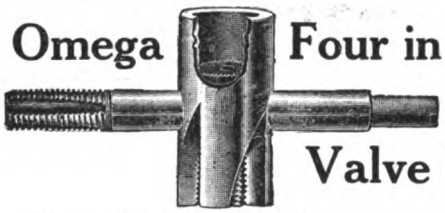


The original and most satisfactory Pump Connection. Can be used on any Valve Stem or Pump.

PRICE 25c EACH

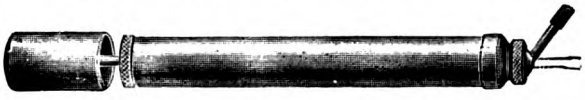
ACORN RED HARD RUBBERS will fit any connection of the Acorn Type. The tough red rubber core gives lasting qualities, five to ten times as great as regular gray rubbers. **PRICE 25c PER DOZEN.**

Omega Four in One Valve Tool



Re-cuts injured thread on inside or outside of stem. Removes Valves and re-faces top of Valve Stem. Carefully machined and finished. **PRICE 25c EACH.**

Pioneer Grease Gun



A substantially made Gun that will handle the lightest oil or heaviest grease with equal satisfaction. Furnished with large and small nozzle; nickel plated finish. **PRICE $1.50 EACH.**

Send for catalogue showing our complete line of automobile parts and accessories.

STEVENS
Automobile *Supplies Tools–Parts*

Dealers, Car Owners: Remember that all Stevens goods are fully guaranteed. Stevens goods must make good or we will. We go the limit because we know the kind of Quality, Material and Workmanship that go into Stevens products. It pays to get the name "Stevens" on whatever you buy.



SAMPSON FEATHEREDGE INNERTUBE PLUG

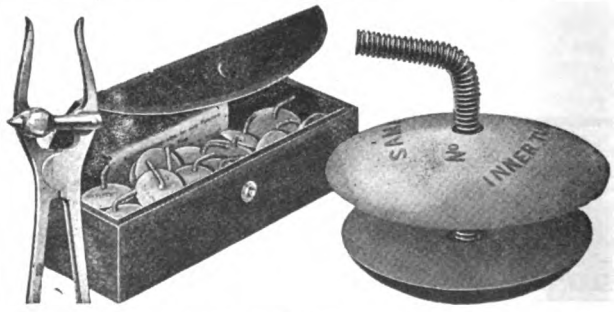
Punctures and small blow-outs repaired forever in 1½ minutes.

Here's a **permanent** repair for all punctures and small blow-outs. No cement. No vulcanizing. No patches. No disappointment. Anyone can do it—in 90 seconds. Autoists are wildly enthusiastic about it. Simple as A, B, C. With cutting edge of tool make clean, round hole. Spread hole with plier ends. Screw down plug. Snap off end of bolt. It cannot injure tube or shoe because of the pliant edge of pure, soft rubber. And the tube will never again leak at that point.

Guarantee: Sampson Plugs are guaranteed never to leak or injure tube or shoe. Money back at any time if you want it.

3 OUTFITS:

No. 1.	Tool and 6 Plugs in carton	$1.50
No. 2.	Tool and 12 Plugs in black enamel box	2.50
No. 3.	Motorcycle Kit, Tool and 6 Plugs in stout wallet	1.50

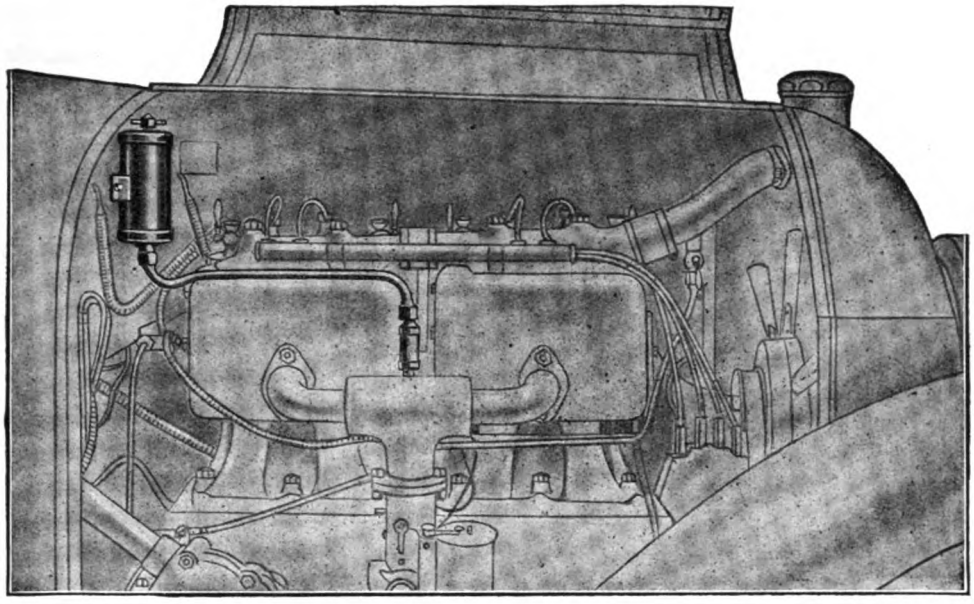


STEVENS & CO.,

Manufacturers and Distributors to Jobbers of Auto and Cycle Parts and Accessories

375 BROADWAY, NEW YORK

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THE TRIPLEX GAS ECONOMIZER

PATENT APPLIED FOR

IS

THE BEST ACCESSORY ON THE MARKET

BECAUSE

It automatically and positively increases your mileage per gallon of gasoline, cleans and keeps clean of carbon deposit your cylinders, valves and plugs, and increases your H. P. and speed.

YOUR

Expense for Gasoline, Valve Grinding and New Plugs, will be decreased from 20% to 40%.

It is entirely automatic, no levers or adjustments, uses only water, no injurious chemicals. Is easily attached in 15 minutes. Comes to you complete, by parcel post, for $7.50. Send us the name, model and year of your car.

ABSOLUTELY GUARANTEED

Your money promptly back if it does not fulfill our claims

MANUFACTURED AND SOLD BY

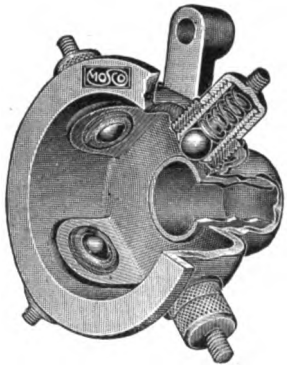
Triplex Gas Economizer Company

223 WEST 49th STREET NEW YORK CITY

Write Now for Our Catalog, Prices and Discounts

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SPECIALTIES





TIMER SHAFT EXTENSION



Bemus Timer Patents { Sept. 24, 1907 / Dec. 17, 1907 / Feb. 16, 1915 / Apr. 27, 1915 } Others Pending

A New Timer for Ford Cars

The first Bemus Timers made in 1906 sold for $16.00 each, and they were worth the money. This **New Ford Model** sells for **$2.25** and is worth $16.00.

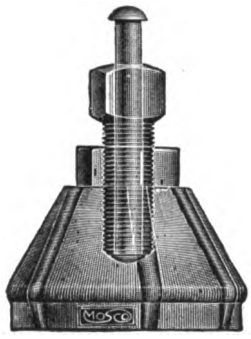
BEMUS BALL CONTACT TIMER *Costs More Worth More*

STOPS THAT SKIP. By reason of the method of mounting—on the time shaft—the main cause of skipping is eliminated. You will be surprised at the improvement here.

SMOOTHES OUT THE RUNNING to a degree which you would have believed impossible.

GIVES THE MOTOR MORE POWER, MORE SNAP, STEADIER PULLING, AND DOES AWAY WITH THAT JERKY RUNNING ON LOW THROTTLE.

PRICE $2.25



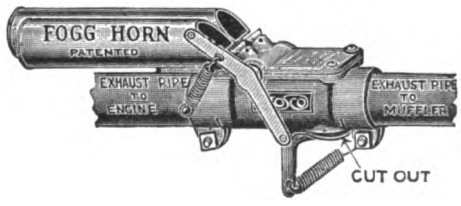
Patented { Mar. 24, 1914 / Dec. 15, 1914 }

WHEEL PULLERS

(Loose Plunger Type)

For Ford, Overland, Buick and Maxwell Cars

Every practical man knows that the only way to start a wheel which is "frozen" to the axle is to drive back the axle while pulling the wheel. Two men are required by the old method—the ordinary wheel-puller will never take off a stuck wheel—one man can do it easily with the MOSCO pullers. They have loose plungers extending through the screws—and bearing on the end of the axle. A blow with the hammer on the plunger, a turn of the screw, another drive with the hammer, and the wheel is off—no matter how long it has been on, nor how fast it is stuck. Information and prices on request.



FOGG HORN

for FORD *and* METZ Cars

Still going. Still blowing its clear, mellow signal on thousands of cars throughout the land. Some of the skeptics tell us that the electric horn has supplanted exhaust whistles, but we notice that the old reliable FOGG continues to sell. The reason? Because it is the horn located between the engine and the muffler, where it gets the full blast of the gas. Also because it has a cut-out in the body so that in buying the FOGG you get two devices in one—a signal and a cut-out.

PRICE, WITH CUT-OUT, - $5.00 **WITHOUT CUT-OUT, $4.50**

MOTOR SPECIATIES COMPANY

WALTHAM MANUFACTURERS MASSACHUSETTS

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Make ONE Dollar Of Spark Plug Investment Do The Work Of THREE

Instead of keeping a stock of plugs with terminals to fit the three types of cable terminals installed on new cars at the factory, why not stock the plug that fits *all* terminals—JUMBO JIANT?

You cut two-thirds off the investment tied up in your stock of plugs—

Yet with a two-thirds smaller stock you can always meet the demands of the fellow who wants a plug in a hurry—whether he has plain, Q-D, or clip terminals. And you're protecting your customers' interests, too: because

JUMBO SPARK PLUGS

Are GUARANTEED For One Year

If any Jumbo Jiant shows any defect, the owner has only to return it to us with the guarantee coupon, and he gets a new plug without question or argument—this promise holds for 365 days after purchase.

Selling Jumbo Jiant plugs is one of the good ways of getting "solid" with your customers, because Jumbo Jiant is

NON-FOULING

—look at the electrodes, and you'll see why. No matter how much oil is splashed up against the plug, it drains away down the inclined electrodes, leaving the actual sparking point free and clear. If Jumbo Jiant ever stops sparking, it won't be soot that does it.

The way to begin is to begin—better write to-day for detailed information and prices.

GIBSON-HOLLISTER MFG. CO.,

3380 Washington Street, Jamaica Plain, Mass.

(69-3)

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UTILITY



PRICE $10.00
Complete with
Pneu-Meter

THE ONLY TRULY AUTOMATIC TIRE PUMP ON THE MARKET

The Pneu-Meter installed on the hose line prevents over inflation as well as under inflation. Connect your pump, set your Pneu-Meter at the right pressure, start your engine and forget it.

You don't have to watch your pump—the Pneu-Meter does it for you—when your tire is properly inflated, it becomes a **Safety** blow-off valve, using excess pressure to sound a continuous signal. **So simple a woman can work it.**

PRICE $2.00

UTILITY Jr.



PRICE $6.00
Complete with
Pneu-Meter



WHISTLING PNEU-METER

Sold separately and can be installed on the hose line of any other spark plug or gear driven pumps, garage air tanks, etc.

Absolutely accurate and cannot get out of order. Whistles loudly and can be heard fully a block away, and will continue until the engine stops.

Over and under inflation decreases the life of your tires. This is due to the use of tire pumps which are equipped with ordinary dial gauges and which at the best are inaccurate. This trouble and expense can be absolutely avoided by using **Utility Pumps equipped with Whistling Pneu-Meters.**

Smallest and fastest—simplest and best constructed pumps ever made—**absolutely safe.**

Built of rust-proof bronze, brass and nickeled steel. **LASTS A LIFETIME.**



7', 6' and 5' Long Respectively

The UTILITY Socket Wrench Set

A New Principle With Many Advantages

Has all the advantages of socket wrench sets consisting of fourteen wrenches, with none of their faults. Instant in adjustment. No screws to manipulate, or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench.

SOME NEW FEATURES

Will grasp any nut instantly and requires no further effort to hold wrench in place.

In removing, the jaws hold nut firmly at all times, so it cannot fall or become lost. On the other hand, nut can be placed in jaws and applied to bolt or screw when same is inaccessible to the hands.

Unequalled for use in Garages and Machine Shops, in fact, wherever nuts and bolts are used.

Will take all nuts from ⅛ to ½ inch, inclusive.

Will take all nuts used in auto work.

Will take hexagon nuts, square nuts, wing nuts, cock nuts, and nuts rounded or distorted by use of other wrenches.

Cannot slip and bruise fingers of workmen, as jaws have rigid bearing on four sides—the harder you pull, the harder the jaws grab the nut.

Look at its wonderful advantages and then look at the price.

Utility Wrench Set Complete, $2.50

Packed in neat canvas bag.

Write for Our Dealers' Proposition.

THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

A Socket Wrench Set in itself.

Takes not only all sizes of nuts used in connection with demountable rims, but many other kinds and sizes.



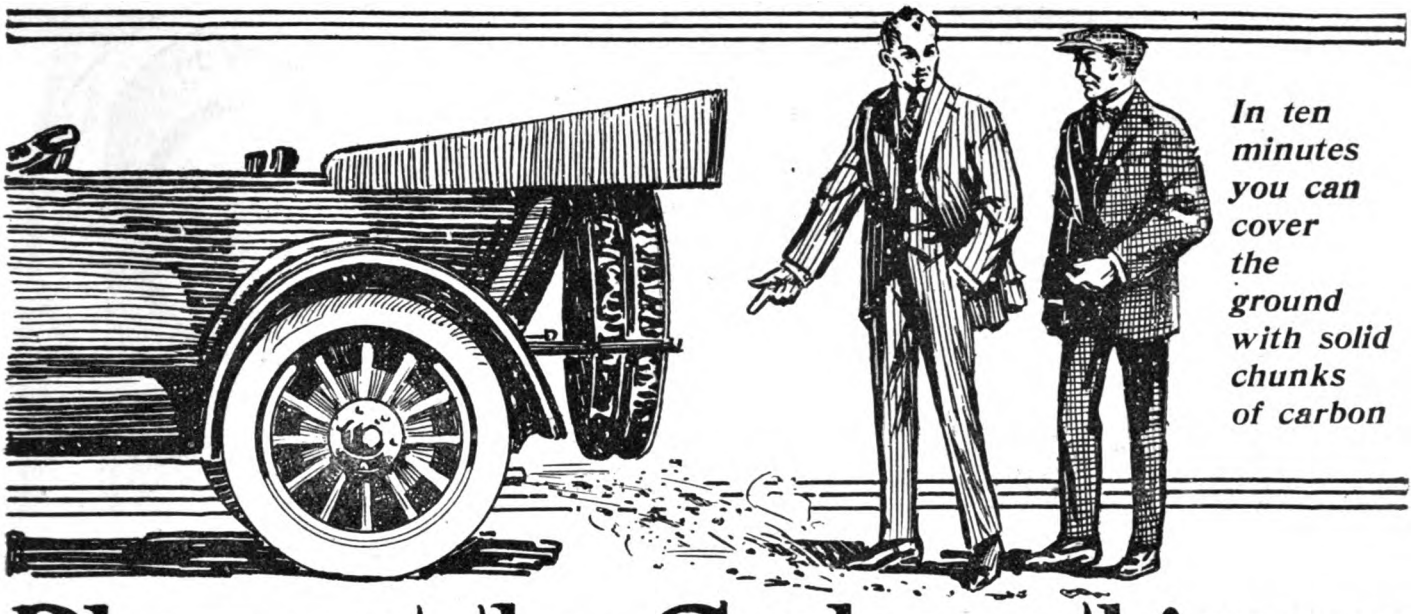
Wrench can be folded when not in use.

Price $1.50

THE HILL PUMP VALVE CO.

18-22 EAST KINZIE STREET **CHICAGO, ILLINOIS**

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Blow out the Carbon this way

OF all the agencies in the world for attacking and softening hardened carbon, including kerosene, alcohol and other oils, **live steam** has been found to be the greatest of all.

The Hart-Bell Carbon Remover is a simple little device which you can attach to your car in a few minutes and is so constructed that wherever you may be when starting your engine, at the garage or while it is standing idling at the curb somewhere, you may in 5 or 10 minutes make the insides of your cylinders as clean as the palm of your hand.

CARBON HART-BELL REMOVER

The Hart-Bell Carbon Remover has no mysterious or alleged influence. It is not one of those chemicals which are supposed to clean the cylinders and which may, at the same time, corrode away the iron. It is an absolutely safe and sure method which demonstrates its own efficiency immediately on any car by spitting out from the exhaust the solid chunks of carbon until the pavement is covered with particles.

Then you turn the cock back to neutral where it remains ready for immediate use when you feel that the cylinders again need attention.

Added to this, you have the additional advantage of being able to turn the three-way cock to another position, permitting a slight inflow of air or moisture in warm weather.

The **Hart-Bell Carbon Remover** does **not** admit water to the manifold. **It injects atomized vapor so fine that in the cylinder it becomes superheated steam.**

Would a device which absolutely eliminates carbon forever from your motor be worth the price of one cleaning, $5?

Let us send you our enlightening booklet which is based upon the most advanced engineering practice.

Utility Products Co., Inc.

1414 Times Bldg. NEW YORK





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RAYNTITE Tops are proof against drizzles or cloud-bursts. Over a year's severest, competitive tests, conducted at our testing station, prove this, and all RAYNTITE Tops (double or single texture) are

GUARANTEED FOR ONE YEAR

Not to Leak, Crack, Peel nor Blister

Why not devote the same careful attention to top selection that you do to power, ignition or tires? Isn't the cover for your car, your friends and yourself as important as other essentials of an automobile?

CROWN YOUR CAR WITH

DU PONT FABRIKOID

REG. U. S. PAT. OFF.

RAYNTITE

backed by the Du Pont name, which for more than a century has stood for integrity of purpose, superiority of product, and financial responsibility. You cannot get a better nor more serviceable top. You settle the top question satisfactorily if you insist that your 1916 car be equipped with a RAYNTITE TOP.

If your present top is in bad shape, any topmaker can re-cover it with RAYNTITE. We do not make, nor sell, complete tops—only the material.

FOR SAMPLES OF RAYNTITE (Single or Double Texture) ADDRESS

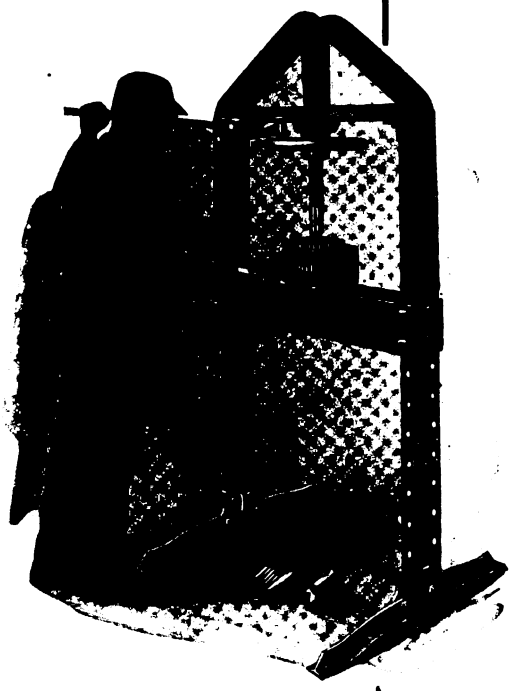
DU PONT FABRIKOID COMPANY, Wilmington, Del.

CANADIAN FACTORY AND SALES OFFICE, TORONTO

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Do ALL of Your Repair Work and do it at a Profit with a

WEAVER
GARAGE PRESS



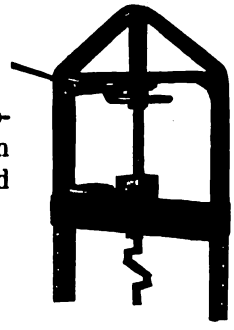
Stop paying out money to some "machine" shop for handling your difficult jobs—

A **Weaver Garage Press** will eliminate that outlay and bring jobs from other shops to **you.**

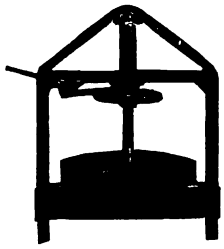
Don't antagonize and exasperate your customers by tying up their cars for two or three weeks while you send work "to the factory" which you **should** handle in your own shop—

Install a **Weaver Press** and **surprise** them by repairing their cars "while they wait"—They'll come back and bring others.

For Automobile Work



This Press was designed to handle the problems of the Auto Repairman. It is wide enough to accept an auto wheel and can be adjusted to meet practically any requirement.



Built Right

Leverage 1500 to 1; from 74 inches high, made of one piece of heavy 5-inch Channel Steel; ball bearing wheel with Bronze thrust bearings. **The Screw does not revolve.** Width between frame 32 inches; perpendicular adjustment 48 inches; weight 425 lbs.

Net Price (Complete with Equipment) **$48.00**



WEAVER Auto Ambulance

For towing disabled cars; will attach to either front or rear axle. Roller bearing *Cast Steel* Wheels; telescoping tongue.

Weight 140 Lbs.

List Price.....$30.00

WEAVER Auto Twin Jacks

One man can handle any car with ease. Full ball and roller bearing casters and lifting mechanism. Made in two sizes.

Per Set (Two)

$20.00 —— and —— $36.00



WEAVER MANUFACTURING CO.

2175-79 So. 9th Street **Springfield, Illinois**

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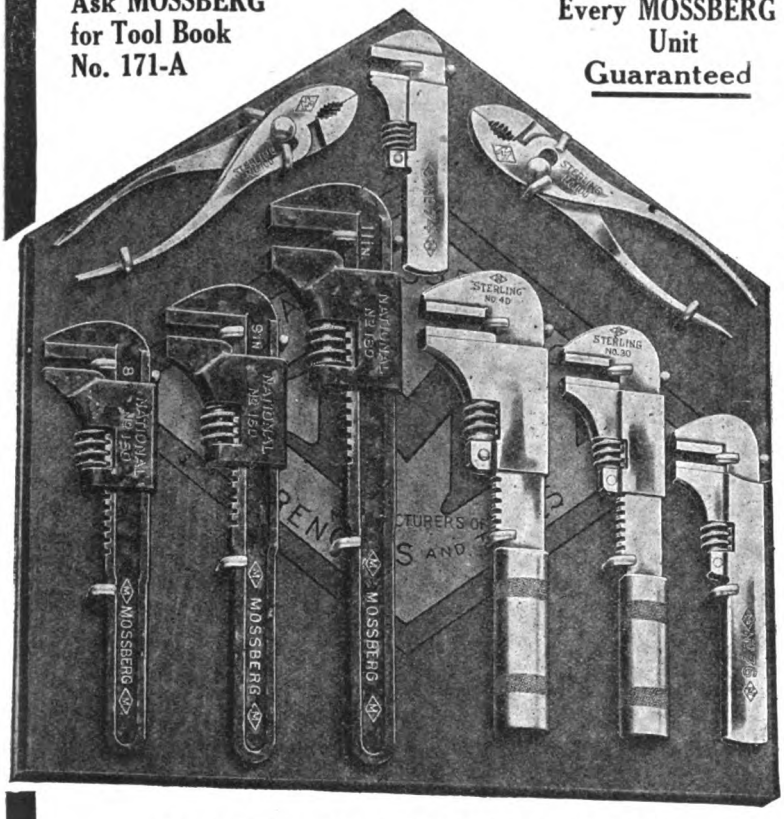
DEALERS

"Just the Wrenches that Sell—Just the Way to Sell Them"

These compact assortments, made up especially for your needs, will be sent to you through your jobber or direct upon receipt of check.

Ask MOSSBERG for Tool Book No. 171-A

Every MOSSBERG Unit Guaranteed



"ATTLEBORO" DISPLAY BOARD

Includes 6 each of the following Wrenches:

74 Sleeve Wrenches	4¼"	long, nickeled
76 Sleeve Wrenches	6 "	long, nickeled
Sterling 30 Wrenches	8 "	long, nickeled
Sterling 40 Wrenches	9 "	long, nickeled
Sterling 50 Wrenches	10 "	long, nickeled
National 150 Wrenches	8 "	long, polished, mottled
National 160 Wrenches	9 "	long, polished, mottled
National 180 Wrenches	10 "	long, polished, mottled
Sterling Pliers 100,	6 "	long, nickeled

"X" Display Board

Includes:

1 doz. each (double end) General Service Set

¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" ⅞" 1"

1 doz. each (double end) S. A. E. Set

⅜" ½" 9/16" 11/16" ¾" ⅞" 15/16" 1" 1⅛" 1¼"

1 doz. each (single end)

¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" ⅞" 1"

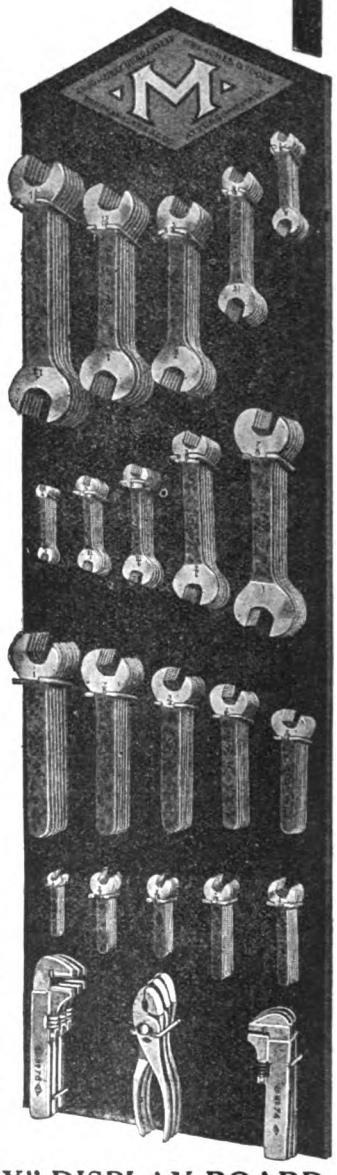
Six each:

No. 74 Sleeve Wrenches 4¼ inches long.

No. 76 Sleeve Wrenches 6 inches long

No. 100 Sterling Pliers, 6 inch Slip joint—knurled

"X" Board given free with the above selection offers exactly the items you can best dispose of and the best way to dispose of them.



"X" DISPLAY BOARD

Ask Your Jobber or—MOSSBERG

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

BRANCH OFFICES: (For Your Convenience)
Chicago, 180 N. Market Street.
San Francisco, Cal., 324 Underwood Building.
Los Angeles, Cal., 503 Equitable Building.
Seattle, Wash., 214 Maritime Building.
Dallas, Texas.
Waynesville, N. C.
Export—Guiterman Rosenfeld Co., 35 S. William Street, New York City.

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SIMMS High Tension MAGNETO

AND

SIMMS-HUFF

Electric Starting and Lighting System

Will Be Used On

50,000

MAXWELL CARS

To be made for the 1916 Season

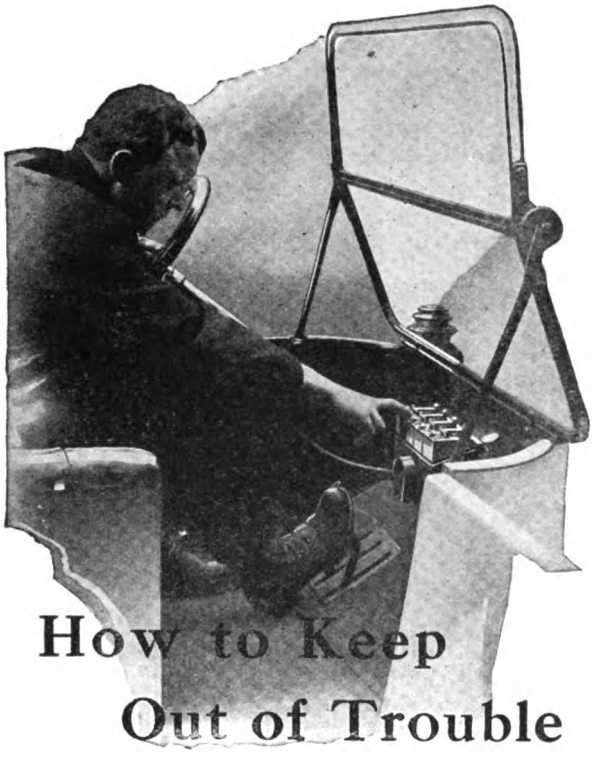
This is the largest combined order for ignition, starting and lighting equipment ever placed with one factory.

The SIMMS MAGNETO Co.

EAST ORANGE, N. J.

The Simms Electric Starting and Lighting System for Ford Cars will soon be ready for delivery. It represents an exceptional opportunity for dealers. Write quick for full information.

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How to Keep Out of Trouble

Getting out of trouble is a matter of wits —Keeping out of it, a matter of wisdom

When your Ford gets cranky and hard to start—loses its power and flexibility, its coils need adjustment. With nothing to go by that you can see or hear, getting a set of Ford coils in good adjustment is a harder thing to do than to regulate four clocks so they will tick in unison and keep exactly the same time.

The best adjustment possible gives relief only for the time being—the trouble will come back.

—— *The* ——

CONNECTICUT MASTER VIBRATOR

FOR FORD CARS

will not only eliminate Ford ignition troubles, but will give your motor more power, greater flexibility and marked economy in fuel. Once installed, nothing can disturb the uniformity with which it delivers a hot, fat spark accurately timed for each explosion. It is a specially designed instrument—one master coil with a single set of vibrator points to time the sparks for all four cylinders.

Easily installed on either old or new models—the only Master Vibrator on the market which affords a workmanlike installation on the new Fords now coming through.

PRICE, $9.00

CONNECTICUT TELEPHONE & ELECTRIC COMPANY

MERIDEN - - CONNECTICUT

The New Schrader Quick-Acting Dust-Cap

The operation of testing the air-pressure in tires having been found on occasion difficult and irksome by reason of the jamming together of the valve stem and dust cap, the firm of A. SCHRADER'S SON, Inc., have designed and placed on the market a new "Quick-Acting" Dust Cap which can be removed from the valve stem by a simple quarter turn.



The new SCHRADER "Quick-Acting" Dust Cap eliminates the work of screwing the cap down the entire length of the valve stem to the felloe of the wheel. All that is necessary is to slip the cap over the valve and turn it one-quarter turn. This locks it securely to the valve stem. To unlock, simply give one-quarter turn in the opposite direction.

PRICE 40 CENTS
$2.00 Per Set of Five

For Sale by Jobbers, Dealers, Garages or

A. SCHRADER'S SON, Inc.,

783-791 Atlantic Avenue, BROOKLYN, N. Y.



Pat. 1091318. May 19th, '14.

HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

REPAIRMAN

There has been a period in your life that you were unable to tell a valve from a spark plug, a magneto from a carburetor, or a cylinder from a piston; some one had to tell you what these parts were and their function. The troubles arising from these and other parts of a car, you have mastered, but you are still at sea if you do not understand and are not prepared to rebore and fit oversize pistons, for this is the most important repair that can be given a worn engine.

The HEISER IMPROVED CYLINDER REBORING TOOL for Ford Engines, makes a good shop out of a poor one and a better shop out a good one, but best of all, it gives the owner service. The end of this season will see one million Fords on the highways; this means many million dollars will be spent on reboring and fitting oversize pistons.

The early bird catches the worm. We furnish oversize pistons to fit the rebored cylinder, $1.50 each, Complete.

Write for further particulars about this wonderful tool.

HEISER SPECIAL TOOL CO., (Dept. A) KINGSTON, MO.

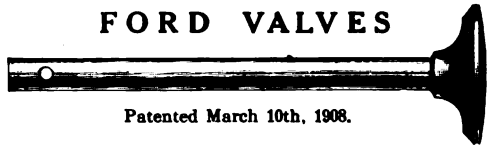
ROUGH VALVE BLANKS

REPAIRMEN - make your own valves and save money by buying the rough blanks from us; we can furnish you blanks with any size head or stem in quantities to suit you. All blanks have **Cast Iron Heads** and **Carbon Steel Stems** fused by a patent process and guaranteed.

Write for Price List and Discounts

We can furnish you the **Finished Valve**, if you prefer.

FORD VALVES



Patented March 10th, 1908.

We make them and make them right, all finished complete. A large stock always on hand.

Get Our Prices Before Buying Elsewhere

MICHIGAN ENGINE VALVE CO. - Detroit, Mich.

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HUMBOLDT'S NEW IDEAS FOR FORDS

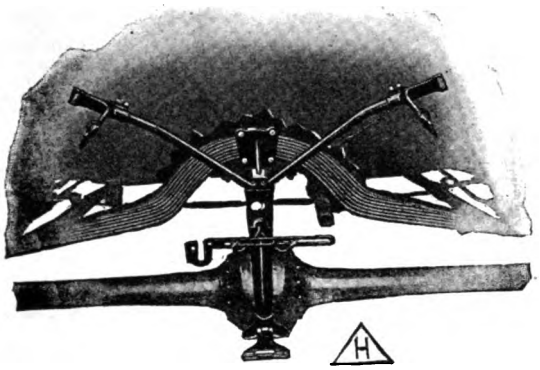
The only practical rear end tire holder on the market at the present time is our No. 284.

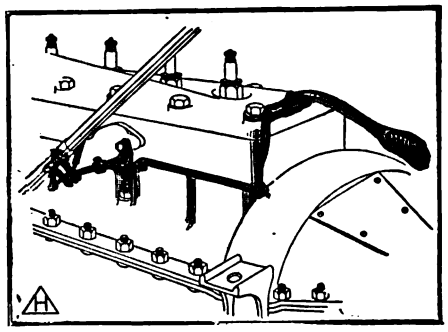
It holds the tires in rigid position, no chafing possible, and holds them free of the exhaust. Suitable for one or two tires.

Made of selected malleable iron and supplied with license pad holder and lamp bracket.

Finished in hard black rubber enamel.

Complete with straps, $3.90





Use Your Foot

and get that positive and flexible control that is characteristic of the highest priced cars.

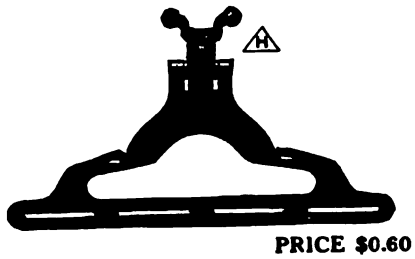
Our foot accelerator is the best, neatest and most easily attached accelerator in the world. It can be installed in 20 minutes without boring holes or otherwise marring the car.

Independent of steering post control.

Absolutely the most desirable accessory ever devised for Ford cars.

It costs only $1.

Humboldt Combination Crank Holder, Lock and License Bracket.



Attaches to front spring clips and has a folding prong which holds the crank vertical and prevents swinging and rattling. An eye loop permits locking the crank with a padlock. The license plate is held rigid and in an out-of-the-way position.

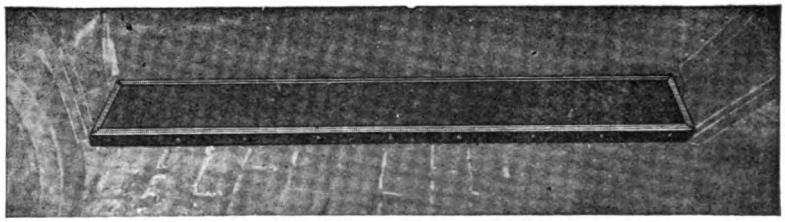
PRICE $0.60

The Great Demand

for a neat, well-made linoleum running board outfit is supplied by us with this set, which is made of the best quality standard brown lincleum with corrugated brass mouldings.

Completely assembled, ready to be mounted on touring car or runabout.

Set of two, $7.50





Ridewell Shock Absorber

A resilient compound spring cushion that absorbs all wheel vibration and eliminates the danger and discomfort of sidesway. Especially designed drop forgings. A *better* shock absorber.

Constructed of selected material and properly designed. Will outlast the car.

"Use the same set on succeeding models."

Set of two for front or rear, only $5
Complete set of four - - $10

Dealers and Jobbers

who handle our line build up an exclusive trade in accessories for Fords that finds its reflection in their bank balances. Write us about it.

Complete catalog on request.

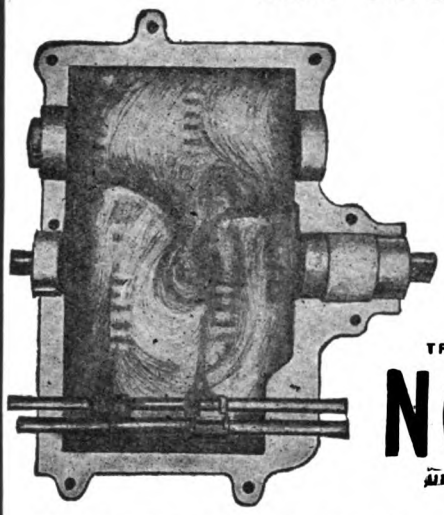
Humboldt Machine & Stamping Company

Long Island City, New York

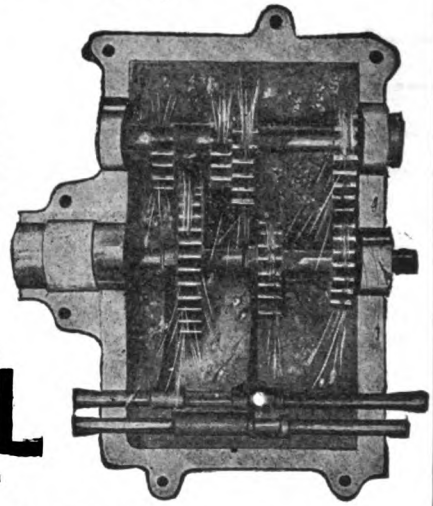
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The RIGHT and the WRONG Way

to Lubricate Transmissions



Look at these two illustrations—Study them Note the vast difference between PROBABLE lubrication with ordinary oil and POSITIVE lubrication with NON-FLUID OIL. Which depicts the actual working conditions of YOUR TRANSMISSION?



TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE

These gears are operating smoothly and silently without undue strain or wear on gear teeth. Gears are completely enveloped with "K-No. 00 Special" NON-FLUID OIL—all the time. This coating is pressure-resisting and so adhesive as to cling to gear teeth regardless of weather conditions, speed, or heat. "K-No. 00 Special" stays where put—remains on the gears and eliminates the possibitity of undue wear and abrasion—and saves power losses. It also reaches and lubricates all shaft bearings. Thus, it may be seen that the use of "K-No. 00 Special" NON-FLUID OIL for your transmission gears GUARANTEES you the most efficient and economical operation.

Now look at these gears, lubricated with oil (or grease and oil). Note how absolutely bare and unprotected the gears are. They operate with a grinding, noisy jar because what little oil they pick up is quickly thrown off. FLUID-oils and grease-compounds fail to cushion the impact of gear-teeth, thus causing wear and abrasion. Power is being wasted in this case at every revolution. A mixture of oil and grease will not help matters any, because grease settles to the bottom of gear case and only an occasional splash of oil reaches the working surface of the teeth. Furthermore, whatever oil reaches the shaft bearings quickly works out and you are in line for great trouble and expense.

Send for FREE sample can of "K-No. 00 Special" NON-FLUID OIL—and try it

Reduced Prices for 1915—Ask Your Dealer. When Buying Look for the Orange-Colored Can Bearing Sprocket Wheel Trade-Mark Shown Above

New York & New Jersey Lubricant Co.

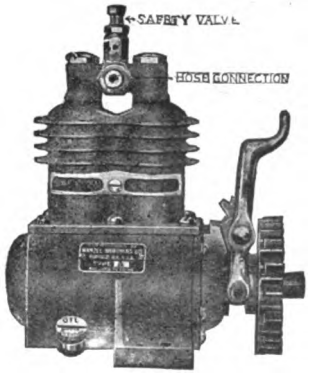
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Two-Cylinder—Engine Driven

TIRE PUMP

The best tire pump that money can buy. Can be installed by anyone. Will fill the largest tire in less than three minutes.



A Few Features of the Manzel Two-Cylinder Tire Pump

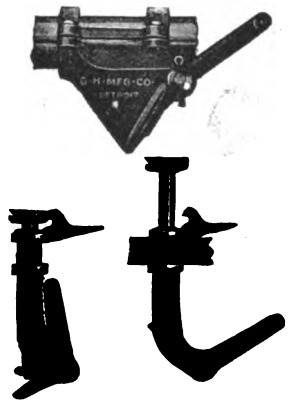
Has two cylinders, the most efficient design for a tire pump;—Runs smoothly and easily and gives a practically continuous flow of air;—Built like an engine;—All metal;—Fins for air cooling;—Has safety valve, cannot blow up the tires;—Supplies only pure air;—Only one place to oil;—Accurately made;—All parts fitted and ground;—Great efficiency;—Each pump tested to 250 lbs.;—Steel gears;—No machine work to attach to car;—Anyone can install it.

Dealers—If you are looking for a pump that will give satisfaction to your customers and a good profit to yourselves, write for our interesting proposition.

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321-323 Babcock Street BUFFALO, NEW YORK

Special Manzel Pump for Ford Cars only $7.50



The Ideal Cut-Out

Simply Cut Notch in Exhaust Pipe and Clamp over it.

PRICES

No. 5B.	For Pipe,	1½	in. o. d.	$1.50
" 6B.	"	1¾	" "	1.65
" 7B.	"	2	" "	1.75
" 7D.	"	2¼	" "	1.75
" 8B.	"	2½	" "	2.00

Gray Lock Pedal

No. 3.	Black	$0.60
" 3.	Brass	.75
" 3.	Nickel	.80

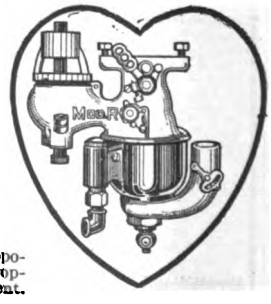
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¶ With this splendid outfit, any mechanic can become an expert welder within a short time. The **Searchlight Welder** is simple to operate, always dependable and will handle the widest range of work.

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¶ The $50.00 price does not include tanks, which are furnished separately. Prices on application.

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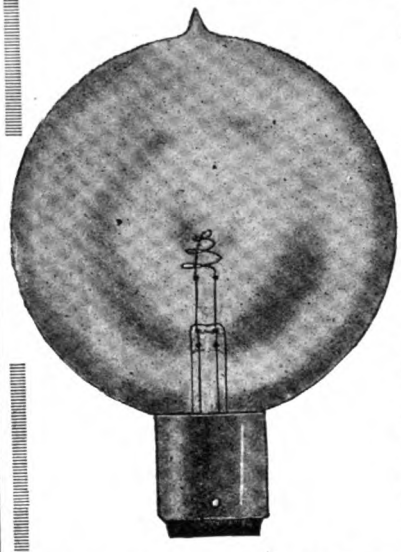
WARNING

To The Trade

On June 22d, 1915, we were granted U. S. Patent No. 1143909, covering the

Tapered Spiral Filament

In Lamp Manufacture



ADVANTAGES—

The Ideal AUTOMOBILE HEADLIGHT

Because:

More concentrated and uniform light, therefore vastly better focusing qualities than any other coil filament on the market.

The illumination of the leg through the center of the tapered spiral concentrates the entire strength of the current into a single-point light of vivid intensity.

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The Genuine Nitrogen Gas Filled

AUTOMOBILE LAMP

One-half the amount of current for the ordinary Tungsten Lamps.

Trade Mark

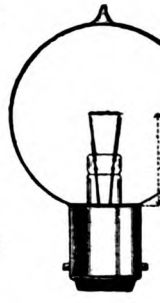
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Burns at ½ watt per candle power.

Bulb will not blacken

Close focal adjustment.



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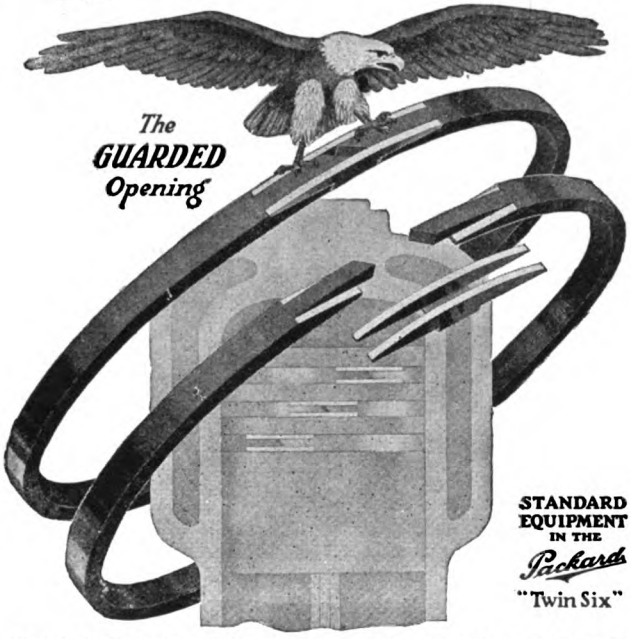
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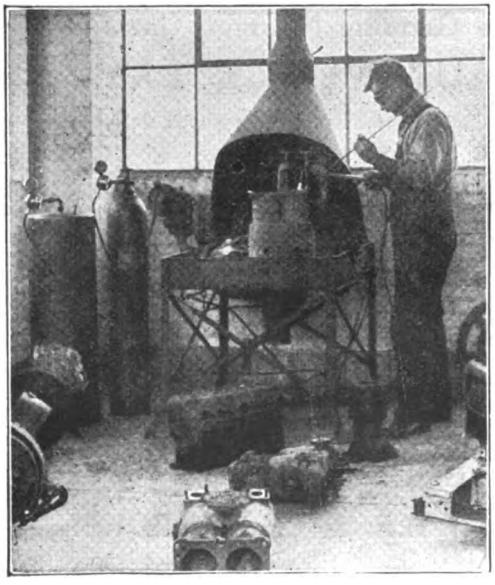
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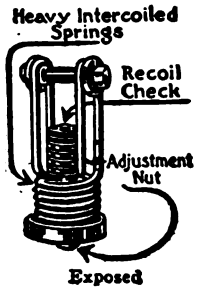
Car owners and dealers benefit alike. Write today for new price schedule. It means that

JOHNSON SHOCK ABSORBER

"THE FASTEST SELLING SHOCK ABSORBER IN THE WORLD"

will sell still faster. The only coil spring shock absorber with a recoil check—the only one that is adjustable to all road and load conditions, is rapidly dominating the market. The next year is bound to score

A STILL GREATER JOHNSON VICTORY.

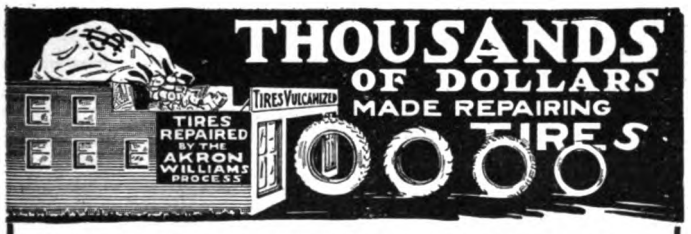


Our new sales plan and lower prices, backed by liberal advertising, means tremendous sales and wonderful profit possibilities for Johnson dealers.

DEALERS: We have some desirable territory for dealers who measure up to the Johnson standard. Let us hear from you.

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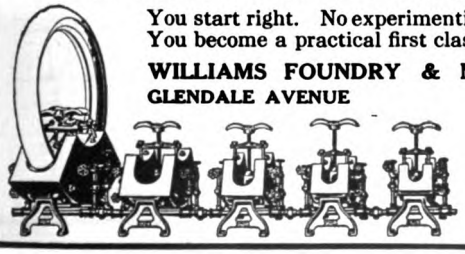
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The better your equipment, the better your work, and the greater your volume of business. Start right. Use equipment which is

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We are making an unusual offer to everybody who buys our equipment. You can become a tire repair expert by our plan.

SEND FOR OUR 30 DAY SCHOOL PLAN

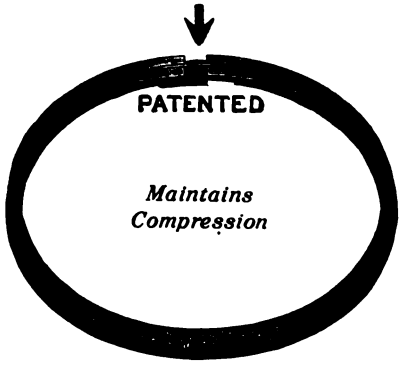


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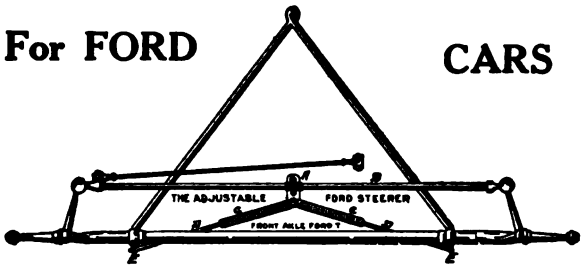
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Patent Applied For

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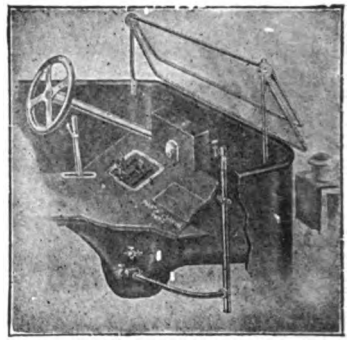
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Auxiliary Seats

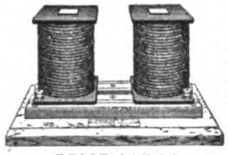


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Weight 20 lbs.

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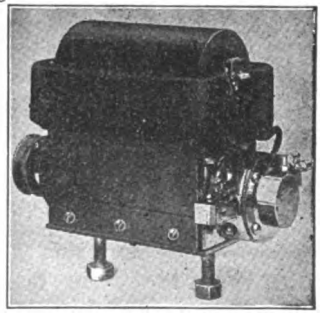
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Six inches over all — Length of Cut three inches — Screwdriver end — Quality Guaranteed

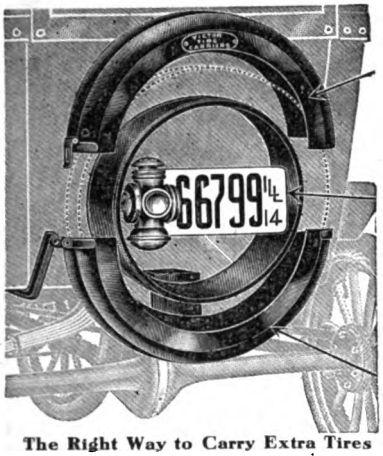
Price, 15 cents each post paid — Price, per dozen, $1.50 — Price, per gross, $13.75

LIBERAL DISCOUNT TO DEALERS

MONTGOMERY & CO., Inc., Tools, Supplies and Machinery, 105-107 Fulton Street—62 Ann Street, NEW YORK CITY

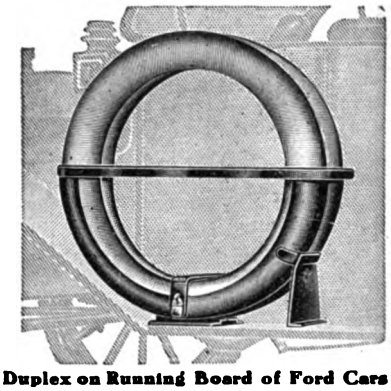
VICTOR, SIMPLEX AND DUPLEX TIRE CARRIERS

HANDSOMELY FINISHED IN BLACK ENAMEL



The Right Way to Carry Extra Tires





Duplex on Running Board of Ford Cars

A handy man with carpenter's brace and bit and a wrench can attach any of these carriers to the car in thirty minutes,

The **VICTOR** is made of sheet steel in three sections, formed to fit, completely enclose and protect the two tires, as shown.
The **DUPLEX** is an abbreviated portion of the lower half section of the **VICTOR** with bars across the top.
The **SIMPLEX** is for one tire only. **DUPLEX** and **SIMPLEX** are made in all sizes.

Made by THE INTERNATIONAL STAMPING CO., 1852 Austin Avenue, Chicago, Illinois

The Arsenal School of Automobile Electricity.

Specializes on Electric Starting and Lighting Systems and Storage Battery Construction and Repair.

A six weeks' course of class-room lectures and actual shop work that will enable any intelligent repair man to become an expert on starting systems and storage batteries. No matter how good a general repair man you are, you miss the most profitable part of the repair business unless you are an expert on starting systems and storage batteries. Demand for experts exceeds the supply.

Fall term commences Tuesday, Sept. 7th. New classes every thirty days thereafter. NO MAIL COURSE. Students now being enrolled.

Send for free prospectus giving rates and full information on subjects covered.

The Arsenal School of Automobile Electricity, 401 25th Street, Rock Island, Ill.

The HUNTER

At Last, Mr. FORD OWNER! A SELF-STARTER For $10

Increases the Value of a Ford Three Times

NOTE THE ADVANTAGES

Powerful—The straight pull and powerful leverage enables a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

Every Ford Owner **wants to make his car up-to-date and at the same time provide for comfort.**

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS FOR FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. **Price, $1.00.** Quickly installed. **Sold by leading dealers.**

THE HUNTER AUTO SUPPLY CO., 4101-5 East Ravenswood Avenue, CHICAGO, ILL.

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STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY

Specialists in Piston Rings

MUSKEGON - MICHIGAN

GARDNER

"GEE GEE"



The simple—reliable—large capacity air compressor for ***your*** garage.

Self oiling, no adjustments, no grease cups, requires no attention, and is "fool-proof."

"The Gardner 'Gee Gee'— Best of All the Garage Pumps"

LOW IN PRICE

GARDNER IN QUALITY

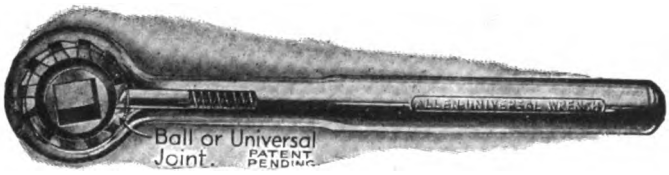
Write at once for "Garage Booklet AC-7" which describes the complete Gardner garage line.

The Gardner Governor Co.

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ALLEN-UNIVERSAL WRENCH

"The Wrench With Universal Action"



A Drop Forged Wrench, Carefully Machined. All Parts Hardened. Fully Guaranteed. The "Universal Joint" principle makes this tool adaptable for use at any angle and in places where a straight wrench cannot be used.



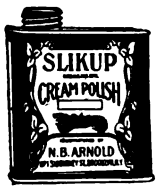
Price $8.00

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Write for Circular D. R. 4.

ALLEN WRENCH & TOOL CO., PROVIDENCE, R. I.



SLIKUP CREAM POLISH

A white creamy polish that never settles. Gives brilliant, lasting lustre with only a few rubs. No acids. Fine for nickel plate. Non-inflammable.



SLIKUP BODY POLISH

Cleans, polishes and restores brilliance to bodies, furniture, etc. No greasy residue to collect dust. Guaranteed not to harm finest varnished surfaces.



SLIKUP HAND CLEANER

A mild antiseptic preparation that cannot injure skin. Fine lather in hard water; contains more real soap than any similar product. No acids or alkalies.



SLIKUP AUTO SOAP

A pure neutral vegetable soap absolutely free from alkalies and acids. Cannot injure highly polished surfaces. Perfect grease solvent. Lasts longer than any other soap.

DEALERS: The "Slikup Salesman" will make easy money for you.

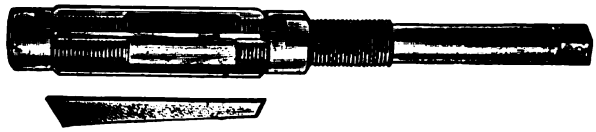
Write today for full information on the Slikup line.

N. B. ARNOLD, 1 Bay Street, Brooklyn, N. Y.

The best made for repair work

The Critchley Expanding Reamer

Try one and you will want more



Reams odd size holes

CHADWICK & TREFETHEN

32 BOW STREET PORTSMOUTH, N. H.

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Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

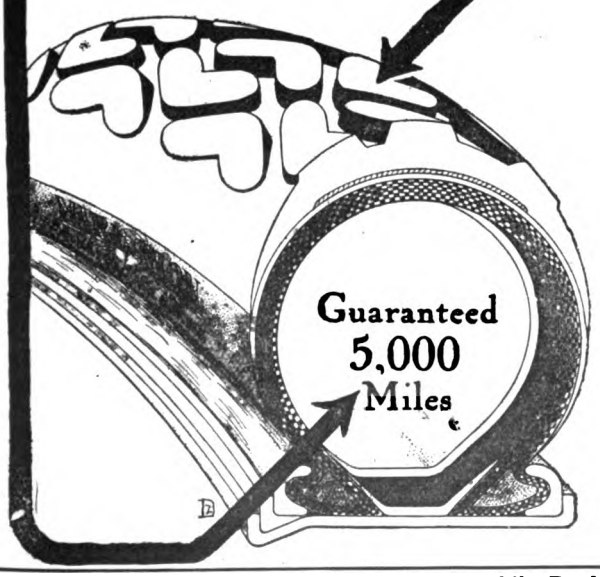
MARATHON TIRES

Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS,
OHIO





"A Twist of the Wrist"

—That's how simple it is to put in or take out the Henemier Valve—no tools required, and so simple in construction that there's nothing to get out of order.



Stem showing Henemier Valve in position.

The Henemier Valve is the long looked-for improvement on one of the most vital parts of the automobile.

The best tire in the world can't produce its maximum mileage unless the "air" is kept in the tire and kept at the right pressure after it is in. And the every-day tire valve, which hasn't changed a bit in form or principle since it was first made for bicycle tires, doesn't keep all the air in the tire all the time.

The HENEMIER VALVE-INSIDE



MADE UNDER U.S. LETTERS PATENT

keeps the air in all the time—keeps the pressure up all the time—keeps it properly inflated all the time.

Fits all standard stems and pump connections. Accepts and discharges air faster than any other valve.

Write for sample—test it yourself—

then you will have a pretty good idea of what we are telling you to tell your customers to buy.

The illustrations will give you a very fair idea of the Henemier Valve, and when you send for a sample you will be able to appreciate the advantages of the Henemier Valve over all others in just about one-half of a minute.

Packed 100 in a box, to retail at 5 cents each. Write for samples and trade discounts today to

THE RIESS MANUFACTURING CO.
SOLE LICENSEES AND MAKERS
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SAVIDGE STEERING DEVICE

Built Especially for Your Ford



$4.90

Easily attached to the front axle and tie rod by simply tightening 6 bolts.

Takes out the steering gear rattle. Eliminates the constant wobbling of the front wheels. Acts as a shock absorber on the Steering. Prevents buckling when turning corners. Keeps your car in the road without gripping "like grim death" to the Steering Wheel. Makes driving over the roughest roads and streets safer and more comfortable than the high priced car equipped with a Worm Steering Gear.

Different from All Others

This Cam Governed Spring gives accurate graduation according to the turning radius. No other device does this.

Sturdy - Simple - Safe - Silent

Thousands in use and not a dissatisfied customer. Sold under rigid guarantee. Soon pays for itself in repair bill savings. Order now. You run no risk.

Every Dealer

that has ordered a few for test purposes has ordered more. Actual test proves Savidge superiority. Here is a live proposition backed by men who know the Automobile Accessory business. Be a Savidge Dealer. Liberal proposition. Write now.

Remember the Name—SAVIDGE

The Savidge Steering Device Co. own and control the basic patents for this device. No other can be like it. Avoid imitations.

Savidge Steering Device Co., 508 Murphy Bldg., Indianapolis, Ind.



3 Big Hits at the New York and Chicago Auto Shows

Lyon Resilient Bumper

Something entirely new.

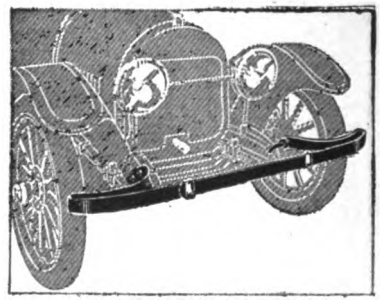
Indestructible

Other Bumpers cannot compete in Efficiency, Appearance and Quick Sales.

Lists $6.00 to $10.50

All Finishes

Made of Spring Steel



Hydraulic Shock Absorber

A dust-proof cylinder with inside working piston attached by universal joints. Glycerine and air do the work. No springs to get out of order. Reduces wear on tires 50%.

Special Price for FORD Size

MANUFACTURED EXCLUSIVELY BY

Metal Stamping Co.

Long Island City, N. Y.

"Ideal" Transmission Brake Band



Shewing Lugs Detached

For Ford Cars

With Detachable Lugs.

A three hour job done in 30 minutes.

Further particulars on request.

Write for Our New Catalogue Embracing 150 Accessories, Including 50 Ford Specialties.

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K-C SAFETY LOCK PATCH



COSTS LESS THAN VULCANIZING!

A vulcanized section costs from $3 to $6. The **K-C Safety Lock Patch** is practically a new section—at one-third the first price and **No Second Cost—No Come Back!**

The **K-C Safety Lock Patch** completely encircles the inner tube. The Lock, formed by edges dovetailing and secured with a wire key, makes spreading or bulging through the blowout hole an impossibility.



Holds the Largest Blowout!

Made of highest quality Tire Fabric. All sizes to fit every make and style of tire.

You might cut away a section of casing from bead to bead and this patch, safely locked in, will hold it's own pressure.

Sold by Leading Auto Supply Dealers and Garages Everywhere.

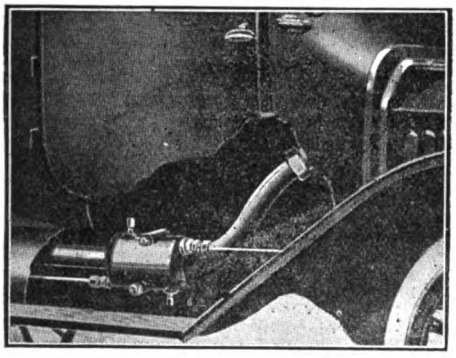
Western Tire & Rubber Co.

"America's Largest Tire Accessory Makers"

KANSAS CITY, MO.

MORE POWER - LESS FUEL

A SAVING OF 25% GUARANTEED



HEAT YOUR GASOLINE WITH THE CARBURETTE VAPORIZER

Everyone knows that cold gasoline will not give off vapor. Here is a device you can install in a few minutes, which utilizes the heat from the exhaust pipe to boil the gasoline, at the same time filter it.

This absolute vaporization allows quicker and more powerful combustion, instant acceleration, extreme smoothness and flexibility of the motor.

SEND FOR ONE C. O. D. PRICE $2.50.

Money Refunded if Not Satisfactory.

PERKINS APPLIANCE CO.
Springfield, Mass.

C·B C·B

A Few Good Ones

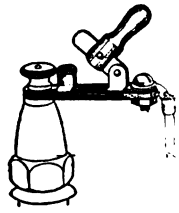
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Line of

Self Selling Specialties

The Spark Plug Switch



A simple, inexpensive attachment that is a boon to every man or woman running a car.

Attach it in a minute to the spark plug—it is a permanent fixture.

One person can test each cylinder while the engine is running. No tools required. No soiling of hands.

It tells if batteries are weak, if magneto is not delivering proper spark, if wire is broken, or why power is lost, and where.

Retails at 25¢ each. If dealer does not carry it send $1 for equipment for four cylinder car, or $1.50 for six cylinder, and so on.

The C. B. Spark Plug Switch makes a Peerless out of a Ford. It is a wonder worker. It is folly to do without it at any price, especially at the low price we charge. Write to-day.

The Coil Type Anti-Rattle



Every Ford owner needs this anti-rattle. It is inexpensive. It stops all rattle. It helps open the door. Attached in a minute, it outlives the car. Price, at retail, 20¢ each (screws included). Sent direct if dealer does not carry it. Over 200,000 sold already.

The Flat Type Anti-Rattle



Eliminates rattle in doors and hood on all cars having door-stop. Throws open door when unlatched. In use all over the country. Easily attached. Lasts as long as the car. Once tried, always used.

Retail price, 25¢ each (screws included). Sent direct if dealer does not carry it.

Good also for house doors and windows.

"SAFETY FIRST"



The Midget Electric Hand Lamp

Handle and bulb attached in a minute to any dry battery. Highly enameled reflector gives far flashing qualities and bright, intense light.

Take it anywhere, stand it anywhere. Always ready. Strong and compact. Lasts a lifetime.

Price complete without battery, 75¢. Sent on receipt of order if dealer does not carry it.

Why try to get along without it when the cost is so small? Everybody should have it handy, and everybody can. Write to-day.

TO DEALERS: *Over $15,000,000 will be refunded Ford Owners August 1st. Don't forget that C. B. Self-Selling specialties are always in demand.*

TO CAR OWNERS: All our specialties for automobiles are labor and temper savers as well as utilities of a scientific nature—never come back from the user. If your dealer does not carry them, send your order direct, and send in his name. We ship promptly.

WILLIAM J. BAILEY

401 MULBERRY ST. • NEWARK, N.J.

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The Old Way



SU-DIG SERIES PLUGS

are proving themselves a profitable accessory among dealers everywhere.

When added to the regular plugs, they markedly increase power, snap, and mileage per gallon. They require no change in the magneto or battery system.

We are getting out some new and valuable dealer helps. Write us, whether you now handle SU-DIG Plugs or not.

SUPERIOR MOTOR POWER COMPANY
(Formerly Superior Motor Specialty Co.)
24 IRVING PLACE NEW YORK CITY

The Su-Dig Way



LOOK! LOOK! LOOK!

The Yankee Folding Running Board Pump

Formerly $6.00, NOW *$4.50* PRESSURE GAUGE ATTACHED $1.00 EXTRA

HANDLED BY ALL LEADING JOBBERS
If Your Jobber Cannot Supply You, Write Us For Discounts

APEX ELECTRIC MANUFACTURING CO.
1410-12 WEST 59th STREET, CHICAGO

$4.50

Size 3½"x5½"x11" Folded



Perfolam

A Clean Car Body

With less effort and less cost.

The Perfolam Sponge cannot scratch—is soft and fits the hand.

The Perfolam is made like a sealed bag of tough but soft lamb's wool. The center is filled with ordinary sponge to hold the water. The lamb's wool being perforated lets the water through, but takes all the rough wear. It will positively outwear any high grade sponge by at least two to one. Used dry it is the best polisher made.

SPECIAL OFFER:—For a short time we will send you postpaid, this 7-inch $1.50 Perfolam sponge for $1.00. Money refunded if not satisfactory.

Dealers! This is a big winner. Write for lucrative dealer's proposition.

The Perfolam Sponge Company
1304 East 20th Street Cleveland, Ohio

It's Money In Your Pocket!

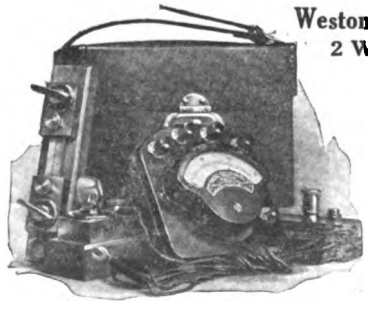
The Garage man who can repair and adjust Electrical Equipment is going to get the cream of the garage business. The ever increasing demand for attention to self-starting and lighting systems will compel you to equip to handle this business.

Weston **Model 280 GARAGE TESTING INSTRUMENT**

is your one great and urgent necessity, to enable you to quickly locate electrical troubles and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped This instrument is extremely accurate, durable and serviceable. It is the most practical electric equipment you can install

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners It will show you how you can handle electrical repairing intelligently and profitably.



Weston Electrical Instrument Co.
2 Weston Ave., Newark, N. J.

New York	Chicago
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Philadelphia	Cleveland
Buffalo	Cincinnati
Richmond	St. Louis
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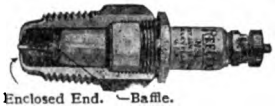
Johannesburg, S. Africa

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Spark REFLEX Plugs

GUARANTEED for SATISFACTION

Self Cleaning
Heat Proof
Long Life



Enclosed End. Baffle.

Snappy,
Powerful
Ignition

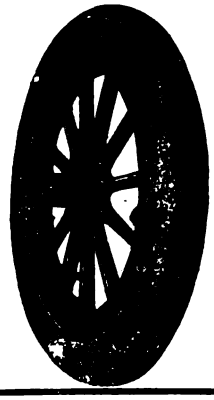
DEALERS: If You Want the Best, You Want REFLEX

We are here to prove it to you. Just state on your letterhead size thread required for your car, and we will send you a Reflex No. 1 Spark Plug, free of charge.

Write for Our Proposition at Once.

The Reflex Ignition Co., 211 High Avenue, Cleveland, O.

TIRE PROTECTION



A complete protection of chrome leather constructed with patented INSULATING and LUBRICATING strip between rivet roots and rubber casing. Prevents heat and chafing.

Prevent skidding on wet and muddy roads.

ARMOR TREADS

Prolong the Life of Your Tires

They may be successfully used upon old casings provided the fabric is in good condition, even though the rubber be worn off.

They fit like a glove and add sturdiness to the appearance of the car.

Made in all sizes for all makes of cars.

Write for Prices and Full Particulars.

ARMOR TREAD COMPANY

HARTFORD, CONN.

A Perfect Penetrating Searchlight

THE NITE-LITE

2000 Ft. of Light.

NITE-LITE is one of the most essential accessories for your car. Some of its valuable uses are, for reading signs, watching edge of road 2000 ft. ahead, averting head-on collisions, trouble lamp, etc.

The NITE-LITE is furnished with brackets so it can be attached to the windshield or side of car, also a special bracket for motor boats. Brackets have a universal joint so light can be thrown in any desired direction.

MANUFACTURED BY

MANUFACTURERS DISTRIBUTING CO. OF AMERICA

246 W. 56th Street, New York City

LEE *Tires*

PNEUMATIC NON-SKID PUNCTURE-PROOF

Lee Tire & Rubber Co., Conshohocken, Pa.

The Perfect Pump With Perfect Attachments

"Guaranteed Not to Spray Oil with the Air"

Engine Driven KELLOGG Tire Pump

Model 101 with complete attachments - - $15
Special Dodge Outfit - $10
Special Ford Outfit - $9.50

Stock carried by leading distributors and dealers everywhere.

KELLOGG MFG. CO., 267 Circle St., Rochester, N. Y.

The Scientific Safety Garage Heater

The Only Heater Listed By Underwriters.

Send for book on Scientific Garage Heating.

Built by THE SCIENTIFIC HEATER CO., 2300 Power Avenue, Cleveland.

J. H. SAGER COMPANY

Manufacturers of

J. H. S. ABSORBERS, SAGER EQUALIZING SPRINGS, BUMPERS, and Other Automobile Specialties.

Write for Catalogue.

291 South Ave., ROCHESTER, N. Y.

Goodrich Safety Tread Tires

Best in the Long Run

Cut This Coupon and get our Free Booklet that Dealers Everywhere are Talking About.

Some manufacturers and dealers questioned our judgment when we not only improved our 1915 model

C. C. Shock Absorber

but also reduced the price of our heavy car type to

$10.00 for set of two. Model for FORD,

$4.50 for set of two, $8.00 for set of four.

Our dealer aid booklet, "Proof of Profits," explains our attitude—tells why so many of our dealers are making more dollars profit this year than last by selling C. C. Shock Absorber quality at C. C. price.



Of course, you know that all working parts of C. C. are specially heat-treated steel—that C. C. stand abuse and are sold with the Cox guarantee, but you should also know why C. C. dealers are making more dollars profit.

Better fill out and send us this coupon today.

COX BRASS MFG. CO.

Established 1872

Dept. M, ALBANY, N. Y.

Branches or distributors in all principal cities of U. S. A.

COX BRASS MFG. CO., Dept. M, Albany, N. Y.

Gentlemen: Please send me your Free Booklet, "Proof of Profit," and your C. C. Booklet and Special Dealer Proposition.

Name.....

City.....

State.....

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RUBBER AUTOMOBILE SUNDRIES

"ESSEX" BLOW-OUT PATCHES
"ESSEX" RELINERS
"ESSEX" TIRE PLASTERS
"ESSEX" OUTER BOOTS
"ESSEX" UNVULCANIZED SHOE LINERS
"ESSEX" RADIATOR HOSE
"ESSEX" RED INNER TUBES
"ESSEX" PUMP HOSE
"ESSEX" GOGGLES

"ESSEX" ASBESTOS BRAKE LINING
"ESSEX" ASBESTOS ENGINE PACKING
"ESSEX" GENERATOR TUBING
"ESSEX" RUBBER LAMP CONNECTION
"ESSEX" SPRING BUMPERS
"ESSEX" PYRAMID MATTING
"ESSEX" FORD MATS
"CONDENSITE" RADIATOR FILLER CAP
"CONDENSITE" STEERING WHEELS

Write for latest Catalog

Made by the ESSEX RUBBER CO., Trenton, N. J.

WHY REPAIRMEN SHOULD USE Marko



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

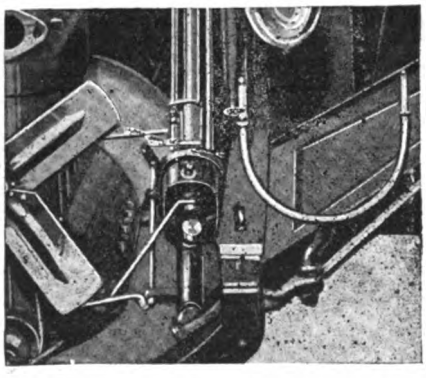
Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

"Marko" batteries lead because of their great efficiency and reliability.

Write At Once for Our Proposition to Repairmen and Dealers.

STORAGE BATTERIES

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.



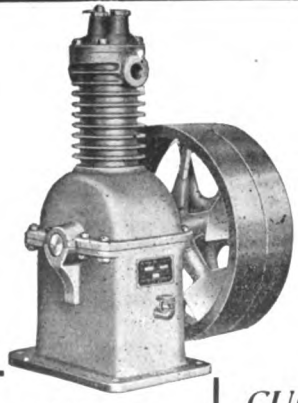
"THAT HEAVY CAR FEEL TO THE FORD STEERING WHEEL"

Can be had by equipping your car with a

Rounds' Safety Steering Gear

Comfort and Security with every mile. Steers easier. No lost motion. No spring to pull against. Built of first class material. **Price, on your car, $15.00. Satisfaction or money back.** *Circular on request. Write today.*

C. C. ROUNDS and COMPANY - DOWS, IOWA



MADE IN FOUR SIZES.

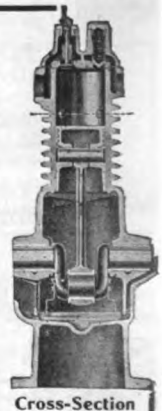
AIR FREE FROM OIL—

THAT IS WHAT YOU MUST FURNISH TO YOUR PATRONS IF YOU WISH TO GIVE THEM GOOD SERVICE.

CURTIS GARAGE AIR COMPRESSORS

will furnish AIR FREE FROM OIL because unlike all other air compressors the amount of oil furnished the cylinder is controlled—only sufficient oil furnished to properly lubricate without excess to be carried over into the air line. Examine the cross-section illustrated and note that neither crank nor connecting rod dip into the oil and the oil is not thrown direct into the cylinder.

Write Us For Full Particulars Of Either Stationary or Portable Outfit.



Cross-Section of Curtis Compressor.

CURTIS PNEUMATIC MACHINERY CO., 1530 KIENLEN AVENUE, ST. LOUIS, MISSOURI.

Chicago Office, Marquette Building. New York, 30 Church St.

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TUTHILL'S TITANIC
SAFETY-FIRST
Patented Feb 15, 1910
Guaranteed forever Against Center Breakage

Will You Accept the Verdict of These Leading Jobbers Who Endorse and Sell

TUTHILL TITANIC SPRINGS?

No Center Bolt—Guaranteed Against Center Breakage—Also furnished with the Dann Insert—The Interleaf Shock Absorber

TUTHILL DISTRIBUTORS

Albany—Albany Hardware & Iron Co.	Los Angeles—Chanslor & Lyon Co.
Atlanta—Elyea-Austell Co.	Milwaukee—Babcock Auto Spring Co.
Baltimore—Baltimore Hub, Wheel & Mfg. Co.	Minneapolis—Weston Motor Supply Co.
Boston—Post & Lester Co	Oakland—Chanslor & Lyon Co.
Buffalo—H. D. Taylor Co	Peoria The National Electric & Auto Supply Co.
Chicago—All Jobbers	Philadelphia—Manufacturers Supplies Co.
Cincinnati—The Ohio Rubber Co.	Portland—Chanslor & Lyon Co.
Columbus—Griswold-Sohl Co.	Rochester—Sydney B. Roby & Co.
Dallas—Fisk Co. of Texas	San Antonia—The Fisk Co. of Texas
Davenport—Sieg Iron Company	San Francisco—Chanslor & Lyon Co.
Dayton—S. T. & G. A. Gebhart	Seattle—Chanslor & Lyon Co.
Denver—Auto Equipment Co.	Sioux Falls—The H. F. Brownell Co.
El Paso—Western Motor Supply Co.	Spokane—Chanslor & Lyon Co.
Indianapolis—W. J. Holiday Co	St. Louis—Auto Devices Co.
Kansas City—Faeth Iron Store Co.	Tampa—The American Supply Co.
Lincoln—Nebraska-Buick Auto Co.	Toledo—Union Supply Co.

WRITE FOR "BEST SELLERS"

Tuthill "Titanics" can be easily adapted to any axle construction without any extra expense.

Why not add to your profits by getting your share of the Spring Replacement business. Get in touch with your nearest Tuthill Distributor—or write us direct.

TUTHILL SPRING CO., 758 Polk St., Chicago, U. S. A.

Miller's No. 14 Three Cavity Sectional

(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - **$100.00**

With Gasoline Burner Outfit, extra - **$1.50**

Without Inside Vulcanizers and tube plate instead, **$5.00** less.



MILLER'S REPAIR MATERIALS

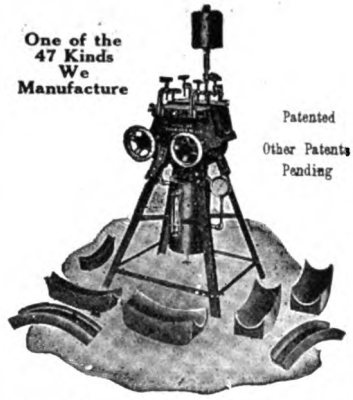
Common Tread Stock, per lb.	$0.50
Standard Tread Stock, per lb.	.70
High Grade Tread Stock, per lb.	.85
Cement Stock for Casings	1.25
Cement Stock for Tubes	1.75
Inside Tube Patching Rubber, cured one side, per lb.	1.50
No-Cement Patches, per dozen packages	2.50
No-Cement Patching Rubber, sheet form, per lb.	2.00
Fabric Sea Island Cotton, 17½ ounces, one or two sides	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides	.65
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement	Net, 2.00
*Miller's Three in One Repair Stock	1.20

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 10 lb. lots or over, 10 and 5 per cent. On 20 pound orders, 25 and 5 per cent. for cash.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture



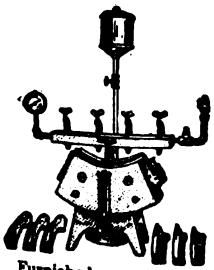
Patented

Other Patents Pending

That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....**$95.00** Less All Molds.....**$42.00**

MILLER'S SECTIONAL VULCANIZER With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - **$41.50**

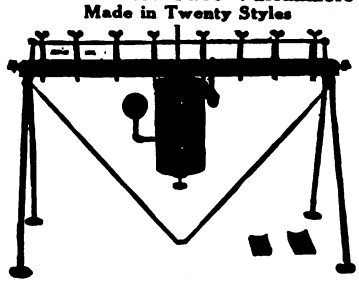
Miller's High Pressure Air Pump

is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. pressure. Write for details.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Inner Tube Vulcanizers Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

Miller's Rubber Instruction Book.

Price Prepaid, $1.00 Net

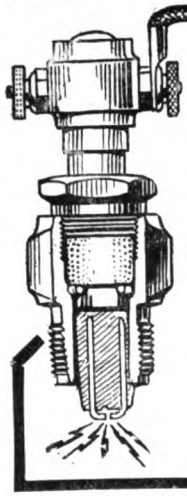
Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Cog" Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*

CHAS. E. MILLER

Anderson Rubber Works

ANDERSON, IND., U. S. A.

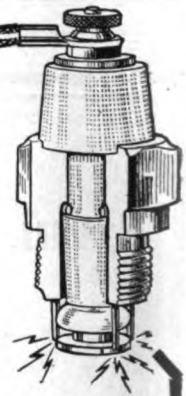
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TWO-POINT IGNITION SERIES PLUG

PECO

SINGLE IGNITION VALVE PLUG



Radically Different from ALL OTHERS!

PECO SERIES PLUG FOR TWO-POINT IGNITION.
Both plugs connected in series ignite gases twice, simultaneously in each cylinder. Both types are the very perfection of the art of ignition. Constructed on the only true and correct principle. Long recognized by scientists, now made absolutely practical and reliable.

"More Power To You"

PECO VALVE PLUGS FOR SINGLE IGNITION.
They burn all your gases, with resulting increased power and fuel economy. **Peco Series Plug** is free from any **static** influence (new discovery). **Peco Valve Plug** will not leak or corrode. Live representatives wanted. Liberal discounts. Interesting information on new discovery in spark plugs free.

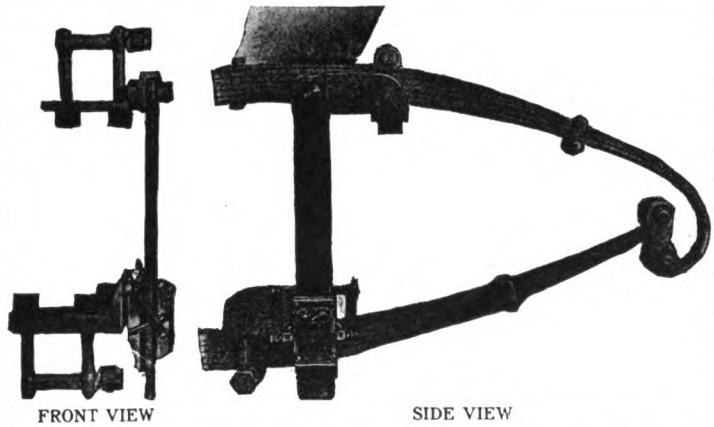
Power & Efficiency Co., Broad—State Building, Trenton, N. J.

SAVE ONE-HALF THE COST OF A NEW AUTO TOP



by using our patent applied, copyrighted, top cover order blank.
Manufacturers of Auto Tops, Top Covers, Seat Covers, Ford Tops.
WRITE FOR CATALOGUE
We can save you money.

BUOB & SCHEU, 300 E. Court St., CINCINNATI, OHIO



FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.



PATENTED
PERFECT-LOCK PATCH

"20th CENTURY" PATCHES

are the ONES that interest the JOBBERS and DEALERS—because of the **HIGH QUALITY** and **LOW PRICE** that increase sales. The ONES that interest the MOTORIST—because of the **GUARANTEE** of **Absolute Satisfaction** or **Money Refunded.**

Handled by Jobbers and Dealers Everywhere

20th CENTURY TIRE PROTECTOR COMPANY
MIDLOTHIAN, TEXAS
Largest Exclusive Patch Manufacturers in America



RELIABLE CLINCHER PATCH

HYATT QUIET SERVICE

HY-FLEX-ROL

Hyatt Quiet Bearings are used in the majority of American made automobiles

Bearings required for motor car repairs may be obtained on short notice at any of the service branches indicated.

HYATT SERVICE STATIONS

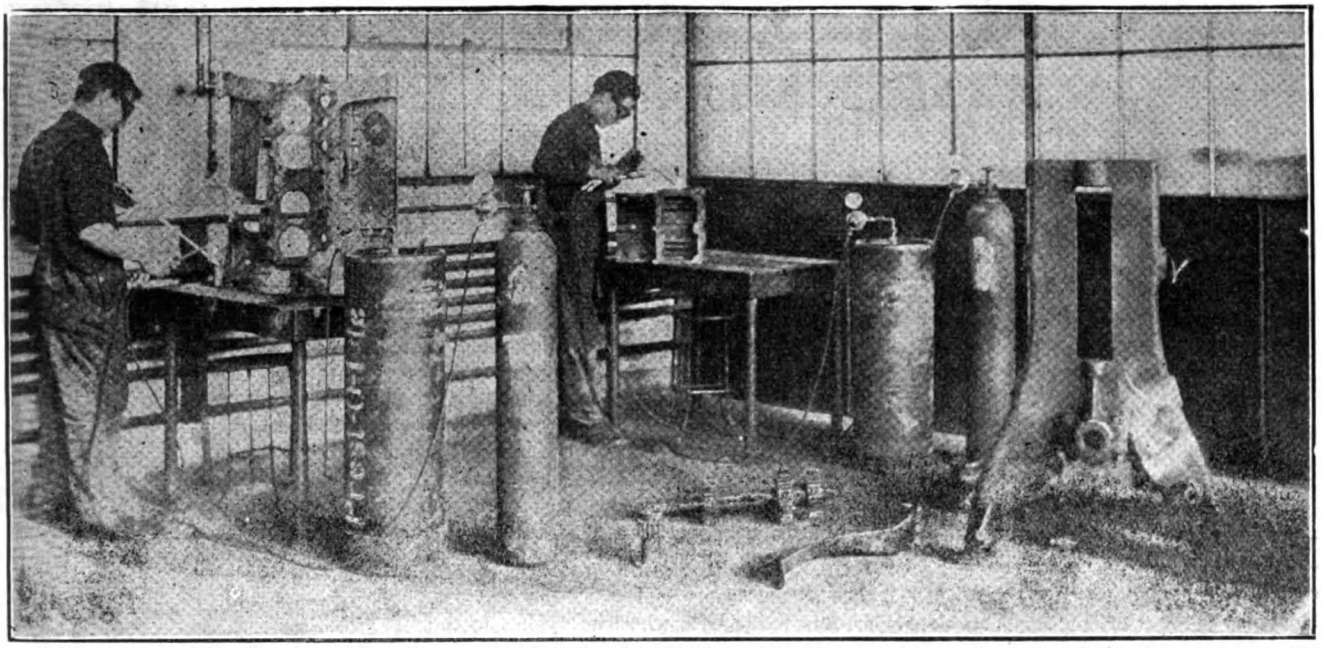
Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Minneapolis, Minn., 1400 Hennepin Ave.
Detroit, Mich.
Los Angeles, Cal.
New York, (Harrison, N. J.)

SERVICE AGENTS

High Wycombe, Broom & Wade, England

HYATT ROLLER BEARING CO.
DETROIT, NEWARK, N. J. CHICAGO

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Style D Outfit on the Job

$35.00

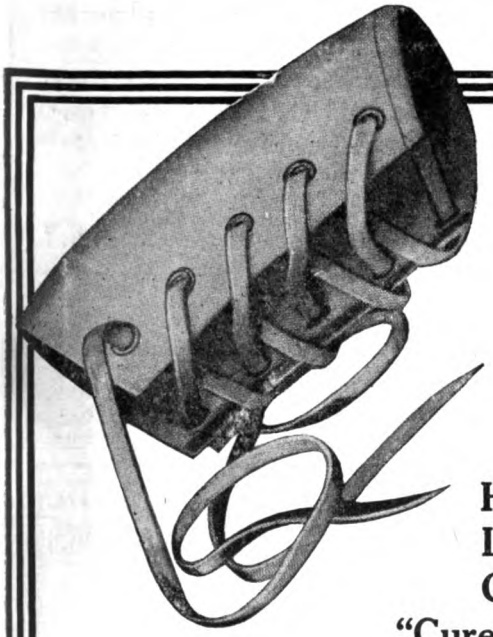
COMPLETE WITH SUPPLIES

(Tanks Not Included)

If it can be done, the **DYER** OUTFIT will do it.
Having this outfit you are prepared for an emergency, while at the same time investing very little money.
The burning out of carbon is a regular source of income, and this end alone will pay for the entire outfit in a short time.

Catalogue on Request.

THE DYER APPARATUS CO., CAMBRIDGE, MASS.

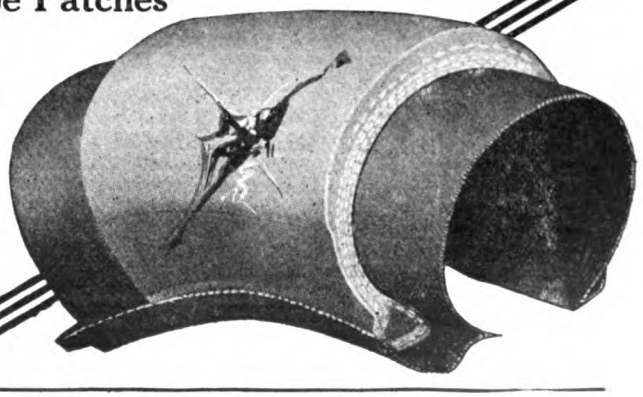


Firestone Accessories

—prove out in time of emergency and win friends for you on the practical basis of quality. The list includes everything needed for quick easy repairs:

Hook-On Boots for Clincher or Straight Side Tires
Lace-On Boots — Blow-Out Patches
Cementless Tube Patches
"Cure-Cut" Cement
Air Pressure Gauges
Tire Tape
Tire Mica, etc.

Firestone Hook-On and Lace-On Boots are easily put on and they "stay put." The Hook-On type made for both clincher and straight side tires.



Good dealers everywhere are upholding their reputation and adding new customers through Firestone supremacy. Catalog on request.

Firestone Tire & Rubber Company
"America's Largest Exclusive Tire and Rim Makers"
AKRON, OHIO—Branches and Dealers Everywhere

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TRADE APCO MARK

SIDE TIRE HOLDERS

FOR FORD RUNNING BOARDS



There are so many new rear tire holders on the market that the public is inclined to overlook the good points in favor of a side tire carrier. Absolutely the only advantage of having the tires on the back of the car is that of balance, and as a pair of shoes weigh but 20 lbs. this is purely an imaginary one. There are hundreds of reasons, however, why you should use **APCO** Side Tire Holders, and the following are a few, any one of which is sufficient for you to decide in their favor.

1. They keep the tires clean. 2. They keep the tires away from the hot exhaust. 3. The tires can be removed in five seconds and replaced in same time. 4. They cannot be lost off the car. 5. They are much neater in appearance. 6. They can be installed in ten minutes. 7. With them it is possible to carry a trunk at the rear. 8. They make unnecessary the changing of tail light location. 9. They weigh seven pounds less than the lightest rear holder on the market. 10. There are no straps to lose or break. 11. Price is the lowest of any tire holder on the market, irrespective of advantages. 12. Special catch on top bracket locks automatically when closed and lock need not be used unless wanted. 13. Screws that hold bracket to body cannot be removed with tires in place. 14. Lock is solid brass, mail type, which opens automatically when key is turned. 15. Lock clasp is rubber covered to prevent rattle. Furnished in black enamel only. Packed in corrugated cartons 6"x11"x7½" and weighs seven pounds. Complete with bolts, screws and lock, made in two sizes. Regular carries two shoes and Special carries one shoe 3½" or 4", or 3½" shoe on demountable rim or wire wheels.

The advantages of the demountable rim or detachable wire wheel as applies to the Ford car are limited, and when the extra tire is securely strapped to the standard side or rear tire holder, it is more work to detach it than it is to change the tire. The new **APCO** holder simply requires the turning of a key and the extra tire is at your service, and by reversing the operation the other tire is securely locked in position—on the running board where you can see it.

Your insurance policy does not cover the theft of extra shoes unless they are valued at more than $25, but an **APCO** tire holder is theft proof and it is yours for life for $2.

$2.00

AUTO PARTS CO., - PROVIDENCE, R. I.

AMERICAN
AUTO WHISTLE



SERVES TWO PURPOSES

A Loud Warning Signal That Also Protects Your Car From Thieves

When leaving your car you simply take the key with you, which leaves the whistle open so that your engine cannot be started without the same blowing loud enough to be heard blocks away.

It is a whistle that will blow for you as long as your engine goes, with just a kick of your foot, thereby giving you the use of your hands and feet in case of accident.
It is a whistle that will prove it was blowing at time of accident, if necessary.
It is a whistle that will tell you if a cylinder is leaking or skipping on your engine.
It is a whistle that cleans itself. *Write for prices and full particulars.*

ALFRED H. CLARK, 1307 HOWARD AVENUE BRIDGEPORT, CONN.

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

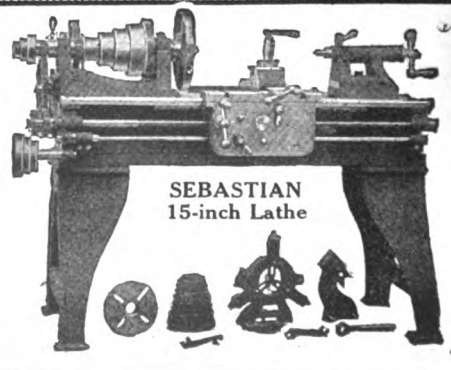
If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.
The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)
THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio


SEBASTIAN
15-inch Lathe

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Thousands of Ford Cars, in Every State in the Union, Equipped

with our Conover Cowl-windshield for Ford cars, shows conclusive evidence of merit. Sold by all the best dealers, the country over. Used on 1912, 1913, 1914 and early 1915 model T. Thousands of Ford owners are using them and praising them. The demand is country wide. Wonderfully improves Fords. Worth all they cost for looks alone. When riding in Hot weather, you don't have to be cooked, you open the bottom ventilating section and are cool and comfortable. When it storms, you open the rain vision upper section and look under. It makes driving Safe and convenient, and at the same time gives protection from the elements. It is an all year proposition. Our Universal shield for the New 1915 cowl-dash Ford has all the above advantages. It is the final touch of elegance and refinement that brings the new Ford right up to date. No better shields made at any price.



F. O. B. Adrian, Mich., $15.00

Carried in stock, prompt shipments.

Capacity 300 per day.

CONOVER COWL-WINDSHIELD

Bolts on without fitting

UNIVERSAL WINDSHIELD

takes place of plain old fashion folding shield that comes with the new 1915 Cowl Dash Ford.

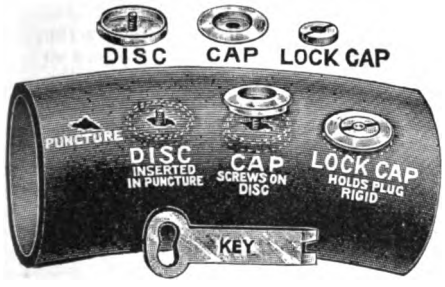
Complete with Brackets
F. O. B. Adrian, $10.00



PAGE WOVEN WIRE FENCE CO.

Windshield Department ADRIAN, MICH.

SPITLER PUNCTURE PLUGS



(Patented May 11th, 1915.)

The Spitler Puncture Plug repairs punctures in automobile and motor cycle inner tubes quickly, and without the use of cement, assuring a safe, permanent and economical repair.

The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

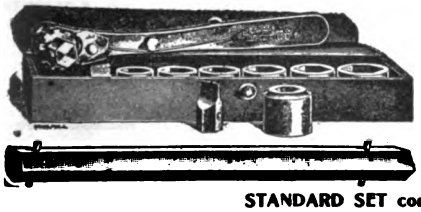
To insert The Spitler Puncture Plug into the puncture, fold the inner tube at right angles and cut the corner thus formed, making the puncture large enough to easily insert the plug. Wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

This device fits the inner tube in a manner which prevents any possibility of injury to the shoe on tube. *Write for Circular.*

PRICE:—Automobile Plugs one inch, four to set, $1.00 per set.
—Motorcycle Plugs ¾ inch, four to set, 75c. per set.

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY



LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U.S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.
Price, in leather case, - - - - $3.00

Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER, 180 N. Dearborn Street, CHICAGO, ILL.

The Trade Is Cautioned Against Selling Infringements On My Patent.

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"SUPERIOR" STREAMLINE HOODS FOR FORD CARS



"Patent Applied For"

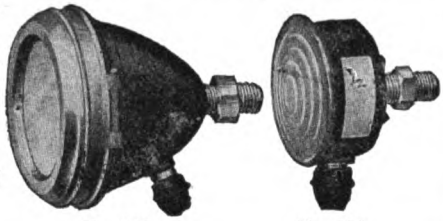
"SUPERIOR" 1915 Lamp Brackets Will Enable You To Put On Any Stock Side or Tail Lamp On Ford Cars.

Furnished in "Malleable" Iron, 3 Brackets To A Set.

"SUPERIOR" BOLT-ON 1915 ELECTRICS READY TO ATTACH.

Attractively Designed—Complete with All Fittings.

"SUPERIOR" BOLT-ON 1915 OIL LAMPS NOW READY.



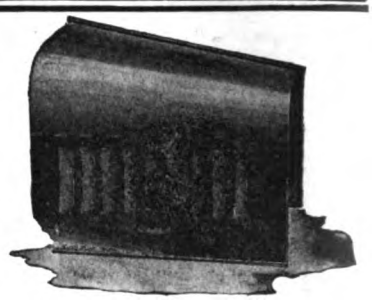
No. 800 No. 801

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are just merely painted and chip off easily.

IMMEDIATE DAILY DELIVERIES—NOW!

"SUPERIOR" COWL WINDSHIELDS CROWN FENDERS GET THE PRICE!



PATENT APPLIED FOR.

Price $8.00 Complete

No. 1. FITS 1912-13-14 FORDS.
No. 2. FITS 1915 FORDS.



"SUPERIOR" V-TYPE RADIATORS.

Price—Brass $34.70 German Silver $38.00

GET OUR CREDIT ALLOWANCE ON OLD RADIATORS

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

SEND FOR LATEST ILLUSTRATED SPECIALTY SHEET FOR FORD CARS



WHY spend money for a new top? You can give your old one new life and new looks with

"F-S" "Evernew" Auto-Top Dressing

It is the best substitute for a new cover. It is easily applied, dries quickly and makes the top bright, pliable and waterproof. Eight standard colors and special shades to order.

Write for color card and prices

FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

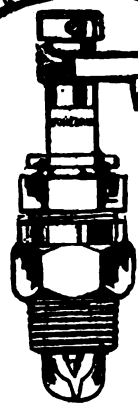
136-140 North Fourth Street - - Philadelphia

"Evernew" Auto-Top Sizing is necessary as the first coat on unpainted cloth, mohair or canvas.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special shades to order.



STONEBRIDGE



The Plug

THAT MAKES Both PROFIT and FRIENDS FOR YOU

The demand for this plug is headed your way Right Now. As fast as we explain it—we sell it. If you held one in your hand and looked it over carefully you'd understand why live dealers all over the country are stocking the **Stonebridge "Easy Clean" Spark Plug.** Its advantages are right where you can see them, for yourself.

1. **The only plug that can be cleaned without removal from the car.**
2. **Never needs adjusting.**
3. **Entire porcelain can be removed and replaced while plug proper stays in motor.**
4. **Has special safety connection on terminal.**
5. **You can test out plug without the use of any tool.**
6. **Spring terminal always assures positive contact — not sometimes, but always.**

DEALERS:

We pay your advertising bills—not in talk—but in Real Money!

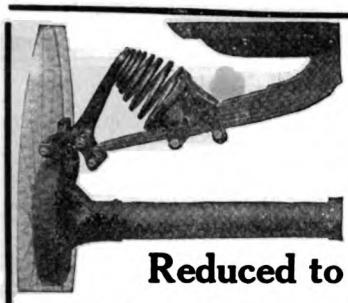
WRITE US.

DEALERS: We have a proposition that is a wonder; it reaches right thru your front door and rings the cash register. It's a kind of co-operation you never heard about before. Write us now for particulars.

STONEBRIDGE SALES COMPANY

10 WALL STREET - NEW YORK, N. Y.

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HASSLER

Shock Absorber for FORD Cars

Reduced to **$15** For a Set of 4

Efficient factory management and large production have enabled us to reduce the price of the Hassler Shock Absorber from $20 to $15 for a set of four.

The same **large** conical spring. The **same** Hassler patented lever construction that holds down the leaf spring and prevents upthrow. The **same** shock absorber that over fifty thousand private owners and hundreds of commercial users have used for two years with perfect satisfaction, only the price is reduced—to $15.

DEALERS

Our dealer proposition is better than ever. We will send you a trial set. Sold under absolute guarantee. Write for our liberal proposition.

Robert H. Hassler, Inc.
Indianapolis, Indiana

A Low-Priced Vulcanizer

FOR CAR OWNERS AND GARAGES, THAT DOES AS GOOD WORK AS THE HIGHEST PRICED VULCANIZER

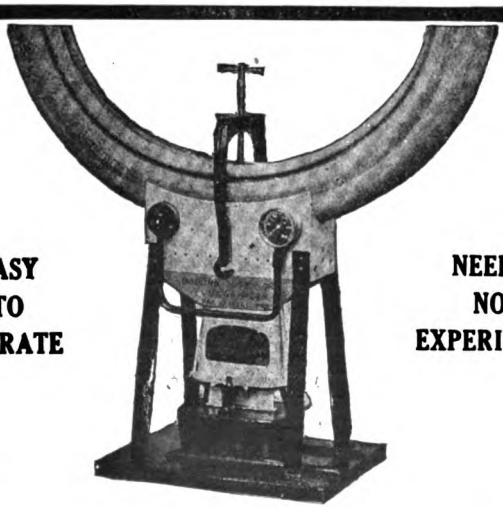
Why should you pay big money for vulcanizers when you can get the SUPERIOR VULCANIZER at a price that will enable you to pay for it on a few jobs?

No rubber air bags, bead molds, solid forms, etc. As simple as we know how to make it.

Write for our book fully describing machines. Free for the asking.

Money back if not satisfied.

LEE C. MAPES, 16 FULTON AVE., ROCHESTER, N. Y.



EASY TO OPERATE

NEEDS NO EXPERIENCE

Free Your Ford

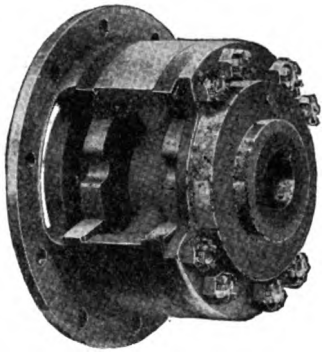
— FROM —

Sidesway, Skidding or Stalling

That's what thousands of Ford owners are doing by means of the Gearless Differential.

"Adds fifty per cent to comfort and cuts my upkeep cost"—that is a sample of what users are writing us from all over the country.

And it's true. Ask any engineer about the differential gears in your car. Learn how they tend to make your tires scrape along the ground when the road's uneven—how they waste power by failing to deliver it where it's needed. The



Bailey Gearless Differential

is the first improvement in the standard type of differential in 15 years. That is what the Engineering Department of the New Process Gear Corporation — the world's largest makers of differential gears—reported recently.

Positive drive on both rear wheels. Power always delivered to the wheel with positive road traction. In ordinary driving you get all the advantages of a solid axle.

Pays for itself quickly in saving—worth many times its cost in added comfort and safety. Sent complete, ready to install. Circular on request.

FORD DEALERS!

We are receiving hundreds of inquiries from Ford owners—only a small percentage of the actual sales possibilities once the value of the Bailey Gearless Differential is demonstrated to them.

There is good profit for you—and we have a no-risk proposition that's a winner. Write for it.

Gearless Differential Company
866 Woodward Ave. Detroit, Michigan

JOBBERS CARRYING STOCK:

Chanslor & Lyon Co., San Francisco, Cal., and branches; The Auto Equipment Co., Denver, Colo.; Post & Lester Co., Hartford, Conn., and branches; Irvin T. Donohoe, Washington, D. C.; Seminole Sales Co., Tampa, Fla.; Motor Car Supply Co., Chicago, Ill.; Motor Electrical Equipment Co., Chicago, Ill.; Excelsior General Supply Co., Chicago, Ill.; Hippee Motor Supply Co., Des Moines, Ia.; Jones Auto Exchange, Wichita, Kans.; Henderson's Garage, Shreveport, La.; Auto Supply Co., Baltimore, Md.; Automobile Supply Co., Detroit, Mich.; Tisch Auto Supply Co., Grand Rapids, Mich.; W. S. Nott Co., Minneapolis, Minn.; Kansas City Automobile Supply Co., Kansas City, Mo.; New Jersey Engineering & Supply Co., Passaic, N. J.; Rogers & Rogers, Buffalo, N. Y.; Syracuse Auto Supply Co., Syracuse, N. Y.; M. & M. Supply Co., Cleveland, Ohio; The Fen Far Co., Cleveland, Ohio; Toledo Rubber Co., Toledo, Ohio; The Auto Rubber & Mill Supply Co., Youngstown, Ohio; Ford Specialty Co., Philadelphia, Pa.; Consumers Auto Supply Co., Pittsburgh, Pa.; The L. & L. Motor Supply Co., Sioux Falls, S. D.; The Ferris-Dunlap Auto Supply Co., Dallas, Tex.; Bertram Motor Supply Co., Salt Lake City, Utah, and branches; Chemi Company, Richmond, Va., and Branches; Julius Andrae & Son Co., Milwaukee, Wis; Walkerville Hardware Co., Ltd., Walkerville, Ont.; John Millen & Son, Ltd., Toronto, Montreal, Vancouver, and branches.

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Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

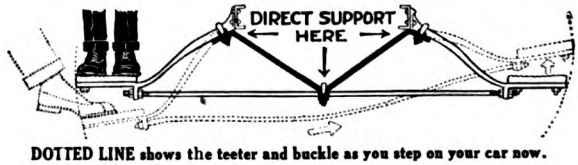


R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri

Casey
TRADE MARK
K.C. AUTO SUPPLY CO.

Running Board Braces.

Make Your Ford as Quiet as an Electric and as STRONG as a Truck.



DOTTED LINE shows the teeter and buckle as you step on your car now.
SOLID LINE shows how rigid *CASEY* braces are guaranteed to make it.

Why not stop that rocking and teetering in your Automobile? Every time you or one of your passengers step into or out of your car (as illustrated by the dotted lines above) your truss rods, frame and fenders are strained into most strenuous contortions and then quickly released back into normal position again.

Is it, therefore, any wonder the mud guards become loosened at their fastenings and rattle or the truss rods snap off at the threaded ends?

Two dollars invested in a pair of *Casey* Braces will positively insure your Car against this abuse during its entire life. Will make your Running Boards STRONG and QUIET.

You can safely carry battery and tool boxes, entire camping or touring outfits or other loads on your running boards and there will be no strain or pull on your rods or fenders to make them LOOSE and NOISY.

The three-point suspension as used in bridge building and other metal construction, is an accepted standard, because it is scientifically right. Your Automobile will be rigid because the strain is equally distributed between the three points of support as indicated by the three arrows in the illustration, and jumping on the step with both feet cannot strain your Chassis in the least.

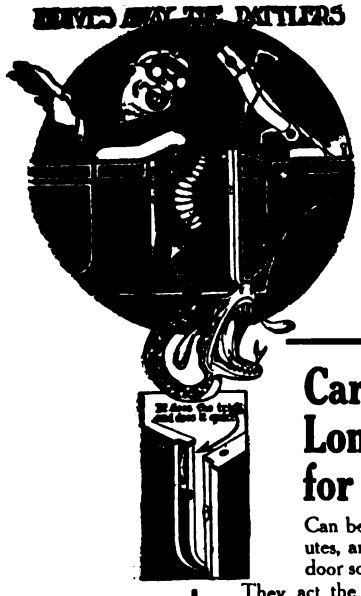
You can easily attach these braces in a few minutes yourself, and they will positively do wonders for your car. No drilling or fitting necessary. All you need is a wrench. Shipping weight, 4 pounds.

***Casey* Running Board Braces,** $2. per pair complete.....

All Cash Orders received for the next 30 days will be sent prepaid.

KANSAS CITY AUTOMOBILE SUPPLY COMPANY,
KANSAS CITY, MO.

Our New Ford Autolog Has Many Such Valuable Hints for the Ford Owner.



Gouin's Anti-Rattler For Auto Doors

Car Owners Have Long Been Looking for this Device———

Can be applied by anyone in a few minutes, and instantly puts a tension on your door so that rattling is absolutely impossible. They act the same way on the hoods and keep them from rattling. Simply rivet under hood ledge and radiator ledge.

The Biggest Seller in the Automobile Field

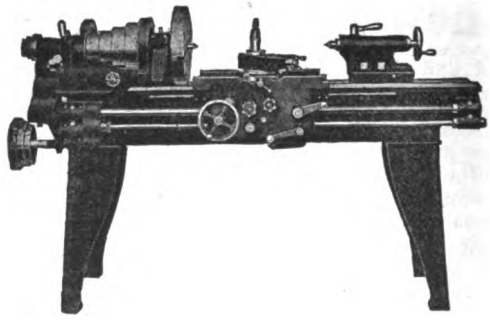
PRICE 25 CENTS EACH
Or a Set of Four for $1.00

Money back if not as represented.

Dealers and Jobbers—Write for our liberal quotations. State and County distributors wanted, some good territory open, but it will not last long, so write at once. Secure this fast selling article at once.

Address all communications to

The L. J. Gouin Co.
14 Roosevelt Ave., Poughkeepsie, N. Y.



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 6 and prices.

THE MONARCH MACHINE CO.
SIDNEY, OHIO

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STOP THAT LEAK

You are using too much oil!
You are wasting gasoline!
You are not getting enough power!
DON'T THE UP-KEEP GIVE YOU THE BLUES?

Trade Mark



Patent Applied For

AUTO OUTING CO. (Buick Distributors), Baltimore, Md., writes:—When you called 18 months ago about "NO-LEAK-O" Rings, we were not interested. Buick cars were giving such good service, we could not see the need of new rings. You made such strong claims that we tried a set. The increase in power, saving of oil and gasoline was a surprise to us. Our repeated orders for hundreds of "NO-LEAK-O" Rings speak stronger than we can write.

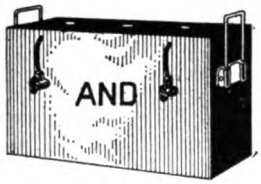
"NO-LEAK-O" piston rings have grooves which CONTROL THE OIL, giving perfect lubrication without waste. No smoke. No carbon. No oily spark plugs. No grinding of valves. We absolutely guarantee each ring for QUALITY, ACCURACY, and SATISFACTORY service. ONE PIECE, LOW COST, HIGH EFFICIENCY. Carbon eliminated by controlling the oil.

AUTOMOBILE ACCESSORIES CO., 816 W. North Avenue, Baltimore, Md.

PLATES JARS SEPARATORS SOLUTION
TERMINALS SEALING COMPOUND

STORAGE BATTERY

REPAIR



ASSEMBLY



PARTS
IN WIDE VARIETY



WALTER L. THOMPSON, 655 W. 43d St., New York

ST. LOUIS BATTERY CHARGER



2MB TYPE

The Simplest and Most Economical Device for Charging Storage Batteries Made.

Operates from the ordinary alternating current light wires.

Sizes for the Garage and the Car Owner.

Prices Low

ST. LOUIS ELECTRICAL WORKS
Arlington and Easton Aves., ST. LOUIS, MO.

The Most POWERFUL and RELIABLE STARTER is

The Compressed Air Rotary

Thurber Starter



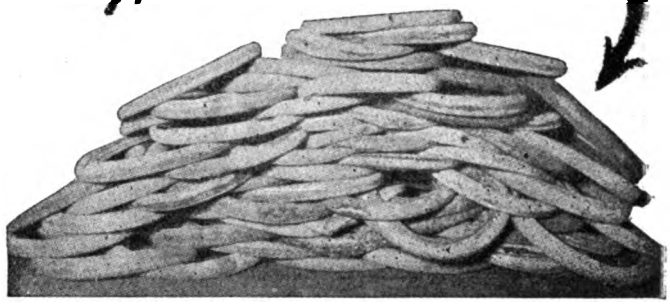
AND TIRE INFLATOR

Air Pumps and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 R P M under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc. Hundreds in use. **PRICES: Model M, Large Cars, $85.00—Model J, Medium Cars, $70.00—Model F, for Fords, $65.00.** F. O. B. Cars Our Works, Detroit,

NORTHERN ENGINEERING WORKS
12 CHENE STREET - - DETROIT, MICH.

From This



Don't Throw Away Your Worn Tires Like So Much Junk!

It is unnecessary, highly extravagant, and altogether uncalled for—**Retread them at a LOW COST with "Pacific Fibre Treads" and cut down your tire expense $50 to $500 a year**—Our free booklet tells you how.

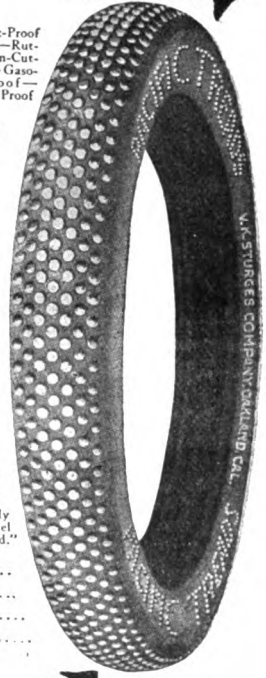
To

In 15 Minutes your old tires can be made good for

5000 Miles more

—Guaranteed
—Puncture-Proof

Blowout-Proof —Skid-Proof—Rut-Cut-Proof—Rim-Cut-Proof—Oil-Proof—Gasoline-Proof—Tear-Proof—Road-Proof—Trouble-Proof



"Pacific Treads"
Are Not Leather Treads

Leather Treads, processed, treated or tanned as many times as you can imagine, will stretch and sag and being non-resilient can never resume their original shape again on the tire, once they are stretched. Pacific Treads on the other hand fit your tire like a glove and expand or contract evenly, smoothly and instantly—as little or as much as is required—never any more.

We Ship on Approval—Pay Express Charges—Ask no Deposit

Pacific Treads will save every motorist who uses them time, worry and expense. We will prove it to you at our own expense if you will fill out the coupon below. Mail it today.

Special Discount Offered to motorists in new territory on first shipment.

Direct From Factory

.....MAIL THIS TO-DAY.....

V. K. Sturges Co., Oakland, Cal.
Gentlemen: Send me your book, **"5,000 Miles Without a Puncture"**—fully describing your new 1915 Model French Fibre "Pacific Tread."

Name.....
Address.....
City & State.....
My Tire Sizes Are.....

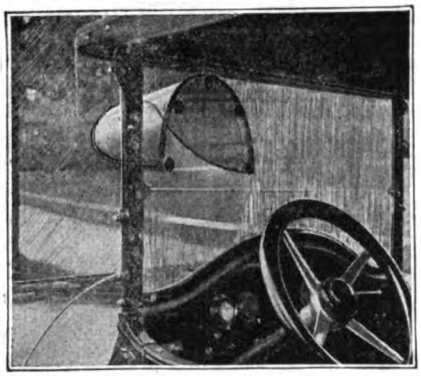
Don't Be Mislead

Don't let a garage man (who makes a big profit on tires) tell you that "Pacific Treads" are just like all the other treads—They're not—It would be just as foolish to compare a velocipede with an automobile.

Thus

Our 1915 Model Now Ready for Delivery

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View From Rear

FREY'S U-CAN-C RAIN SHIELD

Made of tough, flexible, transparent Pyralin. Lasts for years. Attached to glass in 10 seconds and as quickly removed. No water can run under or drip off the edge.

It Rolls Up

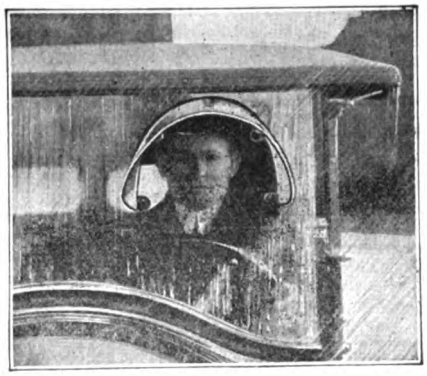
and goes into a strong tube, 11x3 in.

Send us your dealer's name with $1.50 and we will mail you prepaid, one of these necessary shields.

Fits All Cars

FREY'S U=CAN=C TRADE MARK RAIN SHIELD

First New Automobile Accessory In Five Years

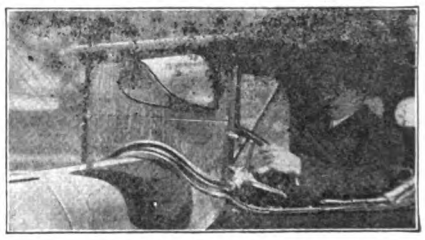


View From Front

You Can See this from the pictures.

Stick it on your wind-shield and know the comfort and safety of driving your car in all storms, with a clear view ahead.

It sticks to your glass wind-shield with five vacuum cups. **We guarantee** no wind can pull it off when properly applied.



DEALERS—Write quick for prices and agency proposition. **Stick** one to the glass of your show window. You will sell one to every car driver.

List Price, Complete

Amber..... .... **$2.00 Each** **Clear**..... .... **$1.50 Each**

FREY MANUFACTURING CO.

1516 MICHIGAN BLVD. **CHICAGO, ILL.**



"There's An Inner Tube the Boy Saved from the Junk Pile with TIRE-DOH."

Don't throw away inner tubes because they look beyond repair. When we tell you

TIRE-DOH

has permanently repaired a 37-inch tear in an inner tube you will better appreciate our claim that it is the most wonderful puncture and blowout repair on the market.

Tire-Doh will save you many dollars tire expense in repairing both tubes and casings. Anyone can use it—on the road or in the garage—and the average inner-tube puncture repaired with Tire-Doh costs less than 2 cents.

TIRE-DOH REPAIRS ARE PERMANENT

A Tire-Doh repair is as tough and elastic as the repaired surface.

Tire-Doh used to fill cuts and holes in casings will prevent water and dirt from reaching and rotting the fabric—thus doubling your tire mileage.

Tire-Doh also permanently mends other rubber articles—rubber boots, hot water bags, etc.



AT YOUR DEALER'S OR DIRECT FROM US, $1.00

DEALERS—Unless you handle Tire-Doh your stock is not complete. It is the standard repair and is advertised.

Atlas Auto Supply Company, 657 Austin Ave., Chicago

H-S

REPAIR PARTS FOR FORD CARS

We are the largest independent manufacturers and dealers in repair parts for Ford cars in the world.

Our price list, containing over 300 parts, in frequent demand by the dealer and repairman, will be sent on application.

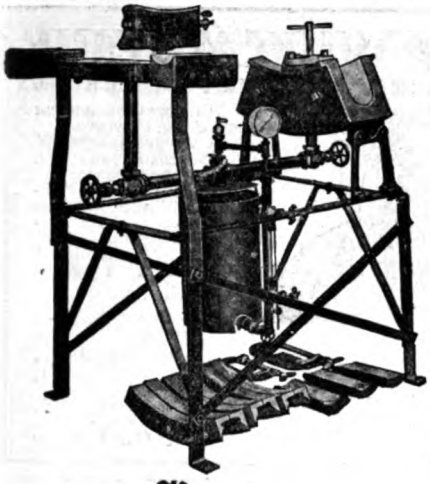
Rear Axle Shafts
Differential Drive Gears and Pinions
Connecting Rods
Nuts
Bolts
Keys
Gaskets
Front Radius Rods
Front and Rear Springs
Bushings
Screws
Pins
Ball Bearings
Washers, Etc.

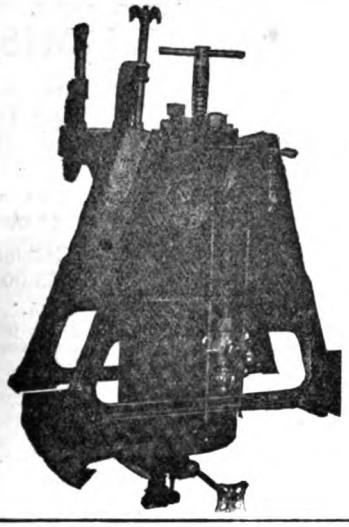
HILL-SMITH METAL GOODS CO.,

88 Pearl St., Cor. High St.,

BOSTON, MASS.

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VANDERPOOL VULCANIZERS

SATISFY

Read What Others Say:—

Pleased with the Vulcanizer got from you. —*O. W. Jordan, Beeville, Texas.*

Vulcanizer is working fine.—*Earl Grey, Saskatchewan, Canada.*

Vulcanizer received and doing good work. —*Dixie Garage, Dalton, Ga.*

The Vulcanizer does very nice work, am well pleased with it.—*J. F. Merino, Winkleman, Arizona.*

We are doing nice business and good jobs with your Vulcanizer.—*Browning & Otto, Wheeling, W. Va.*

After giving the Vulcanizer we bought from you a fair trial we find it to give absolute satisfaction. Have you another at the same price equipped with gas burner? —*A. W. Childress, Richmond, Va.*

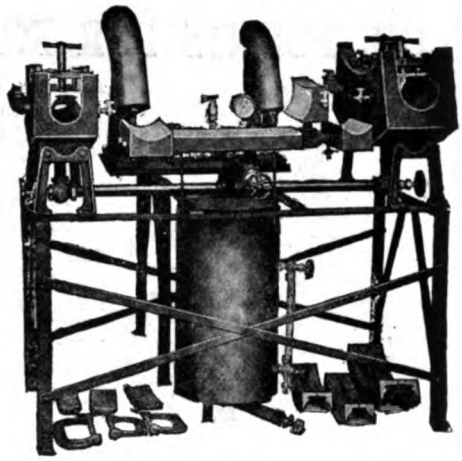
Shipped Mr. Childress another Vulcanizer, March 23, 1915.

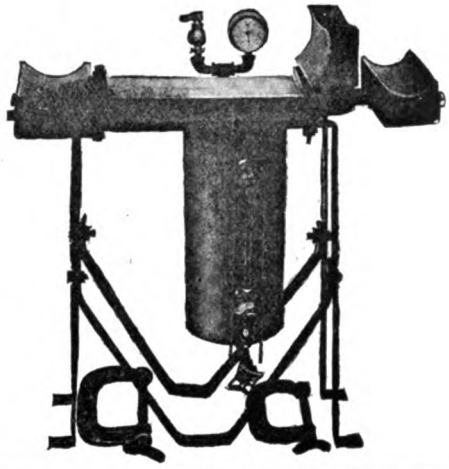
Your Vulcanizer is a wonder. I couldn't get along without it.—*H. Getman Chaumont, N. Y. 3-23-15.*

Vulcanizer which we had from you is working fine.—*Russell Co. E. Sumner, Me. 3-15-15.*

Catalogue Sent on Request.

VANDERPOOL COMPANY
SPRINGFIELD, OHIO





CITRUS
CUBA

Wonderfully rich land, good water, good title. Outdoor life the year 'round. A ten acre grape fruit grove will pay you $2,500 per annum for life. Eastern Cuba is to be the great winter playground of the American. The land is so fertile and accessible that fortunes are to be made in fruits and vegetables. Great country to relieve and cure rheumatism, nervous and respiratory diseases.

Present price of land $50 per acre. No frost and no irrigation or fertilization required. The young man's opportunity and the old man's paradise.

The grape fruit raised here surpasses in flavor and quality anything grown in Florida or Southern California.

The most delightful place in the world for a winter home, and very accessible. Boats sail from New York to all the principal ports, and at very reasonable rates.

For literature and further details address the

CITRUS DEVELOPMENT CO.
101 Tremont St., Boston, Mass.

SAVE YOUR TIRES



Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

VULCANIZIT For inner tube punctures and blowouts,
KUTFILLER For filling cuts and other injuries,
SANBLIST A cure for sand-blisters, repairs blowouts,
NEWTRED For retreading worn tire sections,
PATCHIT Two colors, white and black, for repairing Hot-Water Bottles, Air-Cushions, Rubber Boots, Overshoes and kindred articles.
¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

MONEY BACK IF NOT AS REPRESENTED

Agents wanted everywhere, liberal terms.

Send immediately for descriptive circular giving full particulars of all our special products.

SELF-VULCANIZING RUBBER WORKS, MORRISTOWN, N. J.

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OIL FOUNTS FOR FORD CARS



Also for all other automobiles where oil lamps are used.

Made singly or in quantities, any size or style.

LAMPS REPAIRED
METAL SPINNING

Send samples, blue prints or specifications for estimates.

EXPERIMENTAL WORK A SPECIALTY

Prompt Service
Expert Workmen
Reasonable Prices

COLLINS & CO.
150½ Elm St., Amesbury, Mass.

HORSEY VULCANIZER

THE MOST PRACTICAL SMALL VULCANIZER FOR INNER TUBES



Will repair all punctures and 90% of blowouts. Will vulcanize HORSEY No-Cement Patches, and any tube repair gum. HORSEY PONY VULCANIZER with one box containing twelve assorted (large and small) HORSEY NO-CEMENT PATCHES, all complete,

Price, $3.00

Satisfaction guaranteed.

HORSEY NO-CEMENT PATCHES

Large Box, 12 Assorted Patches - - - - - - 65 Cents
Small Box, 8 Small Patches - - - - - - - 40 Cents

MANUFACTURED BY
THE HORSEY MANUFACTURING CO.
6104 EUCLID AVENUE CLEVELAND, OHIO

Carbon Can Be Removed

thoroughly in 10 minutes, leaving cylinders ideally lubricated; costs only

5c to 12c per cylinder

Just **pure oils, harmless** to everything except carbon.

GUARANTEED OPCO OIL PRODUCTS

CARBON REMOVER

Get our booklet, "*Carbon, Cause and Cure.*" Tells in a simple, brief way how to cure and prevent carbonization.

DEALERS: Get discounts and terms

AMERICAN OIL PRODUCTS CO.
BUFFALO, N. Y.

POLISH YOUR CAR WITH MARVEL-MIST

FIFTY POLISHES FOR FIFTY CENTS

Cleans
Polishes
Protects

Pints
75c

Half-Gallons
$1.75

APPLIED THROUGH SPRAYER



Removes Road-Tar and Oil

Quarts
$1.00

Gallons
$3.00

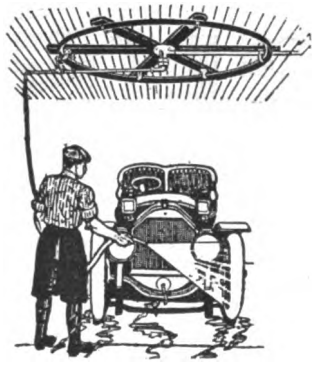
Prices Include Combination Sprayer and Polishing Cloth.

Be Economical. A pint of Marvel-Mist is equal to half-gallon of ordinary polish.
Spray Lightly with Marvel-Mist, rub off with cheesecloth and you have a wonder fully lustrous mirror-like surface. Cheesecloth furnished with outfit.
Beware of Imitations. Like everything good, Marvel-Mist is being copied.
It's Guaranteed. Money back if you want it.

Dealers Wanted Everywhere for Marvel-Mist
Positively the Best Polish on the Market
Send for descriptive circular. Tells all about Marvel-Mist.
MARVEL-MIST MANUFACTURING CO., 56 Greenpoint Ave., Brooklyn, N.Y.

Special Request

¶ IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser



KEEP YOUR CAR CLEAN
WITH A
"PERFECT" VEHICLE WASHER

SAVES LABOR, WATER and HOSE

Send for Catalogue

PERFECT MANUFACTURING COMPANY
ALBANY, N. Y.



"There's a mighty big difference in lubricators!"

Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound
Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.
Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.

DIXON'S

GRAPHITE GREASE No. 677

For Transmissions and Differentials

does the trick. It is highest grade mineral grease and Dixon's selected flake motor graphite, the only form of graphite that will not ball-up or pack under pressure. It covers the bearings with a durable, oily veneer that keeps metal from metal and lets graphite ride on graphite.



Write For Booklet No. 184-G

Made in JERSEY CITY, N. J., by the
JOSEPH DIXON CRUCIBLE COMPANY
Established 1827

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The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS

The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,

"Worn Out Tires Made New."

Please mention the size of your tires.

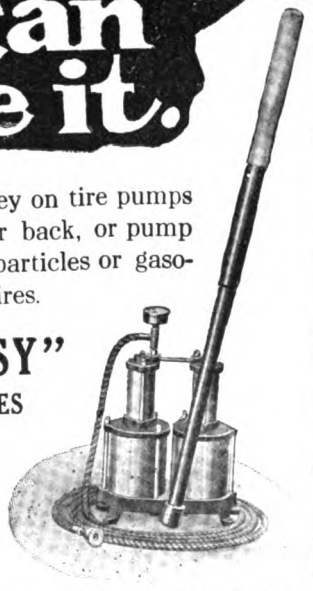
TRIPLE TREAD MFG. CO.

1542 MICHIGAN AVENUE CHICAGO

Factories: San Francisco, Chicago, Winnipeg

At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gasoline fumes into your tires.



"DEAD EASY"

TAKE NO CHANCES

At our risk you can prove that the "Dead Easy" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY

BATTLE CREEK, MICH., U. S. A.

Allen This Tire Pressure Gauge Will Save Tire Expense

Careful, thorough investigation has shown that over 75 per cent. of all tire troubles is directly traceable to under-inflation. This can easily be avoided by testing the air pressure in the tire with the

ALLEN TYROMETER

TIRE PRESSURE GAUGE

This handy, accurate, guaranteed gauge is 4½ inches long, made of heavily nickeled brass tubing, with sliding band which holds the indication as long as desired —clip attached for carrying in pocket.



Satisfaction Guaranteed or Money Back

Price, $1.00

Dealers should have the neat display case and attractive show card.

Write for particulars and price list.

The Allen Auto Specialty Company

Manufacturers

1926 Broadway, New York

1627 Michigan Ave., Chicago



Sta-Tite Piston Rings

Are Mechanically Efficient

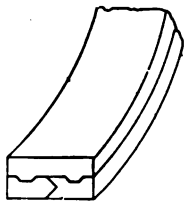
Sta-Tite Piston Rings are made up of three individual interlocking rings, grooved together to give Maximum Flexibility and Resiliency.

The wonderful resiliency of the Sta-Tite Ring enables it to automatically adjust itself to the width of the Piston Ring Groove.

Leakage of Compression and Oil is a mechanical Impossibility.

"Piston Ring Service Is the Key to Perfect Compression."
—Efficiency Ed.

This cross-section shows the Groove Construction which prevents the sections from slipping out of place or "riding" the pins and scoring the cylinder walls.



Prevents the "vents" or slot openings from getting in line and allowing the leakage of Power and Compression.

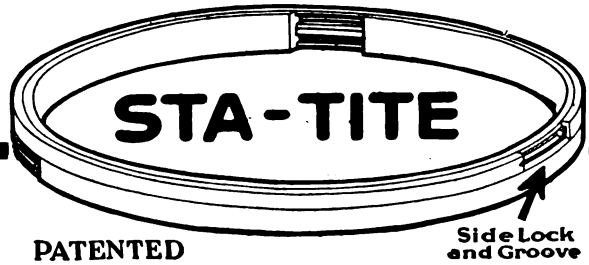
Install a complete set of these Mechanically Efficient Piston Rings and notice the Increased Efficiency of your Car.

Special Inducements to Dealers and Agents.

Rings in All Sizes. **Write for Literature.**

STA-TITE PACKING RING CO.

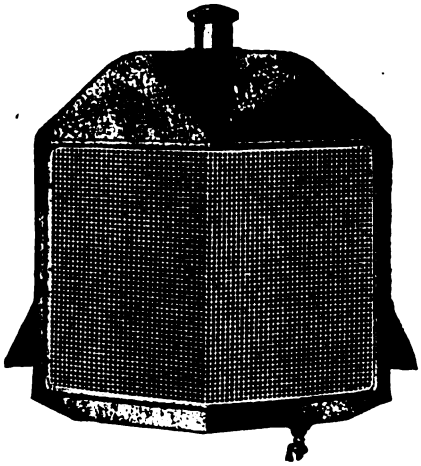
3037 OLIVE STREET ST. LOUIS, MO.



PATENTED **Side Lock and Groove**

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EXTENDED V-FRONT RADIATORS for FORDS



BEAUTY — ECONOMY
DURABILITY

MORE POWER—LESS TROUBLE

A new Rome-Turney radiator on your Ford is more than a luxury. It is necessary if you want to get the full service, power, reliability and durability of your car. Perfect cooling increases power and speed, saves oil and gasoline, prevents delays and prolongs the life of the motor. Every Ford should have one.

We make Rome-Turney Radiators for Ford cars of genuine square tube honey-comb Mercedes type construction, in both flat front and V-front types. They are furnished in either polished brass or German silver.

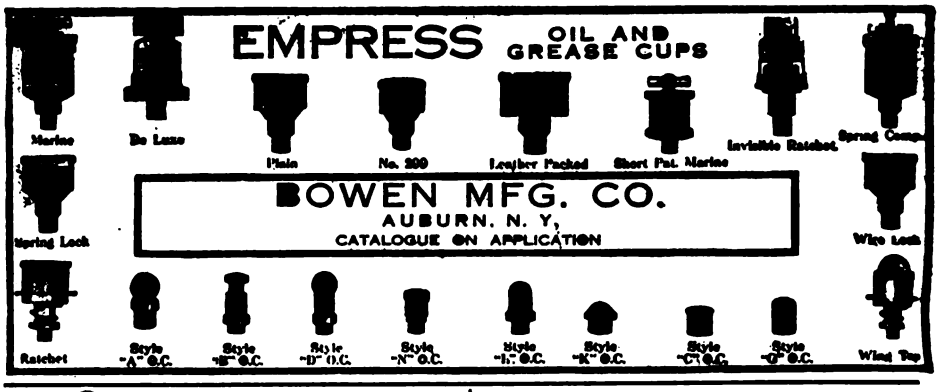
EVERY RADIATOR GUARANTEED

Write for prices and information today.

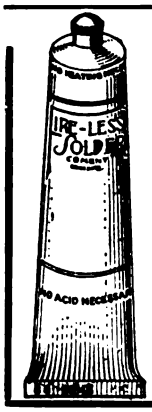
We repair and replace all types of radiators.

ROME-TURNEY RADIATOR CO.
Whitesboro Street, ROME, NEW YORK

EMPRESS OIL AND GREASE CUPS



BOWEN MFG. CO.
AUBURN, N. Y,
CATALOGUE ON APPLICATION



FIRELESS SOLDER CEMENT

For Repairing Cracked Water Jackets, cylinders and leaky radiators, and any kind of metal. Heat will not affect it. Solder hardens in the air. No heat or acid necessary. Supplied in collapsible tubes. No skilled mechanic is necessary to apply this.

Retail Price, 25 cents a tube
Weight of Tube, 2 oz.
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Agents Wanted
Standard Purchasing Company
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Two Air Seals
BOTH POSITIVE

No Tool or Caps necessary to seat or remove the Inside Valve. Interchangable with all Valves.

Double Seal Tire Valve Company
1790 Broadway - New York City



OAKES Horn and fan combined for Ford Cars. Not electric. Press button. Simple and Safe. Economical. Write for booklet or dealers' proposition.
The Oakes Co., Indianapolis

Most Lubrication—
VEEDOL
Least Carbon

For Bargains in Auto Supplies
Write for our catalogue.
LIBERTY TIRE & SUPPLY CO.
102 Chambers Street New York

Eagle Light Cars Equipped with the Wonderful Macomber Rotary Engine.
FORTY to FIFTY MILES to the GALLON of GASOLINE
Cost of maintenance of these cars, about half that of standard tread automobiles. Sales price, $375.00 up—depending upon equipment.
For particulars address
Eagle-Macomber Motor Car Co.
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THE HAMPTON HUMEFIER
The biggest development to motor cars in ten years.
Agents Dealers Motorists
SOLE DISTRIBUTORS
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LICENSE HOLDER
The most satisfactory front clips for attaching license number to any size rod between headlights **25c per set** (coin or postage) prepaid anywhere.
Write for printed matter.
Majestic Auto Supply Co.
P. O. Box 548 Philadelphia, Pa.

Subscribe to the Automobile Dealer and Repairer $1.00 Per Year

THE KING DRAG

The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

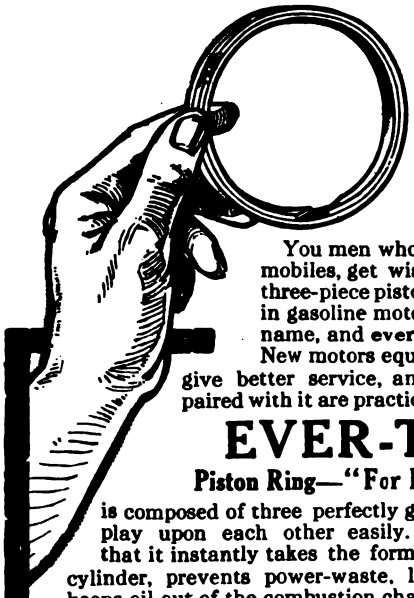
In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

We will send a **sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

Address the

MOTOR VEHICLE PUBLISHING COMPANY, - 71 Murray St., New York City

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Puts Pep In Motors

You men who sell or repair automobiles, get wise to the wonderful three-piece piston ring that puts PEP in gasoline motors. Ever-Tight is its name, and ever tight it is—always. New motors equipped with this ring give better service, and worn motors repaired with it are practically as good as new.

EVER-TIGHT

Piston Ring—"For Leaky Cylinders"

is composed of three perfectly grooved sections that play upon each other easily. It is so flexible that it instantly takes the form of an out-of-round cylinder, prevents power-waste, lessens friction and keeps oil out of the combustion chamber. This means full motor power and no carbon.

Ever-Tight is the only satisfactory three-piece ring made. Repairmen should write if local dealers do not carry it. We want jobbers and dealers in every city and town. *Write for particulars.*

THE EVER-TIGHT PISTON RING CO.
1428 CHESTNUT STREET ST. LOUIS, MO.

EVER TIGHT

PATENTED AUGUST 6, 1912

This Tire Case Gives a Real Protection to Spare Shoes

Allen



EVERY spare shoe needs a sure protection from the deteriorating effects of sunlight, oil and water. The Allen Tire Case, absolutely waterproof, made of highest quality enamel duck by expert workmen, meets every requirement. Made in all sizes and colors to suit. Prices $3.00 and up. At your dealer's. Send today for the interesting booklet of Allen accessories.

The Allen Auto Specialty Co.

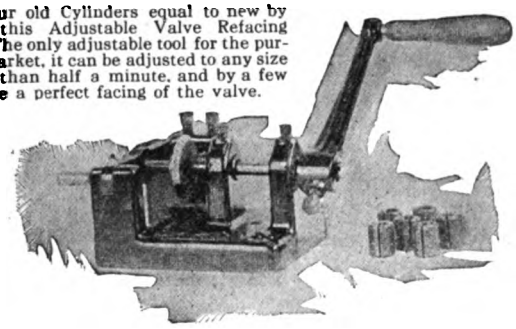
Manufacturers, also, of the Allen Tyrometer, air pressure gauge. : : :

1926 Broadway - - New York
1627 Michigan Ave. - Chicago

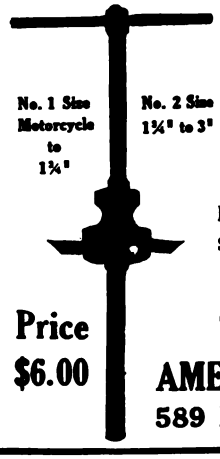
"AMERICAN"

ADJUSTABLE VALVE FACING TOOL

MAKE your old Cylinders equal to new by using this Adjustable Valve Refacing Tool. The only adjustable tool for the purpose on the market, it can be adjusted to any size valve in less than half a minute, and by a few turns will give a perfect facing of the valve.



Price $6.00



No. 1 Size Motorcycle to 1¾"

No. 2 Size 1¾" to 3"

"AMERICAN"

ADJUSTABLE VALVE SEATING TOOLS

With these tools any set of valves can be seated to a perfect point of accuracy.

Instantly adjustable to any size valve cage

Set of Two Tools, comprising either size Seating Tool and the Facing Tool, both fitted with Bushings and Stems for the Valves and Cages of your car..... $10.00

C. O. D. Express or Parcel Post, or from our Agent in your City.

Price $6.00

AMERICAN VALVE TOOL CO.
589 Hudson Street New York

SEES ALL TELLS ALL

MOTOR EYE



DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH

$2.50

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

COUPON

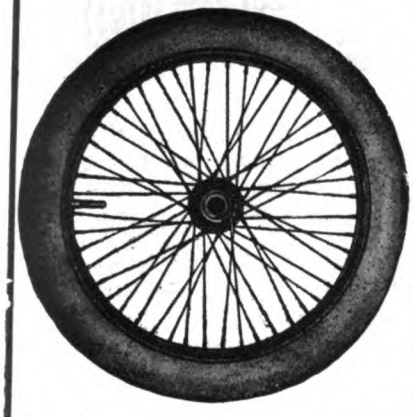
W. LEWIS MACK, General Distributor
"Department A," 26 W. Jackson Blvd., Chicago, Illinois

Gentlemen: Enclosed find money order for $2.50 for which kindly send me, postage prepaid, one MOTOR EYE.

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WIRE WHEELS
FOR
FORD CARS

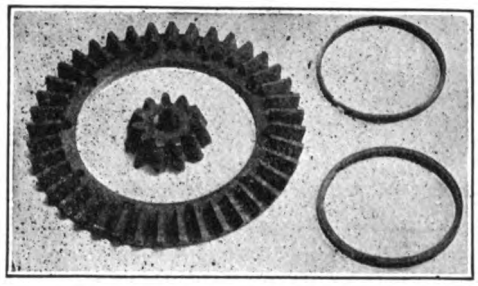
$20.00 per set, complete, ready to attach. No machine work necessary.

DEALERS:
These wheels are backed by a binding guarantee for satisfactory service. Our selling proposition gladly sent on application.

THE
MOTT WHEEL WKS.
100 Hickory St., Utica, N. Y.

Repair Parts for Ford Cars at Cut Prices

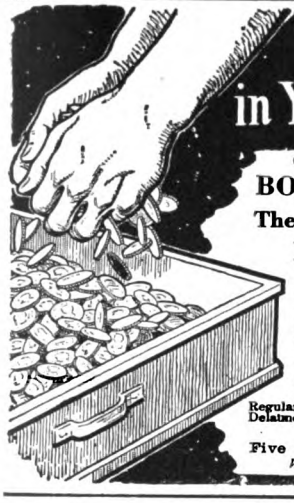
☞ Dealers and Repairmen ☞ All Parts Guaranteed



Differential ring gears, $3.00; differential pinion gears, $1.00; front radius rods, $2.00; rear axle shafts, $1.75; driving shafts, $2.75; plain piston rings, 10 cents; triple piston rings, 60 cents; front springs, $2.80; rear springs, $8.40; connecting rods, $1.00. Our prices on truss rods, valve springs, bushings and other parts will surprise you. We can furnish gears, springs and piston rings for over 40 makes of cars.

Write today for complete lists of parts and cut trade prices.

GROSSMAN AUTO PARTS CO.,
WHITE PLAINS, N. Y.



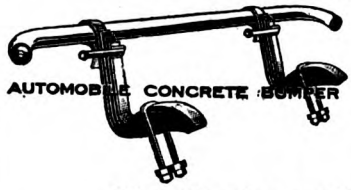
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BOOSTS YOUR BUSINESS
The H-P-B KICK-OVER DIMMER
— is strongest, simplest, most convenient.
— lowest in first cost, guaranteed for life.

The H-P-B KICK-OVER is a switch which when attached to the floorboard, footboard or dash of your automobile, will dim your headlights or change from headlights to sidelights by a pressure of your foot on the protruding knob. Kick the knob again and the headlights are on with their full power. Easily attached to any electrically lighted car in a few minutes.

Regular equipment on Mercer, Brewster, Delaunay Belville and famous Rolls Royce **Price $2.00**
THE H-P-B ELECTRIC CO., Inc.
Five Hundred Fifth Avenue, New York
We Advertise you in your local newspapers.

CONCRETE BUMPERS
PROTECTION FOR YOUR RADIATOR AND LAMPS
Simple and Easy to Attach



No boring of the frame of the cars. Made of good materials reinforced by a steel rod and filled with well seasoned concrete. Made in all sizes of round and square tubing.

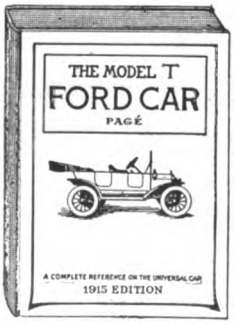
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NOTE—We make a specialty of Rear Bumpers, also Bumpers for all Ambulances and Trucks.

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FOR EVERY FORD OWNER, DEALER, SALESMAN and REPAIRMAN

THE MODEL T FORD CAR
ITS CONSTRUCTION, OPERATION AND REPAIR



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300 (5x7) Pages

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This is the MOST COMPLETE and PRACTICAL instruction book ever published on the FORD CAR. Illustrated by specially made drawings and photographs. All parts of the Ford Model T Car are described and illustrated, in a comprehensive manner—nothing is left for the reader to guess at. The construction is fully treated and OPERATING PRINCIPLES MADE CLEAR TO EVERYONE. Complete instructions for *driving* and *repairing* are given. Every detail is treated in a non-technical yet thorough manner.

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ENLARGED, REVISED EDITION
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THE LATE EDITION AT LEAST ONE HUNDRED PER CENT BETTER . . .

A Complete Ford Instruction

added—as well as many other subjects. Some of the new subjects added are; **Electric Starters, Generating and Lighting** Systems, up to date.

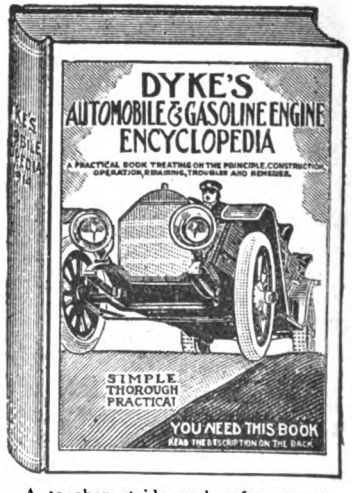
How to Time Valves and Ignition—simplified so a ten-year-old boy can understand.

Six, Eight and Twelve Cylinder Engines; every detail from construction to firing order—simplified.

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are the kind you should stock, Mr. Dealer. We offer not only the largest and most complete line of Starting and Lighting Batteries, but by far

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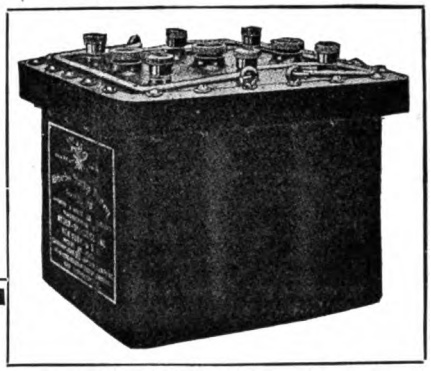
on the market. They are conservatively rated. Comparative test will show that they have nearly double the ampere hour capacity that can be secured from some others of the same rating. This means that

Your Customers get their Money's Worth

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Satisfied customers are your best asset. Our liberal selling terms insure you a substantial margin of profit—write for full details and Dealer Proposition.

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The New Waterproof RAJAH PLUG



Fills the Demand for an Absolutely Reliable Waterproof Plug (Insulated)

Furnished in all the standard sizes with Rajah Regular Terminal fitting any cable. Rajah Ferrule Terminals making a neater connection, will be furnished if a sample of cable is included with the order. **$1.50 Retail**

Rajah Giant Plug	The "Old Reliables"	$1.50 Retail
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DEALERS: Many old Rajah users will immediately adopt this new plug. Thousands more will soon appreciate its excellent qualities. Here's a genuine money-maker for you.

Write for full particulars to

RAJAH AUTO-SUPPLY COMPANY
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An ingenious treatment of small Pure Rubber particles which holds them together in solid form—solid enough to carry the heaviest load your engine will pull—resilient enough to give that "ON AIR" feeling that brought popularity to pneumatics—cannot puncture, rim cut nor blow out—makes your tires cost less by wearing longer.

National Rubber Tirefiller in your tires is like Tire Life Insurance Policies—they insure you more miles out of your tires—complete freedom from all tire trouble—against serious accidents from blown out tires and the real tire service you are entitled to.

It eliminates the delicate and expensive inner tube entirely—it replaces uncertainty with certainty and makes your car absolutely dependable. Let us send you small sample and tell you more about them.

NATIONAL RUBBER FILLER COMPANY,
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You can give to your Ford the same flexibility, power and economy that this carburetor has given to the world's best cars. That unpleasant jerky engine-pull when changing from low to high or when throttled down is entirely eliminated. Insures easy starting and wonderful economy.

There are no complicated adjustments to tinker with and no moving parts to wear out.

The Compound Nozzle of the Zenith regulates the flow of gasoline at every engine speed and under any climatic condition, insuring perfect vaporization at all times.

The choice of the world's best automobile engineers is certainly worth this trial offer.

$20
COMPLETE
Including Manifold and Hot-Air Tube

TRIAL OFFER

If after 30 days' trial you find that the Zenith Ford Carburetor is not well worth the purchase price—return it at our expense and get your money back.

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Complete Motor or Belt Driven, Portable or Stationary Outfits, suitable for any possible garage requirement.

We guarantee to ship one from stock any time.

A Brunner Air Valve or fitting, or a Brunner "Airtite" Tank or Automatic Electric Pressure Controller would improve your service wonderfully.

Tell us what you want, we will be glad to send you our complete catalog and the name of the nearest Brunner Jobber.

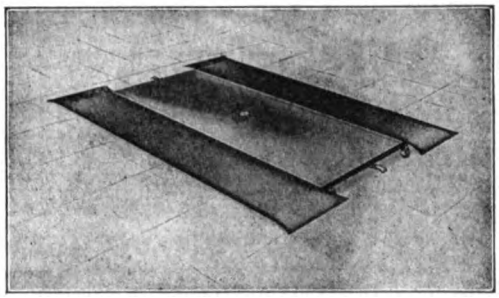
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BRIGHTON AUTOMOBILE TURNTABLE
FOR SAFETY—CONVENIENCE—ECONOMY

Made of Steel

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Easily Operated



Shipped ready for use

Installed in a few Minutes

Absolutely Guaranteed

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WELDING AUTOMOBILE PARTS
Cracked or Broken



Cylinders, Crank Shafts,
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All work absolutely GUARANTEED

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¶ Complete Oxy-Acetylene Welding and Cutting Plants installed.

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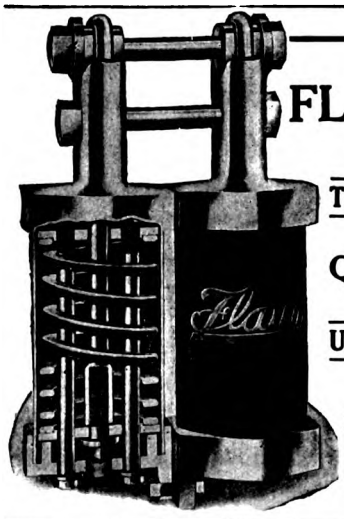
We have the largest
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We make the best
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that mechanical ingenuity can design.

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THE POETRY OF MOTION
SOLD ON
QUALITY AND MERIT
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UNLIMITED GUARANTEE

Write for Dealer's Contract

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THE CARVER
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{DOUBLE-ACTING
PUMP

When a Carver Pump is once Tried we don't hear---

Why the price? We have others.
All pumps are alike, etc.

Because---

In principle it's different. It's made different. It pumps different. It lasts different.

The result is different, and worth more than $6.00.

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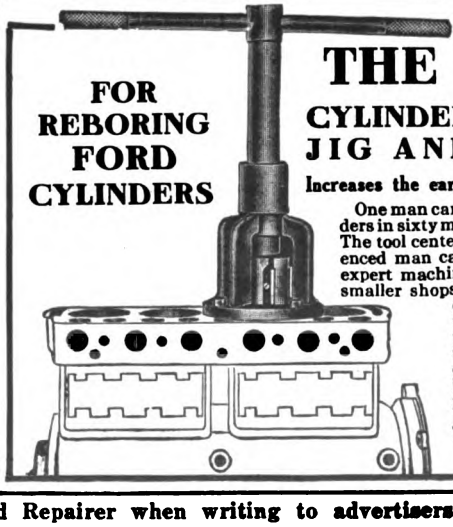
Trade is often won, held and built on little things like a tube patch or can of cement. Confidence in the accessory line you carry—and in the service you give—is the factor that wins for you all the time. All Goodyear Accessories—22 Tire Savers—are up to the master standard set by Goodyear Automobile Tires. Goodyear C-15 Vulcanizing Cement is the most practical you can sell. It is of exceedingly heavy consistency, and for ordinary use can be thinned with a 72 test gasoline. It cures black.

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THE GOODYEAR TIRE & RUBBER CO., AKRON, OHIO
Makers of Goodyear Automobile Tires (2475)

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THE DAVIS
CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

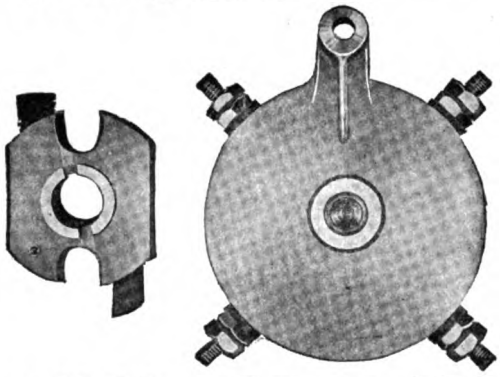
One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

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Price $2.25 **Guaranteed for Life**

With this Timer you get a wipe contact instead of a rolling contact. This contact is made by a low resistance composition brush which makes a positive wipe contact. Furthermore, there is a felt wiper which travels ahead of the brush, which positively keeps contacts clean at all times.

The Rotor in this Timer is in no way affected by centrifugal force, due to the fact that all revolving parts are contained within the rotating unit.

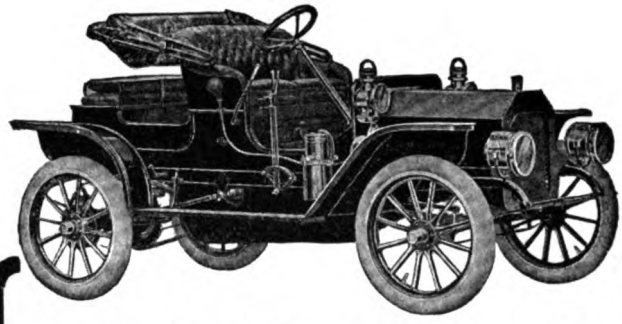
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No. 5125 HOOD FASTENER



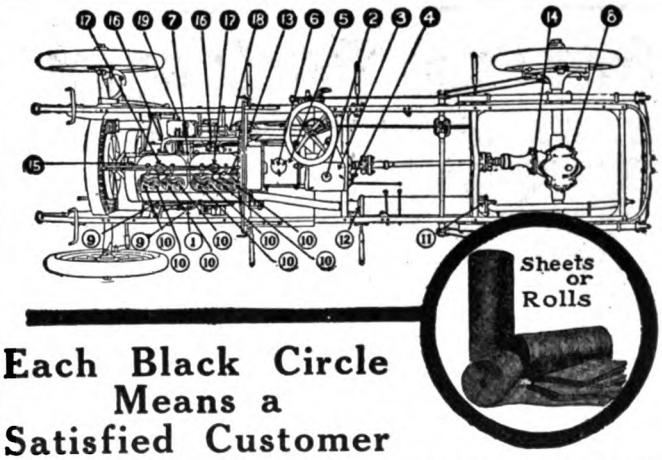
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SIMPLICITY—
NEATNESS.

Reference to our illustration will show that this fastener can be applied to practically any job.

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The growing sales of ENDURA—the water-tight, oil-tight, gasoline-tight sheet packing—indicate that garagemen and dealers are feeling the good effects of putting *special-purpose* packing into cars where it is *needed.* And the fact that ENDURA weighs but *half* as much as other packings that *cannot do the same work as well* suggests the profits and benefits arising from its use. Send this coupon for booklet containing chart, and free samples of ENDURA SHEET PACKING.

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Special-Purpose Sheet Packing
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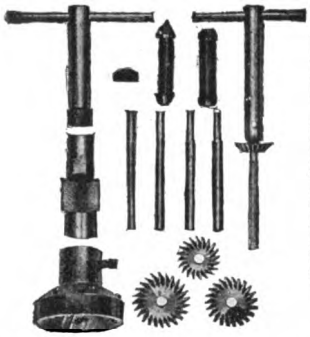
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City.....
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The FOSNACHT VALVE RESEATER is the most convenient, quickest and most accurate tool for cutting valves and valve seats. Every garage using this appliance is delighted with the speed—the cleanliness—and the general satisfaction afforded by the FOSNACHT. Does the work in a quarter the time needed by hand. No expert required to operate it—no emery—no dirt—no tearing apart of motor. The

FOSNACHT Valve Reseater

should be in every garage. Attracts repair work by its ability to turn out jobs speedily and exactly. Holds business for owners. The FOSNACHT VALVE RESEATER is a *real* profit builder. Not a cheap machine—sold at **$25.00, less 5% discount for cash.** The high quality of this unusual tool makes the price a very low one. We believe in quality—quality is remembered long after price is forgotten. The FOSNACHT will pay for itself in a short time through the increase in trade it will bring.

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No Knobs on this Tread—Every layer a Non-Skid. Draws easier an saves 25 per cent on gasoline.



This Tread is so tough it prevents the air tube from punctures. It also prevents stone bruises and blow-outs.

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Hand-Operated Horns

RELIABLE AND EFFICIENT AT ALL TIMES
BEST FOR THE USER
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GUARANTEED THREE YEARS' PERFECT SERVICE

Write for Catalog Showing All Styles of Hand-Operated and Motor-Driven Horns

AUTOMOBILE SUPPLY MANUFACTURING CO.
220 TAAFFE PLACE BROOKLYN, N. Y.
The Largest Manufacturer of Auto-Horns in the World

Every Repair Shop or Garage
SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers in the United States or its territories a **Regulator Eight Day Calendar Clock** 38½ inches high, with a 12 inch dial, finished in **Oak** or **hand-rubbed Mahogany**, with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of **$3.90.** This clock cannot be sent to any foreign country except Canada, and Canadian subscribers must send **50 cents** more to cover extra postage on the paper.

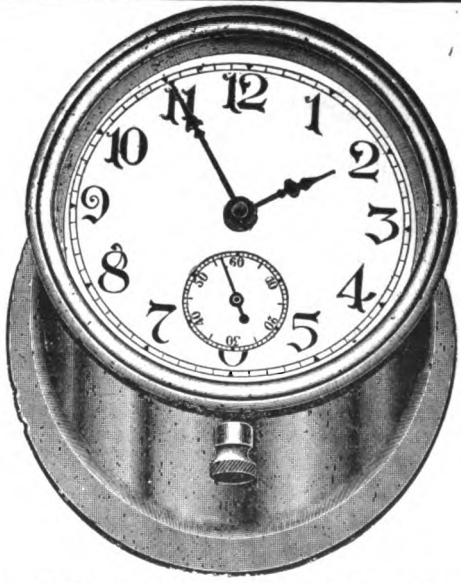
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The engraving shown gives the correct appearance of this clock.

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Remittances can be made in any convenient way. Be sure to state whether you want this clock in Oak or Hand-Rubbed Mahogany.

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For your car, and a good one? The clock illustrated in this connection is manufactured by one of the most reliable clock companies in the country and is warranted in every respect. It is not liable to get out of order. It has interchangeable parts. It is the product of skilled labor combined with the most improved Waltham Automatic Machines. This clock is 3¾ inches high, and has a Porcelain dial 2½ inches in diameter. It has a one day movement with second hand. It can be furnished in burnished brass or nickel plated whichever is preferred. The arrangement we have made enables us to furnish **one of these clocks and a subscription to the Automobile Dealer and Repairer for a year** to all residents of the United States and its territories for the precise price the clock retails for, namely, **$2.50.** If an eight day clock is preferred send 50 cents extra or $3.00. Canadian subscribers should add 50 cents extra to cover the extra postage required on the **Automobile Dealer and Repairer.** This clock cannot be sent to foreign countries. The clock can safely be sent by mail and will be forwarded postage prepaid to any part of the country. Remittances can be made in any convenient way. Address

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The price for one pint can, prepaid and delivered everywhere in the United States, $1.00.

Special price on dozen lots to dealers and repairmen.

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Write for full particulars

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ALL FORD CARS
Need a SECURITY
FORD WATER PUMP

Gear Driven—Pumps 10 to 15 Gallons per minute.
Attached with only the use of screwdriver and wrench.

PRICE $6.00 Guarantee Satisfaction.

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Fit all model Fords except 1915

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BRAENDER
Tires and Tubes

Are Famous For Their QUALITY

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SMOOTH-ON

TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS

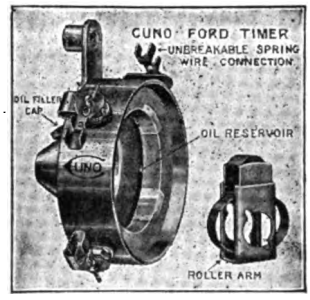
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - **$1.00**

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CHICAGO, 221 N. Jefferson St. SAN FRANCISCO, 36 Sacramento St.



PRICE $1.50

MISSING
in your
FORD
Will be STOPPED
BY A
Cuno Ford Timer

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

Attractive Jobbers' and Dealers' Proposition.

CUNO ENGINEERING CORPORATION, 80 So. Vine Avenue MERIDEN, CONN.

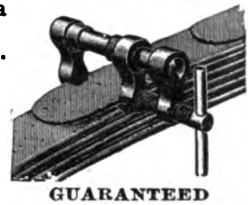
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Highest Grade Drop Forgings. Nickel Plated and Polished.

Gives 100% Easier Riding and STOPS THE SQUEAK

A practical, durable tool for spreading spring leaves for lubricating. Nothing better as a temporary Repair Clamp.



GUARANTEED

One jolt of a rusty, squeaky spring may cost you ten times the price of this sure preventive.

Adjustable to any size auto spring.
Sent prepaid anywhere, $1.50.

SPRING LEAF LUBRICATOR CO., 1000 Forest Ave., Ann Arbor, Mich.

BROWN SUB-BASE OILER
FOR FORD CARS

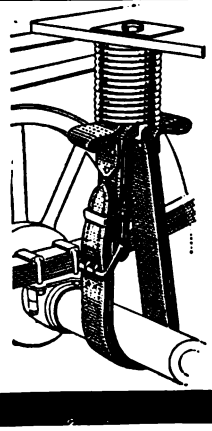


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The hit of the season. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.



HOOVER
SHOCK ABSORBERS

Prevent rebounds and save springs and tires. Simple to attach. ABSOLUTELY GUARANTEED.

Price: WHY PAY MORE?

No. 20	Cars 1000–1500 pounds		$5.00
" 21	" 1500–2500	"	7.00
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" 24	Ford-Rear Springs—all models		7.00
" 25	" Front	"	7.00

If dealer cannot supply you, we will send direct, charges prepaid, on receipt of price.

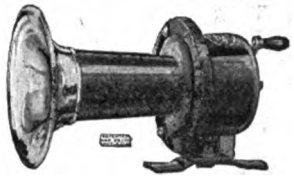
THE W. H. HOOVER CO., NEW BERLIN, OHIO

Manufacturers of a complete line of Top Straps, Rebound Straps, Bow Rests, Joint Covers, Tire Rim Removers, etc.

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$4 SEISS Model A



$4 SEISS Model A

DOUBLE ACTING MECHANICAL HORN

A powerful, Commanding Warning Signal—the surprise in Mechanical Horns. Operated by touch of hand—turning either right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

At your dealer's or direct from factory—with 10 year guarantee, only $4.00. *Write to-day for printed matter.*

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NEW DOVER TWO-IN-ONE
Offset Funnel



New Cone Strainer
New Braced Spout

Removable Spout Forming a Regular Funnel

Send for New 1914 Catalogue (4)

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The "CHALLENGE"
A PERFECT Combination Gasoline Gage and Filler Cap
For FORD CARS

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

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If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.

Quality Counts

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MARVELOUS REMARKABLE
Four to one in our favor



The Jensen Lever Pump inflates four tires with less effort than a compound hand pump inflates one tire. It is absolutely the easiest working pump on the market regardless of price. Send for one. Only about half the price of other lever pumps.

We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

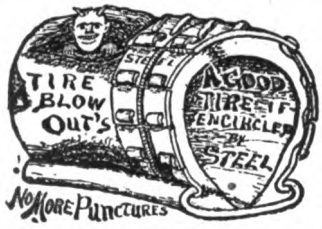
Dealers, write for proposition.

W. H. HOWELL CO., - - Geneva, Illinois

Hang on to your old tires. They will last as long as you live if covered with steel.

The Kimball Steel Protecter makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever.

Special inducements to those in new territory.



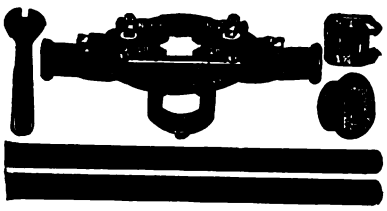


KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS, SMOOTH FORGED OR FINISHED COMPLETE, READY TO ASSEMBLE : : : : :
SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY
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GENUINE
ARMSTRONG
STOCK and DIES
For Cutting
A. L. A. M. THREADS

No. 1 STOCK & DIES, ¼ to ⅝ in.
No. 2 STOCK & DIES, ½ to 1 in.
AND TAPS TO MATCH

Good Tools for Repairmen. These Dies are Adjustable.

MANUFACTURED BY
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335 Knowlton St. BRIDGEPORT, CONN.
WRITE FOR ILLUSTRATED CATALOG

THOUSANDS OF FORD DRIVERS
are now enjoying their cars to the fullest extent, their cars being equipped with a



Comfort Safety Steering Device

If you are not using a COMFORT DEVICE today, it is because you are not thoroughly familiar with its advantages.

Just think of being relieved of that muscle tension when driving over sandy and muddy roads. This feature alone would appeal to any Ford driver. Another feature, it saves tires. LIST PRICE $5.50, DELIVERED.

Agents Wanted in Unassigned Territory.

Special Introductory Offer: We offer a special discount to Ford drivers in territories where our steering device has not been introduced.

Write for circulars and prices.

THE COMFORT MOTOR MACHINE CO., Denver, Colo.

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KEYSTONE SHOCK ABSORBERS

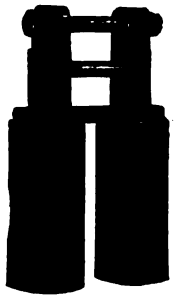
Easy to Ride On — Easy to Buy — Easy to Sell

KEYSTONE ABSORBERS EMBODY BEST FEATURES

$20.00 PAIR

Two large springs, heavy hanger bolts and steel body insures resiliency and strength

NOTHING BETTER MADE OR MORE EFFECTIVE AT ANY PRICE



Will furnish *one* sample pair in EACH TOWN AT $15.00

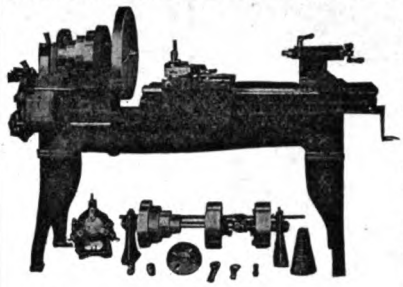
Be the One to Get It

KEYSTONE SHOCK ABSORBER CO.

1216-1218 Liverpool St., PITTSBURGH, PA.

THE UNIVERSAL GARAGE LATHE

IS OUR 14-24" SLIDING EXTENSION GAP LATHE



Saves investing in a large expensive lathe. Swings 14½" over top bed, and 24" through gap. The 7½ ft. machine takes 8 ft. between centers.

Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

Taper attachment, milling attachment, and other accessories if wanted.

Machine is strong, rigid and accurate, has 2⅛" spindle with 1⅜" hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

JUST THE THING FOR GARAGES AND REPAIR SHOPS

Send for New Literature and Prices.

Barnes Drill Co., Inc. 1907 818 Chestnut St. Rockford, Ill., U. S. A.

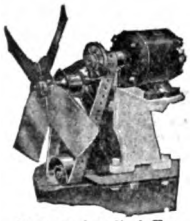
Builders of the All Geared Drill

SHOWS ONE OF THE METHODS OF RUNNING The unique Triangular drive—The

CARLETON GENERATOR

(7 volts, 49 c. p. direct current) solves the lighting problem.

Gives a steady light with or without storage batteries.



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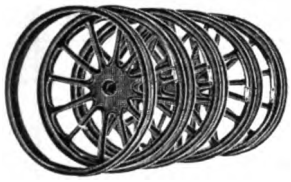
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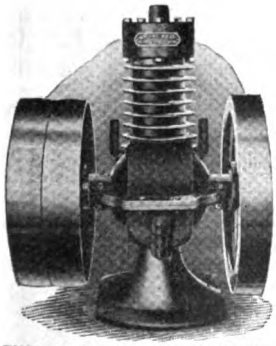
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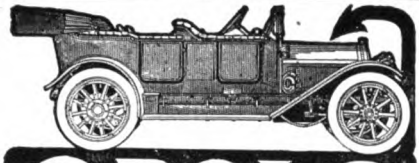


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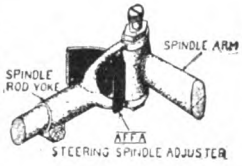
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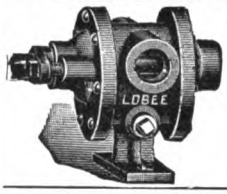


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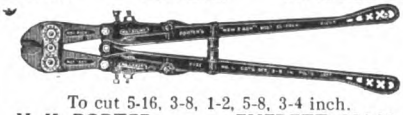
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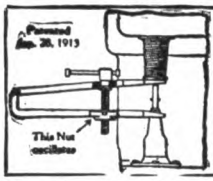


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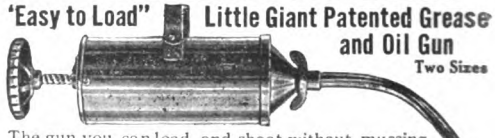
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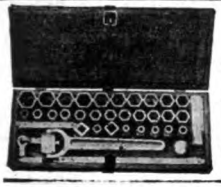
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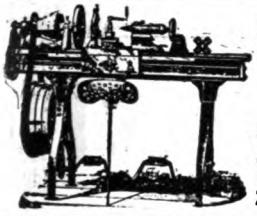
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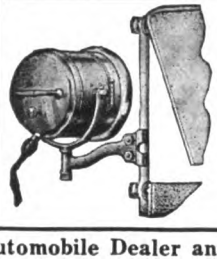
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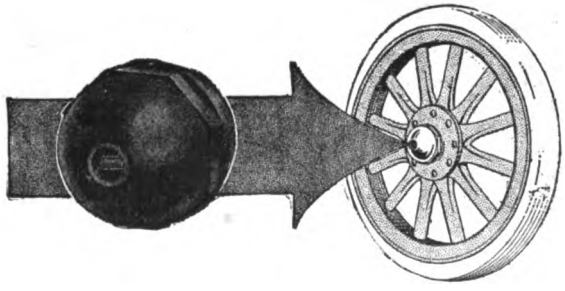
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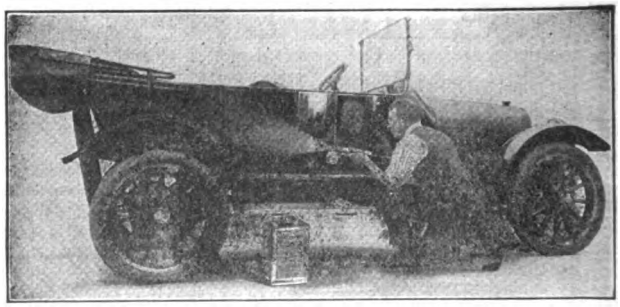
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FISK SERVICE is conducted in the interest of all car owners. It extends to motorists the best the world affords in the way of skill, equipment and the personal interest of a thousand trained Fisk Branch employees and many thousands of selected dealers.

Write Dept. 26 for Fisk Literature.

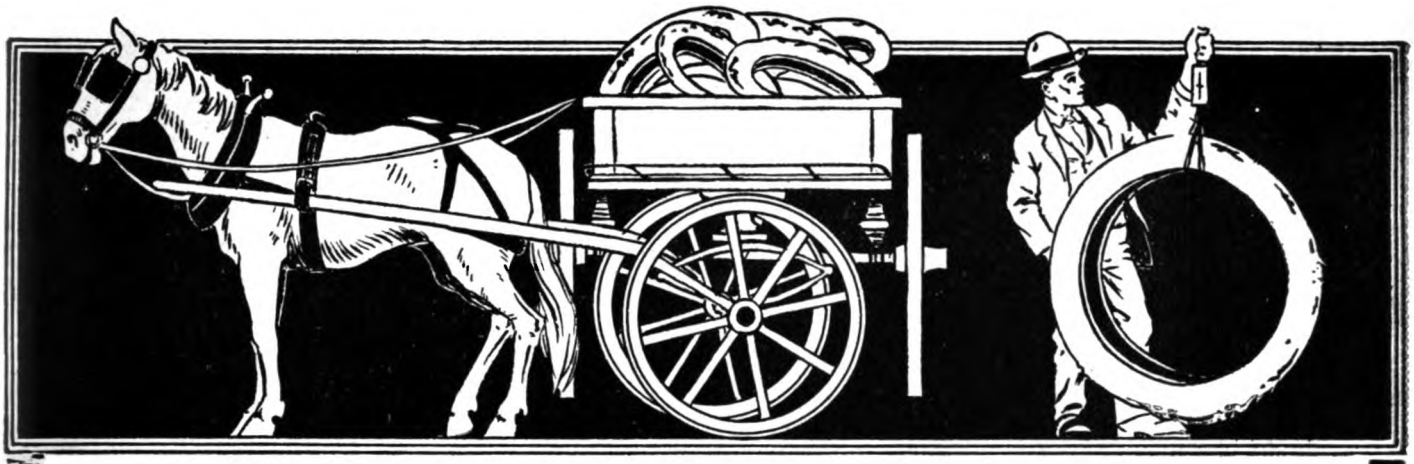


THE FISK RUBBER COMPANY

Factory and Home Office **Chicopee Falls, Mass.**

You Can Buy Fisk Tires From ALL Dealers—Fisk Branches in ALL Principal Cities

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Don't Part With Your Half-Worn Tires

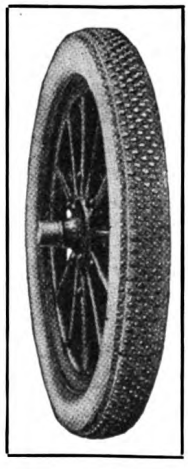
This picture illustrates forcibly what happens to the ordinary pneumatic tire, after 3,000 to 5,000 miles of service—often less. You get about 9c. a pound for it as junk. Now, its just as unnecessary, just as extravagant, to throw away your tires when they become tread worn or rut worn, as it is to throw away your shoes when the original sole gets thin.

What European Motorists Do

The foremost European engineers have for a long time been studying the problem of getting more miles for less dollars. With their usual painstaking scientific thoroughness, they experimented for years with leather tire protectors and steel studded Treads.

The result—for over three years European motorists have been "half-soling" their tires with steel studded Treads, just as we "half-sole" our shoes when the original sole gets thin.

These European motorists are getting from 10,000 to 15,000 miles out of ordinary pneumatic tires, while American motorists are getting from 3,000 to 5,000, and—what is just as important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim-cuts!



We Brought Herr Bullerman Here

When we learned that Foreign engineers had perfected a steel studded Tread that would make a tire run at least 10,000 miles we set about finding out how they did it. Then we brought to this country probably the foremost tire engineer in Europe, Herr August Bullerman, who designed Durable Treads along the line of that foreign study and experiment; improved them by new basic patents and made them even superior to the Treads universally used by European motorists. Their success was immediate. In eight months 20,000 American motorists took advantage of this opportunity to cut down their tire expense and eliminate their tire trouble. Last year the sale of Durable Treads increased 917% in the United States alone. Over 40% of these sales were unsolicited—made through the recommendation of Durable Tread users.

Where is there an automobile accessory which has received such universal country-wide endorsement?

Save $50.00 to $200 a Year

The almost unbelievable waste in tires by the American motorist is not only national—it is vitally personal. It affects you—your pocketbook. Just consider what it would mean to you to get 10,000, 12,000 or 15,000 miles out of your rubber casings, and at the same time drive your car without the constant dread of tire trouble.

It will make your tires run two and three seasons, instead of one. It will save you from $50 to $200 a year outright in tire bills. In round numbers, it would mean a saving in tire miles sufficient to pay your yearly gas and oil bills—by the elimination of punctures, blow-outs, rim cuts and skidding—a gratification which cannot be estimated in dollars and cents.

Guaranteed 5,000 Miles Without Puncture

Durable Treads are sold under a signed guarantee for 5,000 miles of wear without puncture. This guarantee is an iron-clad agreement—as good as a government bond—and holds good whether your tires are new or old, tread worn, rut worn or rim cut. Think of it—to be able to FORGET tires! Not once will you have to get out of that car to fix a puncture and this tire vacation is guaranteed to you.

No More Skidding

Durable Treads are sure footed as a burro and they're supremely convenient.

They are studded with sharp-edged steel rivets, which dig right down through the mud and slush and get to earth every time.

In many of the larger cities of Europe, ordinances compel the use of the steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and—what is more important—you receive perfect non-skid service while your tires are protected instead of injured.

We Ship on Approval

At any time the tires now on your car may meet with injury which will put them out of commission. Why wait for that to happen? We ship on approval.

Do you intend to continue allowing the junk-man to profit at your expense by carrying away in tire miles enough to pay your yearly gas and oil bills? Why not turn to your advantage the experience of European motorists? It is the same question of economy you decide when you "half-sole" your shoes instead of throwing them away when the first sole gets thin. Rubber tires cost several times as much as shoes and are certainly worthy of the same economy.

Special Discount Offer

To motorists in territories where Durable Treads have not as yet been introduced we offer a special introductory discount equal to the full dealers' profit.

Will you let us give you a demonstration at our own expense and risk? Will you let us make you an offer so fair and square that you do not stand to lose one red cent either before or after you buy?

The time for action is NOW, before the tires on your car run another week in "barefooted" condition—before you get your next puncture or blowout.

Cut out the coupon below. If you haven't a pen or pencil handy, you can fill it out afterwards, but cut it out now before you turn the page and forget. It will be the means of adding at least 5,000 miles more life to those tires on your car.

COLORADO TIRE & LEATHER CO.

85 Tread Bldg., Denver, Colo. Dept. H5, Box 228, Chicago, Ill.
Suite 58, 162 W. 34th Street, New York

MAIL THIS COUPON—GET THE FACTS

COLORADO TIRE & LEATHER CO., 85 Tread Bldg., Denver, Colo.; Dept. H5, Box 228, Chicago, Ill.; Suite 58, 162 W. 34th St., New York.
(Address nearest Office.)

Gentlemen: Send me samples of Durable Treads, copy of 5,000 mile guarantee, special discount terms, and your book, "10,000 Miles on One Set of Tires."

Name.....

Address.....

City..... State.....

My tire sizes are.....

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BETHLEHEM FIVE POINT SPARK PLUGS

For SERVICE and PROFITS

You can sell cheap plugs, but what is the use? You get nothing out of it. Your customers do not get value.

Why not push and sell the Plugs that have real quality behind them and that pay you a liberal profit for handling them—

BETHLEHEM FIVE POINT SPARK PLUGS

Guaranteed for the Life of the Car

ILLUSTRATED IS "TYPE A" BETHLEHEM FOR FORD CARS

Ford Spark Plug trouble is notorious. It is due to the cheap equipment Plugs which are supplied. Why replace these with other similar Plugs when—

Here is a Plug that is specially designed to give SERVICE in the Ford engine—that it does give service is assured by the strongest guarantee ever put on an accessory.

At the same time it pays you a liberal profit.

All types of Bethlehem's—$1.25 each—and worth it.

Illustrated Booklet Free—

Type A



Designed for the FORD car

THE SILVEX COMPANY

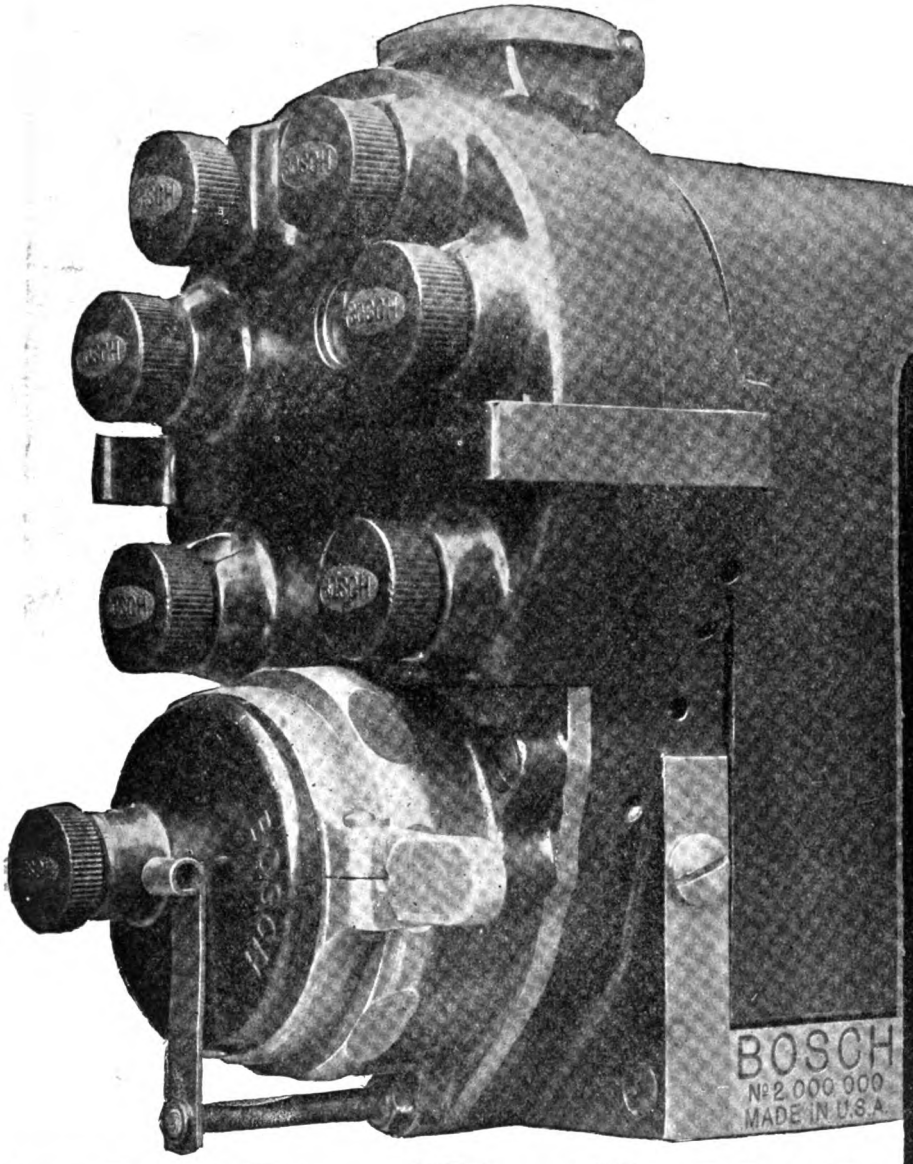
171 Madison Avenue, NEW YORK

FACTORY: South Bethlehem, Pa

PACIFIC COAST BRANCH: Oakland, California
W N DAVIDSON Manager

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2.000.000



The Two Millionth Bosch Magneto
Has Been Made and Sold.

THAT fact is the strongest evidence, the most convincing testimony to the superiority of Bosch Magneto Ignition.

The second million of Bosch Magnetos was sold within approximately two years notwithstanding that other, though less efficient, ignition systems were procurable for less than half the price of a Bosch Magneto.

Merit, and merit alone, is responsible for the remarkable popularity and extensive use of Bosch Magnetos. No other ignition is just as good.

Look for Bosch on the car you buy or sell—insist if you must.

BE SATISFIED, SPECIFY BOSCH

BOSCH MAGNETOS

BOSCH MAGNETO CO., 202 WEST 46TH ST. NEW YORK, U. S. A.

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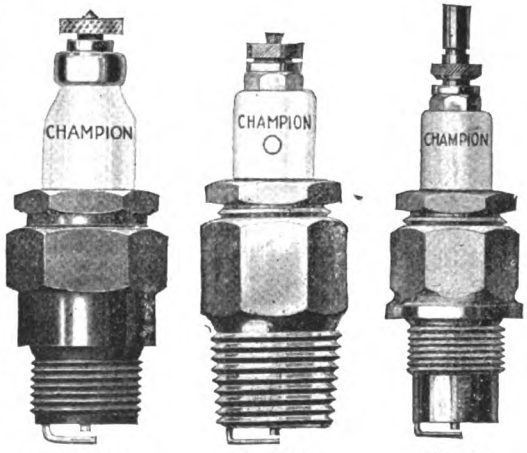


THAT means a stream of sparks so rapid and constant as to be almost a steady flame.

A series of explosions, quick and sharp, beat upon the spark plugs like the blows of a trip hammer.

When you meet emergency conditions and subject *your* motor to exceptional speed or load strains, you *must* have dependability.

You have it absolutely *if your Spark Plugs are Champions.*



Champion
Two-Piece Heavy Stone
All sizes $1.25
For high powered automobiles, trucks, and stationary engines.

Champion
"O" Special
½-Inch
Price $1.00
Special equipment for Overland cars

Champion
Conical
⅞-18 Long
Price $1.00
Specially designed for Buick motors

Champion endurance — reliability — dependability — is developed by repeated testing under just such strains in the motors they are built to serve.

75% of all American-made motors for every purpose are equipped when new with Champion Spark Plugs.

Do not accept a substitute. Be sure that the name "Champion" is on your spark plug porcelains.

Dealers—*Champions are universally demanded by experienced owner—drivers. Keep your spark plug stock a clean Champion stock and your maximum profits are assured. Write to us today.*

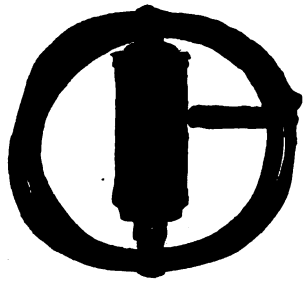
The Champion Guarantee:

Complete satisfaction to the user, free repair, replacement or money back.

Champion Spark Plug Co., 2005 Upton Avenue Toledo, O.

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UTILITY



PRICE $10.00
Complete with
Pneu-Meter

THE ONLY TRULY AUTOMATIC TIRE PUMP ON THE MARKET

The Pneu-Meter installed on the hose line prevents over inflation as well as under inflation. Connect your pump, set your Pneu-Meter at the right pressure, start your engine and forget it.

You don't have to watch your pump—the Pneu-Meter does it for you—when your tire is properly inflated, it becomes a Safety blow-off valve, using excess pressure to sound a continuous signal. **So simple a woman can work it.**

PRICE $2.00

UTILITY Jr.



PRICE $6.00
Complete with
Pneu-Meter



WHISTLING PNEU-METER

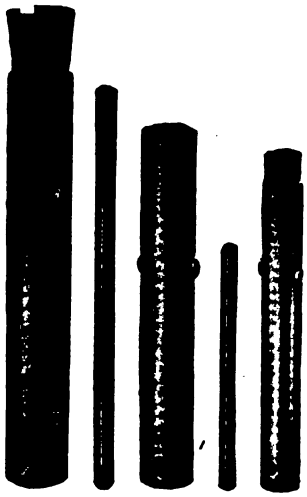
Sold separately and can be installed on the hose line of any other spark plug or gear driven pumps, garage air tanks, etc.

Absolutely accurate and cannot get out of order. Whistles loudly and can be heard fully a block away, and will continue until the engine stops.

Over and under inflation decreases the life of your tires. This is due to the use of tire pumps which are equipped with ordinary dial gauges and which at the best are inaccurate. This trouble and expense can be absolutely avoided by using **Utility Pumps equipped with Whistling Pneu-Meters.**

Smallest and fastest—simplest and best constructed pumps ever made—**absolutely safe.**

Built of rust-proof bronze, brass and nickeled steel. **LASTS A LIFETIME.**



7", 6" and 5" Long Respectively

The UTILITY Socket Wrench Set

A New Principle With Many Advantages

Has all the advantages of socket wrench sets consisting of fourteen wrenches, with none of their faults. Instant in adjustment. No screws to manipulate, or parts to get out of order. Can be applied to all shapes and kinds of nuts, immediately. Has many new features possessed by no other wrench.

SOME NEW FEATURES

Will grasp any nut instantly and requires no further effort to hold wrench in place. In removing, the jaws hold nut firmly at all times, so it cannot fall or become lost. On the other hand, nut can be placed in jaws and applied to bolt or screw when same is inaccessible to the hands.

Unequalled for use in Garages and Machine Shops, in fact, wherever nuts and bolts are used.

Will take all nuts from ⅛ to ½ inch, inclusive.

Will take all nuts used in auto work.

Will take hexagon nuts, square nuts, wing nuts, cock nuts, and nuts rounded or distorted by use of other wrenches.

Cannot slip and bruise fingers of workmen, as jaws have rigid bearing on four sides—the harder you pull, the harder the jaws grab the nut.

Look at its wonderful advantages and then look at the price.

Utility Wrench Set Complete, $2.50

Packed in neat canvas bag.

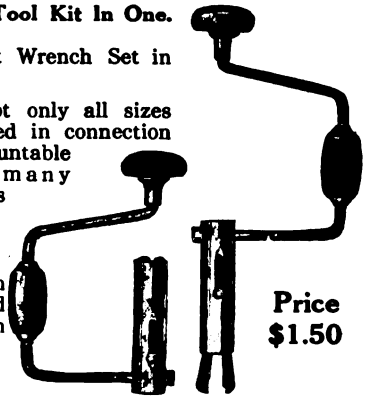
Write for Our Dealers' Proposition.

THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

A Socket Wrench Set in itself.

Takes not only all sizes of nuts used in connection with demountable rims, but many other kinds and sizes.



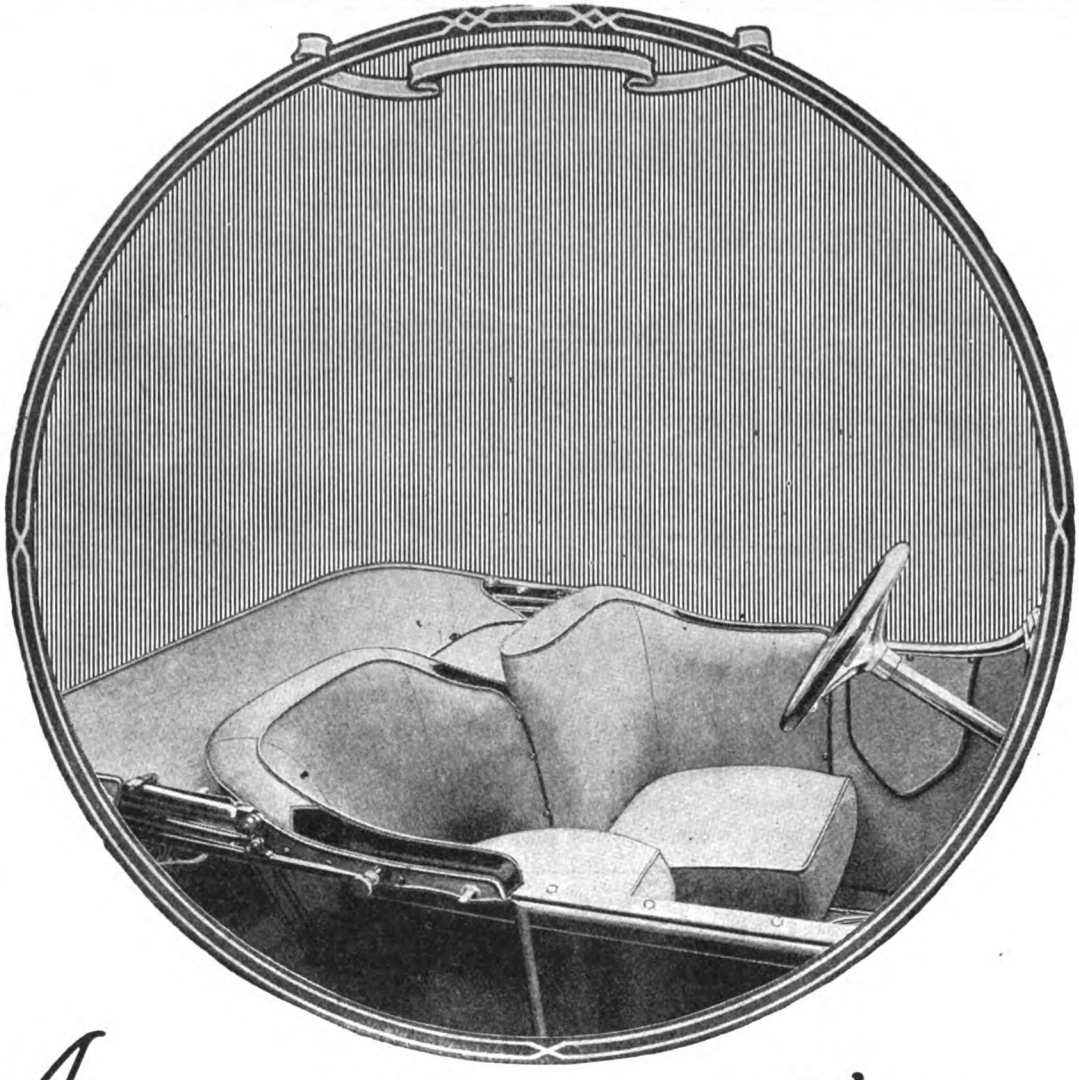
Wrench can be folded when not in use.

Price $1.50

THE HILL PUMP VALVE CO.

18-22 EAST KINZIE STREET **CHICAGO, ILLINOIS**

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A new standard of luxury!



Write today for this catalog.

It illustrates and describes a complete line of high-grade motor car accessories. We have an attractive proposition for car dealers, accessory and supply stores and garages.

Set by Campbell Detachable Upholstery

No other single article of equipment adds to the luxurious appearance of a car like Campbell Detachable Upholstery.

It is the standard by which every car is measured, for looks, for comfort, for pride of ownership.

Your car should be equipped with this beautiful accessory. It goes on over your regular upholstery and is held in place by quick detachable fasteners, so that it can be instantly removed and replaced for cleaning. Its cost is surprisingly moderate.

Every set of Campbell Detachable Upholstery is individually tailored to fit its particular make and model of car. A wide range of patterns, shades and prices offers you a selection that just suits your taste and purse.

No matter what make or model of car you own or are contemplating buying, you can have it equipped with Campbell Detachable Upholstery. A postal will bring samples of fabrics and prices. Address THE PERKINS-CAMPBELL CO., 628 Broadway, Cincinnati, Ohio. New York Office, 89 Chambers Street.

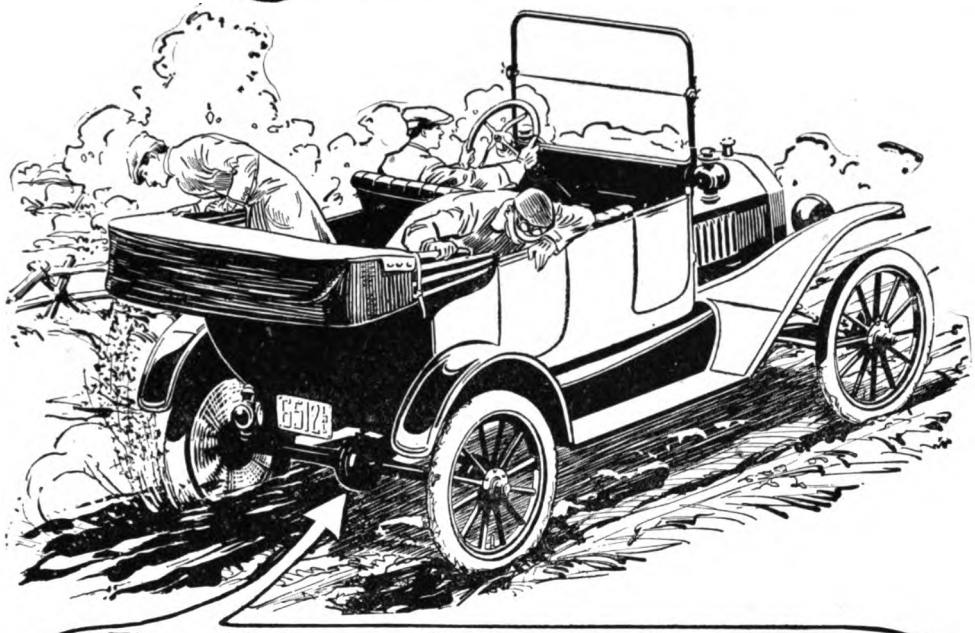
CAMPBELL

Look for the name Campbell on the fasteners. It guarantees unequalled fit, finish and luxury.

CAMPBELL GUARANTEED MOTOR CAR ACCESSORIES

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STUCK!



Through Loss of Traction Due to the inefficient old style bevel gear Differential

Familiar picture isn't it? And ten times the power wouldn't make any difference. It's not power that's needed here so much as traction. Don't blame the engine when you stick in the mud—blame the old style bevel gear differential.

Why continue to use a differential that only pulls one wheel—that carries your engine power to the wheel that has the least traction? And yet car owners and car manufacturers have had to be content with this type of differential for 15 years.

M&S DIFFERENTIAL

"Pulls Both Wheels"

U. S. Patents 1090082, patents in foreign countries. All infringments will be prosecuted.

The M. & S. Differential is made for Car Manufacturers by the Brown-Lipe-Chapin Co. of Syracuse, the world's largest makers of differentials.

The M. & S. is a spiral gear differential which distributes the engine power smoothly and evenly to both wheels.

When one wheel loses traction in mud, sand or on slippery pavements **the power goes to the wheel which has traction.** When both wheels finally find traction, the power is equally distributed. This is due to the action of the spiral gears which act automatically in the same manner as a differential lock and give all the advantages of a solid axle.

Read what "Jeffery" says

* * * * * *

During all our tests M. & S. differential never failed to work entirely satisfactory. We find that anti-skid devices are unnecessary when cars are equipped with your differential, which in itself is sufficient to warrant its use on a car and will be quickly appreciated by the public once it is demonstrated.

Furthermore, the feature that the power is applied to both wheels at all times, will take the car through roads that it would be impossible to pass through with an ordinary differential.

We are very much pleased that we were of the first to whom this new invention was submitted and that we made the test early enough so that we could get this equipment on our "Quad" for 1914 and 15.

THE THOMAS B. JEFFERY CO.

L. H. Bill

Ass't Gen'l Mgr.

Ford Cars First

The M. & S. is built and supplied as "equipment" for any new car by the Brown-Lipe-Chapin Co. The demand for the M. & S. by manufacturers so taxes the factory that it is only possible for us at this time to take care of **replacements** on Ford Cars.

The M. & S. is a **real** gear differential—not a pawl and ratchet device which drives the slow wheel only. Its construction is mechanically correct and is based on a true scientific principle.

We are now making deliveries of the M. & S. special type for Ford Cars. Ford owners can replace their present bevel gear differential. Any mechanic can install the M. & S. in a few hours. It fits perfectly in the Ford housing, using the Ford ring and pinion gears.

Nickel-steel Ring and Pinion Gears, standard ratio for Ford cars, price $6.50.

Write us for full particulars—We have an attractive agency proposition for Ford dealers or any one in a position to take care of replacements.

M. & S. GEAR COMPANY, 1036-1042 Whitney Bldg., DETROIT, MICH.

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TO YOU—WHETHER YOU ARE A MANUFACTURER, ADVERTISING MAN, SALES MANAGER, EDITOR OR PUBLISHER—AN INVITATION IS GIVEN TO ATTEND

The 10th Annual Convention of the Federation of Trade Press Associations

The Bellevue-Stratford Hotel

Philadelphia

Sept. 7-8-9, 1915

THE FEDERATION OF TRADE PRESS ASSOCIATIONS

—comprises 250 leading trade and technical journals.

—exists for the purpose of developing and encouraging higher and still higher ethical standards in publishing, advertising and general business practice.

—represents over $40,000,000 invested capital.

—reaches through its constituent publication, millions of business men!

—includes in its membership publishers expending over $37,000,000 in salaries and wages.

—desires the individual interest and co-operation of every reader and advertiser.

—wants YOU to attend its annual gathering.

EVERY man engaged in producing, advertising or selling merchandise will find much of interest and help at the Annual Trade Press Convention.

WHETHER you come to give of your own experience and observation; to gather the ideas of others or to exchange yours for theirs—this convention will give you big returns on your investment of time.

THE influence of these conventions is assuredly a potent factor in meeting the need of the day for greater economy in production and distribution of both necessities and luxuries.

A GATHERING of hundreds of leaders in the great economic movement toward increased efficiency in the manufacture, sale and distribution of merchandise is bound to be productive of great good and helpfulness. *You should be there.*

For additional information write the Editor of this Journal, or

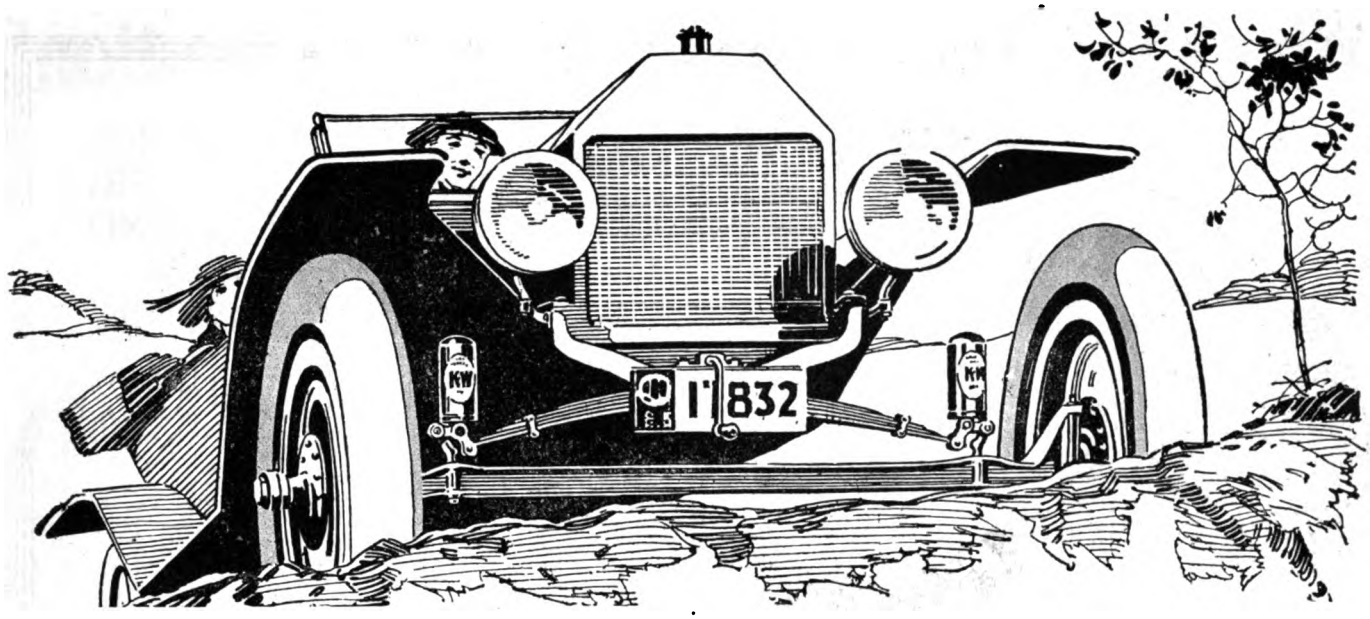
Bartley J. Doyle, Chairman Committee on Arrangements

512 Race Street, Philadelphia

THE FEDERATION OF TRADE PRESS ASSOCIATIONS

John Clyde Oswald, President New York — **A. A. Gray, Vice-Pres.** Chicago — **Grant Wright, Sec'y-Treas.** Philadelphia

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Enjoy the Scenery—Forget the Bumps

Be a Tourist—Not a mere Road Inspector

Many motorists today are slaves to the road. Their daily drives and week end trips are limited because of rough, rutty roads. They arrive home tired from being bumped around and "picking the roads"—they see nothing else all day.

Don't be a mere road inspector—equip your light, economical Ford with K-W Road Smoothers and get the greatest enjoyment and comfort.

K-W Road Smoothers give you this enviable comfort because their design combines these four factors:

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.
4. A construction that does not interfere with the steering.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost *twice the length of spring action* or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.

$15 SET OF FOUR
ONE FOR EACH WHEEL



K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all these vital factors *only* in K-W Road Smoothers

That is why they lengthen the life of your car, by eliminating shock and vibration. Tire economy is assured, because K-W Road Smoothers enable the wheels (not the whole body of the car) to follow the contour of the road. That means no grinding off the rubber of the tires. K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your car's usefulness, and bring you home with that "satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet "That Satisfied Feeling"

THE K-W IGNITION Co.
TRADE MARK
2817 CHESTER AVE. CLEVELAND, OHIO. U.S.A.

Makers of 125,000 Master Vibrators

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What's the Answer to the Touring Question?



But they can't give you the greatest enjoyment the most comfort—and freedom from excessive tire bills—unless they're on your car.

IF ALL roads were smooth as billiard tables; if there were no ruts or thank-ye-ma'ams—no tracks, cobblestones or rough streets to jolt and jar; if all roads were ideal it would not be necessary to equip with strong, sturdy and rugged Miller Tires.

But roads are far from being ideal. The man who wants the most pleasure from his car, must select the tire built to give him the utmost in mileage, safety and service under all road conditions.

All Roads look alike to Miller Tires

because the exclusive Miller Method of building tires does not cook the life out of either fabric or rubber in vulcanizing! Life in the cotton fabric means miles on the road. ***The Miller Method retains the natural vegetable wax and oil in the cotton fibre for wear in your tire.***

This natural lubricant carbonizes at 240 degrees. The old method of vulcanizing requires about 287 degrees to properly vulcanize a tire. And a brittle and lifeless fabric, with the power of resistance gone, results in short mileage on the road.

But the Miller Method of vulcanizing with a low degree of heat—overcomes all that.

And just as this exclusive Method retains the natural vegetable wax and oil in the fabric, so does it conserve all the toughness and wearing qualities in the rubber. Thus it makes a rugged unit of both rubber and fabric—without carbonizing the wax and oil in the fabric—or cooking the native endurance out of the rubber.

The result is a tire that insures practical immunity from blowouts and irritating road-side repairs.

Get yours from the Miller dealer today, and make touring what it should be—a constant pleasure.

If you don't know the Miller Dealer in your town, it will pay you to write us.

The Miller Rubber Co., Akron, U. S. A.

Distributors in the Principal Cities

MILLER

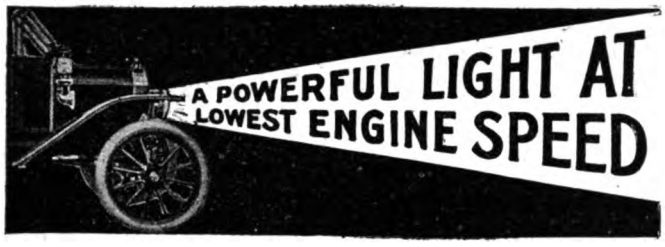
Miller **Geared-to-the-road** Tires gear your car to the road through mud, sand or slush. **With Miller tires on your car you're in control. Its tread is an integral part of the tire and retains its safety features until the entire tire is worn out.** The greater mileage you get from them, will make your choice of Miller Tires an economy, as well as a permanent safeguard.

MILLER TUBES answer the tube question.

ALL ROADS LOOK ALIKE TO MILLER TIRES

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At Last! What All Ford Owners Have Long Waited For



THE NEW YORK AUTOMATIC HEAD LIGHT CONTROLLER FOR FORD CARS

PRICE $5.00

Patents Pending

A LIGHT EQUALLY AS POWERFUL AS $50.00 BATTERY SYSTEMS

Delivers a powerful light at the lowest engine speed. Uses the Regular Ford magneto, requiring no batteries or complications. **Entirely automatic in its operation**—no belts, gears or movable connections to the engine are employed. **It also prevents the bulbs from becoming burned out at excessive engine speed.** This is positively the first and only solution to the electric head light problem on Ford cars. We furnish necessary wires already connected so that anyone can install in ten minutes by the simple removal and replacing of one bolt.

You need one—Why delay. Send us $5.00 with the understanding that you may return the device if you desire.



Install a

New York Master Vibrator on Your Ford Car

Price $8.00 at Your Dealer's

and enjoy the smooth, evenly applied power so noticeable in six-cylinder engines.

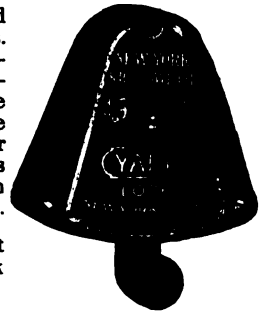
It is immaterial if your car is the latest or oldest model. You need our master vibrator, as it dispenses with all coil adjustments and replacements, and insures easy starting, a hot, perfectly timed spark under all conditions, and entire freedom from ignition troubles. It has for the past six years proven itself to be superior to any existing type. Though many times imitated it has never been equalled and stands to-day the best in its class at any price.

With fittings to install on the new 1915 models.

Prevent your Ford from being stolen by buying

OUR NEW YORK KICK SWITCH WITH YALE LOCK—PRICE $2.50

which fits the new Ford metal or wood coil boxes. This is a handsomely constructed kick switch containing a genuine Yale Lock, which affords the convenience of the regular Kick Switch, but possesses the locking feature which is found in no other type.



Anyone can install—Remit $2.50 today—Money back if not satisfactory.



Two Ignition Systems for Ford Cars

The New York UNI-Coil Ignition System for Ford Cars. Price $15.00

Operated by the Ford Fly Wheel Magneto (or Battery).

This system is primarily intended to operate on the Ford fly wheel magneto. It consists of a well-made elevating gear bracket upon which our Combined Timer and high tension Distributor is mounted. The Distributor is of the most simple construction containing the essentials of the high tension magneto. It uses one unit equipped with vibrator of your regular Ford coil. It dispenses with the timer and practically all of your present wiring, insuring a perfect timed spark and freedom from trouble.

The only satisfactory distributor system for the Ford magneto. Furnished complete to the smallest detail.

THE RHOADES BATTERY IGNITION SYSTEM

is intended for the class of Ford owners who prefer to ***dispense entirely with vibrators.*** This system operates entirely on battery, six dry cells supply ignition for from two to four thousand miles. ***We supply a handsome non-vibrating coil fitted with kick switch,*** also elevating gear bracket. Six years of hard service have proven it to be the best battery system obtainable for Ford cars.

PRICE $20.00

NEW YORK COIL COMPANY

338 Pearl Street **New York, N. Y.**

***Western Branch*—1461 Michigan Avenue, Chicago, Ill.**

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STANDARD Hartford EQUIPMENT FOR Ford CARS

LESS JOLT, LESS JAR, MORE COMFORT FOR FORD OWNERS

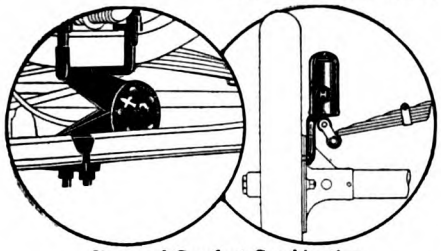
Here is a comfort combination scientifically correct and a pronounced success in practice—

FAMOUS *Hartford SHOCK ABSORBER
On the front of your Ford

AND

FAMOUS Hartford CUSHION SPRING
On the rear of your Ford

The result of a special study of Ford requirements.



Hartford Comfort Combination

The Hartford Shock Absorber on the front of a Ford modifies and softens the spring action at this point, accelerated as it is on rough roadbed by the extra weight of engine. Two Hartford Cushion Springs on the rear, where there is less weight and less spring action, give the rear springs needed resiliency. Thus equipped, a Ford rides with solid comfort over all roads.

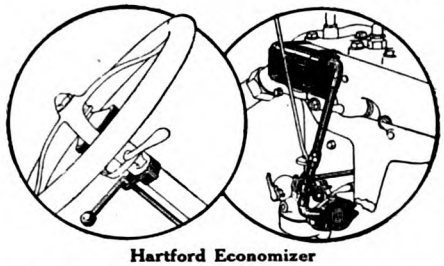
PRICE {ONE HARTFORD SHOCK ABSORBER / TWO HARTFORD CUSHION SPRINGS} **$12**

35% Less Gasoline and Much More Power

The engine of a Ford gets gasoline and air in perfect proportions when its engine is equipped with a

Hartford ECONOMIZER

PRICE, COMPLETE, $6.



Hartford Economizer

The air is warmed by a small air stove which receives its heat from the exhaust manifold. The result is that the engine, fed with an ideal mixture, is smoother-running and more powerful. All this is accomplished with an actual saving of 35% in the gasoline hitherto consumed. That's real economy.

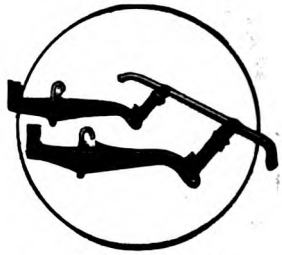
PROTECTS WHILE ADDING A TOUCH OF REAL STYLE

A bumper is a necessity but it must be dependable. The

Hartford BUMPER

is, for it is shock-absorbing. It protects lamps, radiator and mud-guards from contact with the colliding body and at the same time takes the force out of the blow. This saves **all** your Ford from damage. Strong, sturdy, beautifying. Not an adaptation for Ford car, but designed especially for it.

PRICE, COMPLETE, $10



Hartford Bumper

Standard Hartford Equipment for Ford cars adds immensely to the pleasure of Ford ownership. You buy with this guarantee—Satisfaction or Money Back.

We can make any car fit to carry any load over any road with absolute comfort.

HARTFORD SUSPENSION CO., E. V. HARTFORD President **141 Morgan St., Jersey City, N. J.**

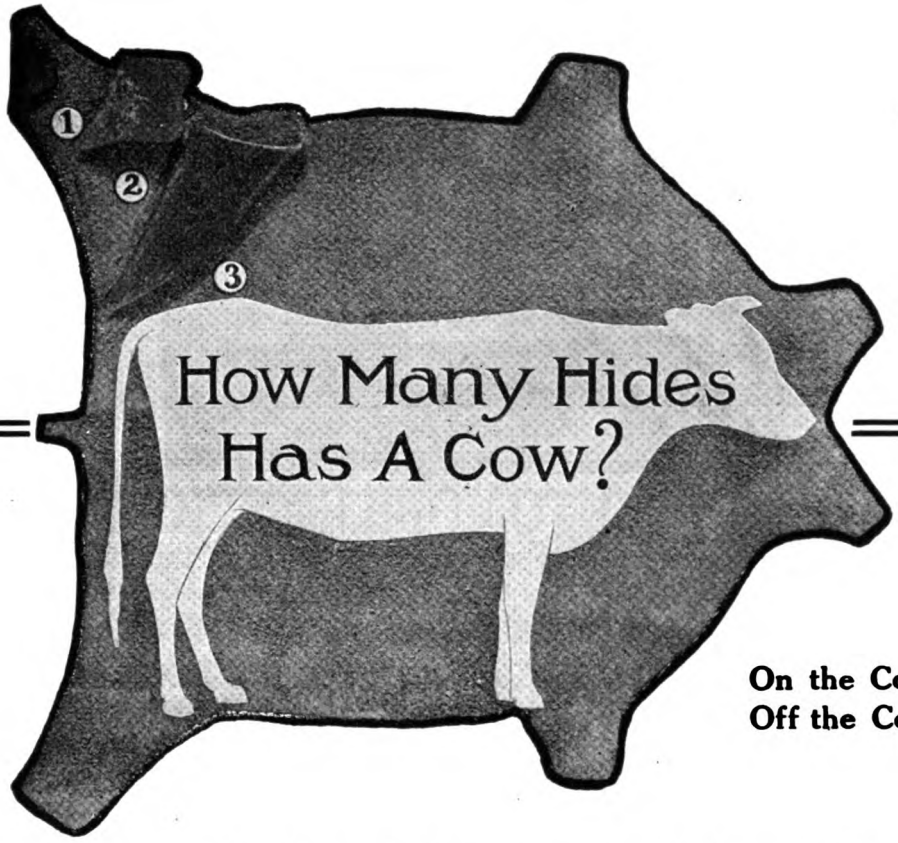
Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper

BRANCHES: BOSTON, 319-325 Columbus Avenue; CHICAGO, 2637 Michigan Avenue; NEW YORK, 1846 Broadway and 212-214 West 88th Street; NEWARK, N. J., 273 Halsey Street; INDIANAPOLIS, 425 North Capitol Boulevard.

DISTRIBUTORS: Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; L. Mastrangel & Co., 117 South Beatty Street, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa., Reinhard Bros Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Charles Rubel & Co., 1312 Fourteenth St., N. W., Washington, D. C.

**Formerly the Truffault-Hartford.*

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On the Cow—One
Off the Cow—Three

AFTER the hide becomes leather it is sliced into several sheets. But—there can be only *one* top, hair-side layer of genuine grain leather. The rest are merely splits, artificially coated and embossed to look like the real thing. These splits are sold as *genuine* leather, but they give neither the service nor wear of true hand or machine buffed leather. Thus we come to

DU PONT FABRIKOID
REG. U. S. PAT. OFF.

Rayntite Tops

Rayntite Fabrikoid, the highest grade top material on the market, is proof against drizzles or cloud-bursts. Long and sincere tests at our experimental station have proved this. It is made in single or double texture, and both bear the Du Pont guarantee not to leak, peel, crack nor blister. Crown your car with Rayntite. Any top maker can build you a new top or re-cover your old one with Rayntite.

The Ideal Upholstery Material

Guaranteed Superior to Coated Splits

Fabrikoid looks like leather but it is not leather. It is made of a strongly woven cloth coated with a flexible, durable compound exactly duplicating the luxuriant feel and appearance of the finest plain and Spanish leather; but—it is far more lasting than coated splits.

It makes cushions and seats combining luxury and style, because it goes on smoothly—tufts beautifully, and is water, dust and grease proof. Furthermore, it is guaranteed for one year. And back of this guarantee stands the century-old Du Pont reputation for integrity of purpose, superiority of product and financial responsibility.

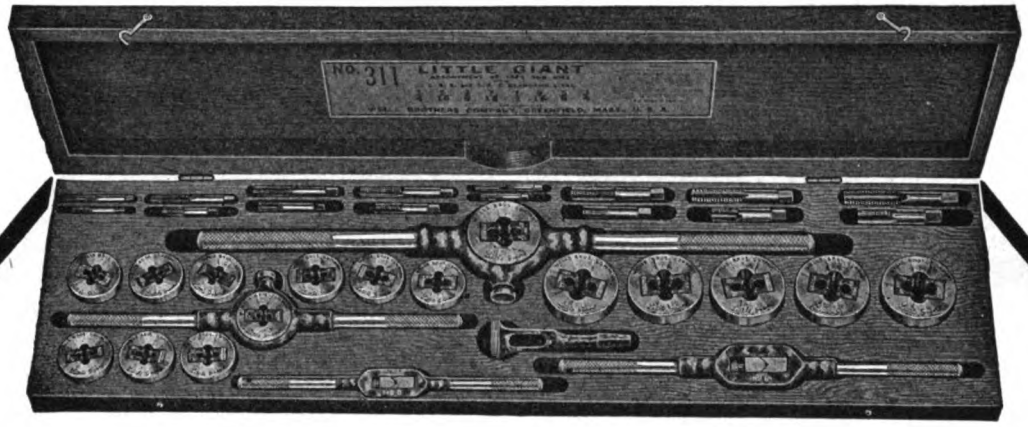
After two years of convincing success, Motor Quality Fabrikoid is being used on over a quarter million of this year's cars of various leading makes. Its merits have fully established its standardization. Be sure. Choose a "Fabrikoid" auto. Any automobile manufacturer can supply you.

WRITE FOR SAMPLES AND BOOKLETS

DU PONT FABRIKOID COMPANY, Wilmington, Del.

Canadian Factory and Sales Office: TORONTO

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Little Giant AUTOMOBILE SCREW PLATES

GOOD WORK REQUIRES GOOD TOOLS

Now that the overhauling season is at full blast repairmen and garage owners need tools for cutting screw threads by hand and should have the best. Out of our large and varied list of assortments of taps and dies we want particularly to call your attention to the screw plates, one of which is illustrated above, called

Little Giant COMBINATION ASSORTMENTS (Containing both S. A. E. and United States Standard Threads.)

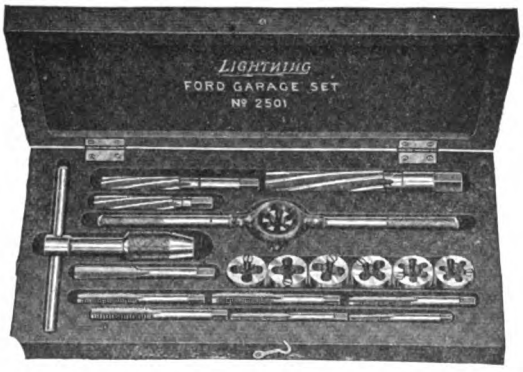
These assortments avoid the expense of buying a separate outfit for each thread standard and the expense of duplication of stocks and tap wrenches.

Little Giant DIES CUT EASIER **Little Giant DIES ARE MORE DURABLE**

Impossible for them to tilt or get out of alignment. Increasing the working strain only tightens the grip of the collect upon the working parts of the dies. Send for circular, "Tools for the Automobile." A postal brings it.

WELLS BROTHERS COMPANY DIVISION

LIGHTNING GARAGE REPAIR SET FOR FORD CARS



TAPS, DIES AND REAMERS—No. 2501

Designed especially for repairs on **Ford Cars, Model T.** A necessity for every garage and repair shop.

Contains:

Seven sizes taps and dies cutting
$1/4^{28}$, $5/16^{24}$, $3/8^{24}$, $13/32^{16}$, $7/16^{24}$, $7/16^{14}$, $1/2^{20}$.

Reamer for connecting rod arm bushing.
" " spindle " "
" " wrist pin " "

Stock and T tap wrench—all contained in neat hardwood case.

Write for catalog describing other screw plates for automobile repairs.

WILEY & RUSSELL MFG. COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

WELLS BROS. CO. DIVISION **WILEY & RUSSELL MFG. CO. DIVISION** **A. J. SMART MFG. CO. DIVISION**

SCREW CUTTING TOOLS AND MACHINERY

GREENFIELD, MASS.

New York 28 Warren St. | Philadelphia—38 No. 6th St. | Chicago 13 So. Clinton St.

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TEMCO Automobile and Garage Necessities



TEMCO Shock Absorber For FORD Cars



They take all the slight jars which your big springs would pass along to you.

They catch the first shock of all big jars and hand the load to the springs gradually.

They take the rebound from the springs gradually—and you are saved from all sudden or violent jars and jounces.

3 Big Features

Combined In No Other Ford Shock Absorber

1 Telescoping Dust Cap

The fender rods on Ford cars would ordinarily strike the top of a shock absorber as tall as the Temco. But Temcos **telescope** and "duck" the blow.

So we don't have to make them lean over to avoid the fender rod.

Temcos stand erect as sentries and add to the appearance of your car. They are absolutely vertical.

2 Longer Springs Stronger Springs

Even when telescoped, Temcos are as tall as others. When normal, they are the **tallest.** This is a big advantage.

It lets us use **longer** springs.

And we make them **stronger** and more **flexible** too. We use **two** Genuine, Crucible, **Vanadium,** Helical Steel Springs in each shock absorber.

They **couldn't** be longer — they **couldn't** be stronger.

3 Radius Links To Prevent side-Sway

Temco Shock Absorbers never lean one way or the other. They stand uncompromisingly erect—always absolutely vertical—giving full spring action.

Radius Links **hold** them straight.

This prevents that tiring side-sway.

And side-sway is the beginning of the dangerous skid.

By preventing side-sway, Temcos minimize skidding.

$15 Complete Set of 4

Unlimited Guarantee

Temco Shock Absorbers must fully, thoroughly and completely satisfy you in every way, or you may return them and get your money back.

To Dealers We were the first to make shock absorbers for Ford Cars and we've made and sold thousands more than anyone else. We are right behind them as we have been for years. We've a valuable reputation to defend. When you stock Temcos you stock the shock absorber which already stands highest in the confidence of most Ford owners and the one which will make a trade-boosting friend every time. Write for any information you desire.

THE TEMCO ELECTRIC MOTOR COMPANY
2117 Sugar Street, LEIPSIC, OHIO



TEMCO-ALTA Universal Shock Absorber For All Cars Complete Rear Set $12



TEMCO Improved Master Vibrator For FORD Cars $12.50



Write for full Information about TEMCO Portable Electric Drill

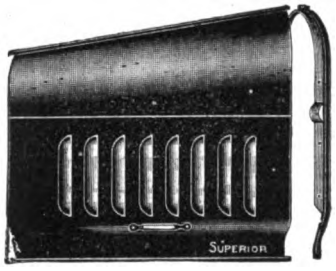
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"SUPERIOR" STREAMLINE HOODS FOR FORDS

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are merely painted and chip off easily. Buy the Smooth Long-Line Hoods.

BUILT OF HEAVY STEEL—TO LAST. IMMEDIATE DELIVERY.



Patented

NEW SURE-FIT HOOD
Complete, $8.00
Model "A" Fits 1912-13-14 Fords
Model "B" Fits All 1915 Fords

NEW WINNERS!!

Crown Fenders, Cowl Shields, Demountable Natural Wood Wheels, Lamps, All Types, Tool Boxes, 1915 Convertible Lamp Brackets.

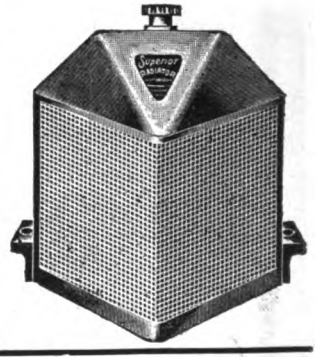
GET THE NEW PRICES!

Send for Latest Illustrated Sheet.

"SUPERIOR" V-Type Honey-Comb Radiators

For Ford Cars.

The New Constructed Vertical Water Flow Core.



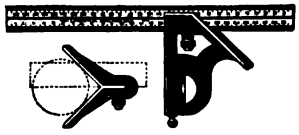
Brass, $34.70 German Silver, $38.00

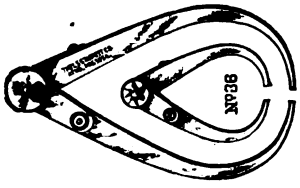
New Proposition. Write Today.

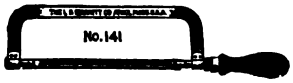
Get Our Credit Allowance On Old Radiators. All Types of Radiators Built and Repaired.

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

If You Own a Car You Should Own These Tools







BY INVITATION MEMBER OF



NEW YORK U.S.A.

Every man who owns a car knows the necessity for handy tools in the tool box when there is no garage nearby. For emergency repairs or for overhauling your car you will find need for all of these

Starrett Tools

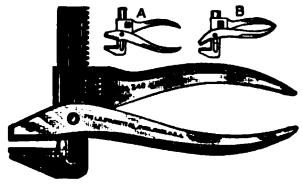
They are convenient and useful. The combination square may be used as a rule, square, or level. The calipers are used in taking sizes of any part. You often need a hack saw to cut some metal part or to fit a piece for temporary repairs.

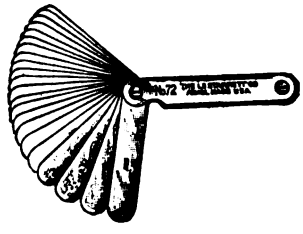
The expansion pliers are the most useful pliers made. They give the plier action on large work far beyond the reach of ordinary pliers. Their grip is extremely powerful. The thickness gage or "feelers" are useful for setting sparking points and for determining thickness of shims for loose parts.

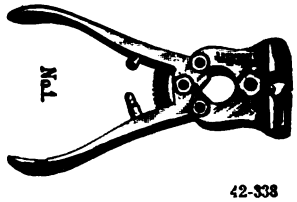
The cut nippers are quick cutters on wire and small stock.

Send for our 320-page catalog No. 20 D. C. showing complete list of tools and prices.

Starrett Tools are sold at all good hardware stores.







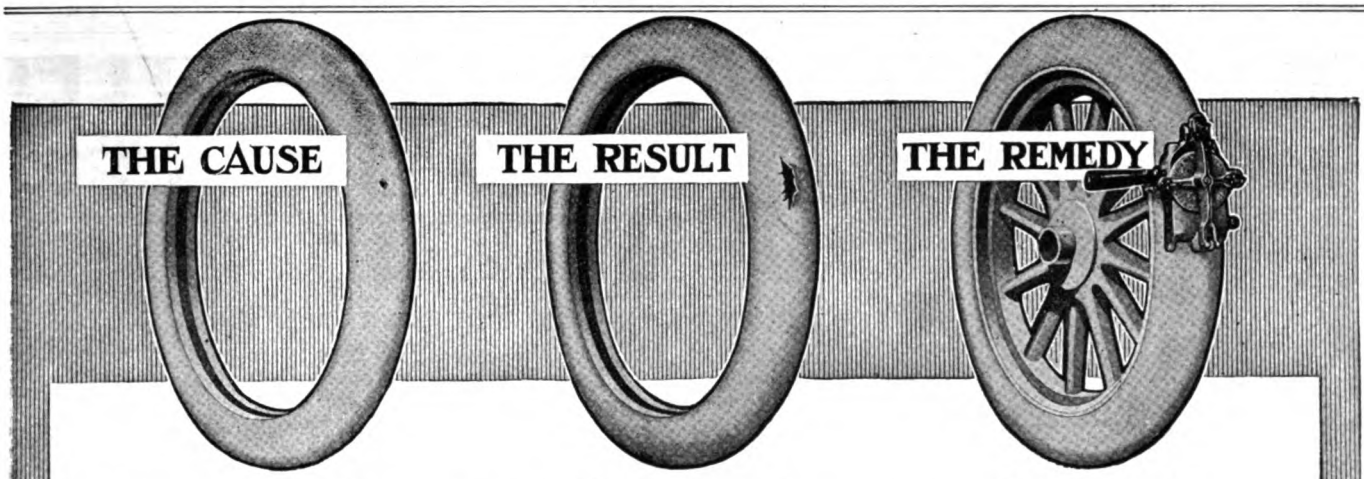
The L. S. Starrett Co.

WORLD'S GREATEST TOOLMAKERS

Athol, Mass.

42-338

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Stop the Hole—Save the Tire

Like a "stitch in time saves nine" so vulcanizing the small hole saves the blow-out later on.

These small holes when neglected expose the fabric. Sand blisters form. Water and moisture ooze through and rot the fabric. Then comes the blow-out—a big repair bill and usually a ruined tire. Stop this needless trouble and expense.

You can save your tires, save repair bills, increase your mileage and prevent tire trouble by vulcanizing the smal cuts and holes with a Shaler Vulcanizer You can keep your tires in perfect condition all the time.

SHALER Vulcanizers

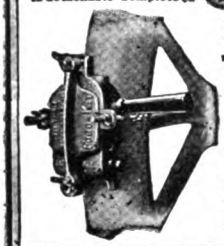
Increase Your Mileage—Save Repair Bills—Prevent Roadside Delay

SHALER

Tube-Kit $2.00

Does away with temporary patches for repairing tubes. Can be carried in the tool box for roadside repairs or can be used indoors. Is free from soot and smoke and the fuel cannot spill and flare up Handle is detachable Complete $2





SHALER

Ford-Kit $2.75
For Ford Tubes and Casings

This model, designed especially to fit Ford tires, makes every practicable tube and casing repair. Safe, simple, clean—no exposed blaze

will repair any puncture, rip, cut, tear or hole in casing or tube in a few minutes and make the repair the strongest part of the tire.

The Shaler is simple and easy to use. Anyone who can drive a car can easily and quickly vulcanize any tire with a Shaler. It requires no watching or regulating. You do not have to fear overcuring or undercuring the rubber. The Shaler has an **automatic heat control** which provides the exact heat for perfect vulcanization—no more—no less. Shaler vulcanizers are standard. Their principle is correct.

We are the world's largest makers of vulcanizers and make a complete line for every need, in every type—Alcohol—Gasoline—Steam or Electric. We make small portable outfits for tourists—Tube Kit, $2.00, (for vulcanizing tubes), Ford-Kit, $2.75, (for Ford owners), Vul-Kit, $3.50, (To carry in tool box for roadside repairs to tubes and casings), Model D, $12.50, (Electric outfit for private garages) and Garage Outfit at $60.

Get This Book Free
"Care and Repair of Tires"

"Care and Repair of Tires" tells the proper inflation you should maintain in your tires according to weight, load and seasons. It describes fully how to protect the tires while car is idle in the garage—how to care for them in winter and extreme hot weather—how to avoid substances that rot the rubber and fabric. It gives splendid hints on the spare tire and its care—how to carry extra tubes. It is really a text book on the care of automobile tires. It also describes each Shaler Model in detail and explains how it operates.

To Dealers—Garages and Repair Shops

Garages can add $20 or more a day to their profits vulcanizing tires with Shaler Vulcanizers. Accessory dealers can greatly increase their sales and profits selling portable Shaler Vulcanizers to motorists. Every repair shop should have the Shaler Garage Outfit. Every accessory dealer should stock the tourist Shalers. Use the coupon today. Get our interesting proposition and read our free book "Common Sense About Tire Repairs" (for dealers only).

C. A. SHALER CO., 807 Fourth St., Waupun, Wis.

Canadian Distributors—JOHN MILLEN & SON, Limited
Toronto, Winnipeg, Montreal, Vancouver

SHALER

Vul-Kit $3.50



Fits Any Size Casing or Tube

Can be carried in the tool box. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. You can't overcure or undercure a repair. Handle always cool. Complete, $3.50.

Dealers—Garage Coupon

C. A. Shaler Co., 807 Fourth St.
Waupun, Wis.

Send me catalog, dealers' terms and free book, "Common Sense About Tire Repairs" (for dealers and garages only.)

Name.....
Street.....
City.....State.....
Do you sell accessories?.....
Have you a repair department?.....
Jobber's name.....

Car Owner's Coupon

C. A. Shaler Co. 807 Fourth St.
Waupun, Wis.

Send me your free book "Care and Repair of Tires" and catalog of Shaler Vulcanizers.

Name.....
Street.....
City.....State.....
From whom do you buy your Auto Supplies?
.....

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TRADE APCO MARK

DOOR ANTI-RATTLER For FORD CARS



The rattle from the doors on the average Ford car is very noticeable and it is almost impossible to eliminate it. The Apco Anti-Rattlers are made from spring steel and are attached by simply removing one wood screw, placing spring in position as shown in cut and putting screw back. The improvement is wonderful and permanent.



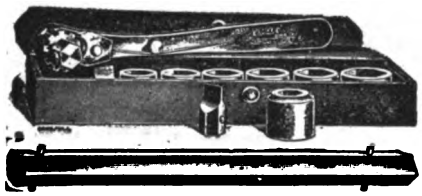
PRICE 20 CENTS

DEALERS: THESE ARE PUT UP ON CARDS OF 24, AND THE PROFIT IS EXCEPTIONALLY LARGE AND THE SALE IS EASY . .

Send for 1916 Catalogue of One Hundred Specialties

MAKERS OF GOOD SPECIALTIES FOR FORDS

AUTO PARTS CO., PROVIDENCE, R. I.



LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U.S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.
Price, in leather case, - - - - $3.00

Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER, 180 N. Dearborn Street, CHICAGO, ILL.

The Trade Is Cautioned Against Selling Infringements On My Patent.

The Arsenal School of Automobile Electricity.

Specializes on Electric Starting and Lighting Systems and Storage Battery Construction and Repair.

A six weeks' course of class-room lectures and actual shop work that will enable any intelligent repair man to become an expert on starting systems and storage batteries. No matter how good a general repair man you are, you miss the most profitable part of the repair business unless you are an expert on starting systems and storage batteries. Demand for experts exceeds the supply.

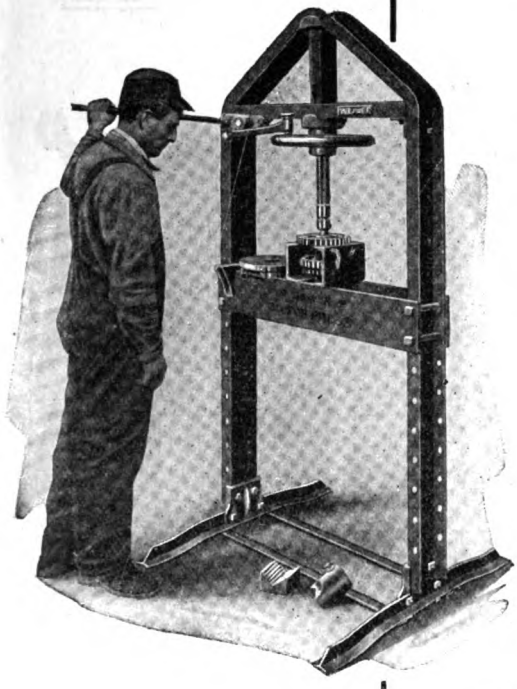
Fall term commences Tuesday, Sept. 7th. New classes every thirty days thereafter. NO MAIL COURSE. Students now being enrolled.

Send for free prospectus giving rates and full information on subjects covered.

The Arsenal School of Automobile Electricity, 401 25th Street, Rock Island, Ill.

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Do ALL of Your Repair Work and do it at a Profit with a



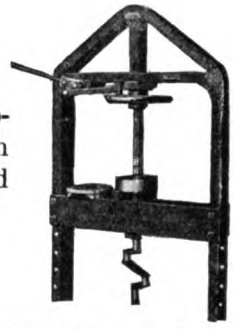
WEAVER
GARAGE PRESS

Stop paying out money to some "machine" shop for handling your difficult jobs—

A **Weaver Garage Press** will eliminate that outlay and bring jobs from other shops to **you.**

Don't antagonize and exasperate your customers by tying up their cars for two or three weeks while you send work "to the factory" which you **should** handle in your own shop—

Install a **Weaver Press** and **surprise** them by repairing their cars "while they wait"—They'll come back and bring others.



For Automobile Work

This Press was designed to handle the problems of the Auto Repairman. It is wide enough to accept an auto wheel and can be adjusted to meet practically any requirement.



Built Right

Leverage 1500 to 1; from 74 inches high, made of one piece of heavy 5-inch Channel Steel; ball bearing wheel with Bronze thrust bearings. **The Screw does not revolve.** Width between frame 32 inches; perpendicular adjustment 48 inches; weight 425 lbs.

Net Price (Complete with Equipment) **$48.00**



WEAVER
Auto Ambulance

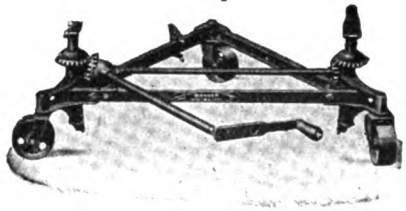
For towing disabled cars; will attach to either front or rear axle. Roller bearing *Cast Steel* Wheels; telescoping tongue.

Weight 140 Lbs.
List Price.....$30.00

WEAVER
Auto Twin Jacks

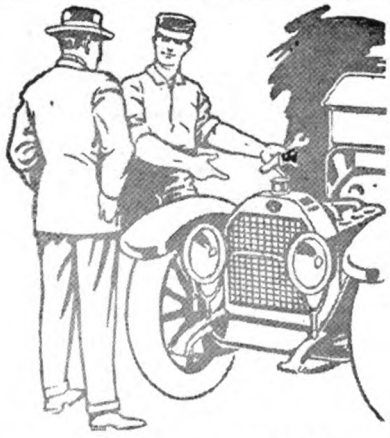
One man can handle any car with ease. Full ball and roller bearing casters and lifting mechanism. Made in **two** sizes.

Per Set (Two)
$20.00 —— and —— $36.00



WEAVER MANUFACTURING CO.
2175-79 So. 9th Street Springfield, Illinois

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Carbon Trouble is a Piston Ring Trouble

IT'S not the fault of the oil at all—it's due to defective piston rings.

¶ All good lubricating oil must contain carbon, but carbonization only occurs when the oil is allowed to get where it has no business to be—in the combustion chamber. It's the duty of piston rings to keep it down in the crank-case where it rightfully belongs.

¶ Don't blame the oil. Put in

LEAK-PROOF

Piston Rings

MADE BY McQUADE-NORRIS MFG. CO.

and you'll reduce carbon trouble to a minimum. You'll get more power, too, for LEAK-PROOF Piston Rings are gas-tight as well as oil-tight—resulting in perfect compression, less friction loss and less motor wear. They will save both oil and fuel.

¶ Put a punch in your motor by installing LEAK-PROOF Piston Rings. They are perfect-fitting, equal-bearing, enduringly-elastic rings. They are made with mechanical exactness to overcome the inefficiency of other rings. Neither gas nor oil can get by them or through them.

In Use in Over 300,000 Motors

Send for FREE BOOK—

"To Have and to Hold Power." It explains the theory and function of piston rings and shows you why you should equip your engine with LEAK-PROOF Rings.

Sold by all up-to-date dealers, garages and repair shops

MANUFACTURED BY

McQuay-Norris Mfg. Co., Dept. R.,

St. Louis, U. S. A.

Canadian Factory—W. H. Banfield & Sons, 120 Adelaide St., West, Toronto.

"Ask the User."

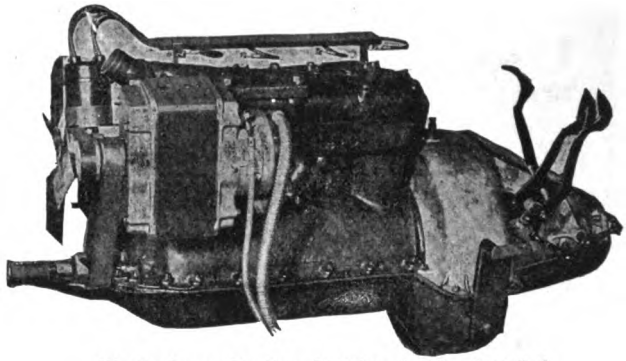


Angle-to-Angle interlocking construction identifies LEAK-PROOF—insist.

BRANCH OFFICES

New York—1919-29 Broadway
Pittsburg—902 Second Nat. Bank Bldg.
Kansas City—513 New Nelson Bldg.
Chicago—718 Michigan Blvd. Bldg.
San Francisco—164 Hansford Bldg.
Los Angeles—224 Central Bldg.
Dallas—509 Juanita Bldg.
St. Paul—American Nat. Bank Bldg.

Westinghouse
Electrical Equipment
Starting
Lighting
Ignition
For Ford Cars



Westinghouse Starting—Lighting—Ignition Installed

A Single-Wire System—A Twelve-Volt System—Silent Chain Drive—A Cut-Out to Prevent Discharge of Battery.

Cranks over 175 r. p. m.; charges battery at 9 miles per hour—All wires armored.

The Lighting and Starting System is complete, consisting of Motor-Generator Unit, battery and box, switches, fuses, chain and guard and sprockets, pulley and belt, wires with terminals attached, all wiring details and instructions, everything required for installation.

Price $75 f. o. b. Pittsburgh

The Ignition System is complete with Ignition Unit, including self-contained coil, mounting bracket, all wiring with terminals attached. Spark plugs are supplied extra.

Price $15 f. o. b. Pittsburgh

The Lanterns consist of headlights with two lamps and tail light. Westinghouse-McCandless Incandescent Lamps used.

Price $7.50 f. o. b. Pittsburgh

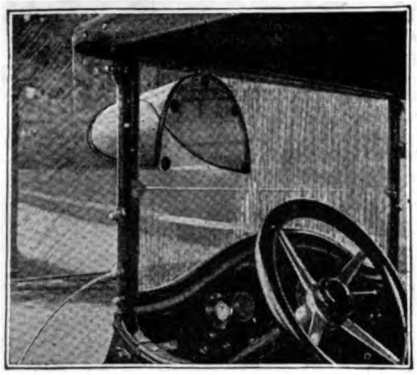
Write for Folder 4311-A
and Our Dealers' Proposition

Westinghouse Electric & Mfg. Co.

Automobile Equipment Department

Shadyside Works Pittsburgh Pennsylvania

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View From Rear

FREY'S U-CAN-C RAIN SHIELD

Made of tough, flexible, transparent Pyralin. Lasts for years. Attached to glass in 10 seconds and as quickly removed. No water can run under or drip off the edge.

It Rolls Up

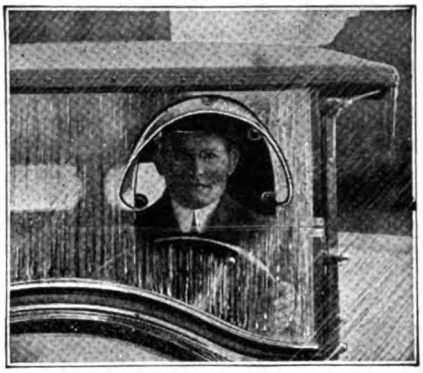
and goes into a strong tube, 11x3 in.

Send us your dealer's name with $1.50 and we will mail you prepaid, one of these necessary shields.

Fits All Cars

FREY'S U=CAN=C TRADE MARK RAIN SHIELD

First New Automobile Accessory In Five Years



View From Front

You Can See this from the pictures.

Stick it on your wind-shield and know the comfort and safety of driving your car in all storms, with a clear view ahead.

It sticks to your glass wind-shield with five vacuum cups. **We guarantee** no wind can pull it off when properly applied.



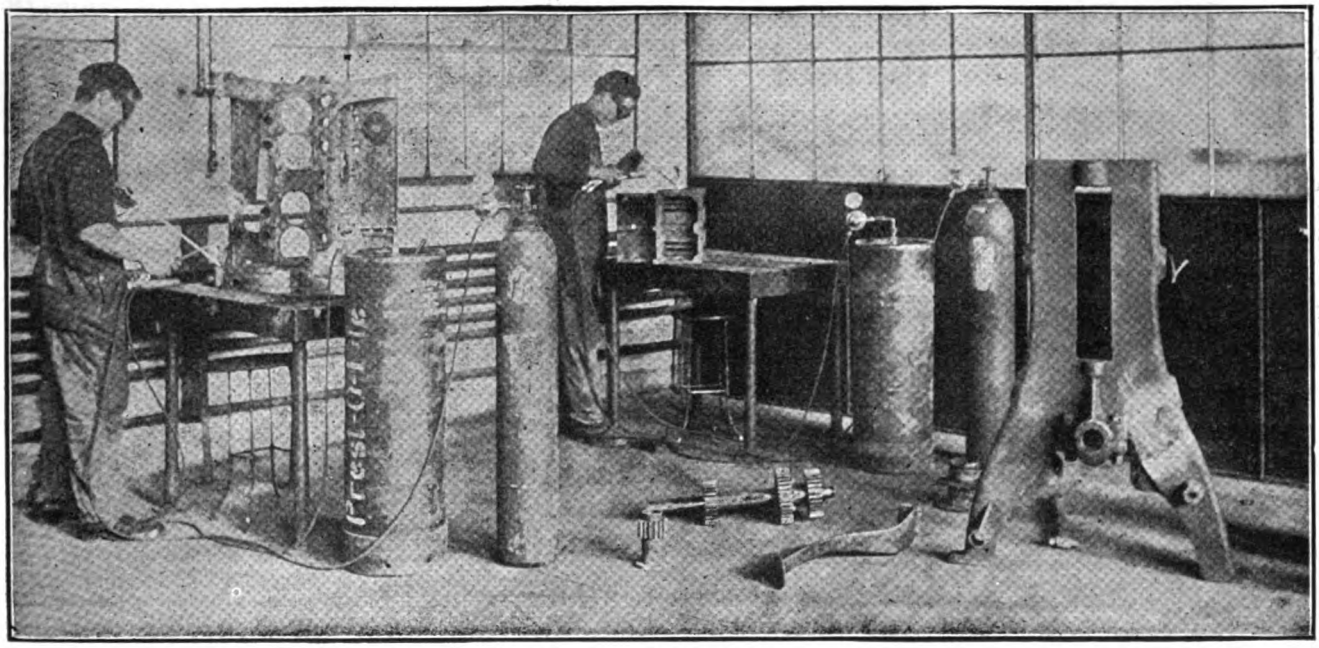
DEALERS—Write quick for prices and agency proposition. **Stick** one to the glass of your show window. You will sell one to every car driver.

List Price, Complete

Amber..... **$2.00 Each** **Clear**..... **$1.50 Each**

FREY MANUFACTURING CO.

1516 MICHIGAN BLVD. **CHICAGO, ILL.**



Style D Outfit on the Job

$35.00

COMPLETE WITH SUPPLIES

(Tanks Not Included)

If it can be done, the **DYER** OUTFIT will do it.
Having this outfit you are prepared for an emergency, while at the same time investing very little money.
The burning out of carbon is a regular source of income, and this end alone will pay for the entire outfit in a short time.

Catalogue on Request.

THE DYER APPARATUS CO., CAMBRIDGE, MASS.

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LOOK! LOOK! LOOK!

The Yankee Folding Running Board Pump

Formerly $6.00, NOW *$4.50* PRESSURE GAUGE ATTACHED $1.00 EXTRA

HANDLED BY ALL LEADING JOBBERS

If Your Jobber Cannot Supply You, Write Us For Discounts

APEX ELECTRIC MANUFACTURING CO.

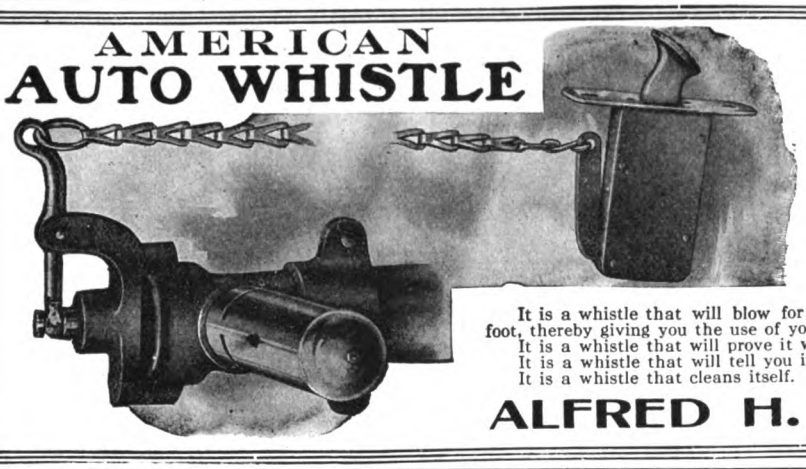
1410-12 WEST 59th STREET, CHICAGO

$4.50

Size 3½"x5½"x11" Folded



AMERICAN AUTO WHISTLE



SERVES TWO PURPOSES

A Loud Warning Signal That Also Protects Your Car From Thieves

When leaving your car you simply take the key with you, which leaves the whistle open so that your engine cannot be started without the same blowing loud enough to be heard blocks away.

It is a whistle that will blow for you as long as your engine goes, with just a kick of your foot, thereby giving you the use of your hands and feet in case of accident.
It is a whistle that will prove it was blowing at time of accident, if necessary.
It is a whistle that will tell you if a cylinder is leaking or skipping on your engine.
It is a whistle that cleans itself. ***Write for prices and full particulars.***

ALFRED H. CLARK, 1307 HOWARD AVENUE BRIDGEPORT, CONN.



The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company

3326 Ludlow Street **Philadelphia, Pa.**

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South

A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver



$15.00 Complete Set

DEALERS!

Do you know that the

RIGHT Shock Absorber

with its **2 inch** resilient action has more than twice as much shock absorbing efficiency, than other absorbers?

And yet it is the lowest priced twin cylinder Shock Absorber!

NO JAR OR JOLT! NO RECOIL!
All Wearing Parts Bushed!

Your customers want the **RIGHT Shock Absorber,** why lose money trying to sell the wrong one?

Get Our Discounts.
Write for Territory Today!

Right Motor Specialties Co.

1320 Michigan Avenue CHICAGO, ILLINOIS

Canadian Branch: TORONTO, ONT., 147 Arthur Street

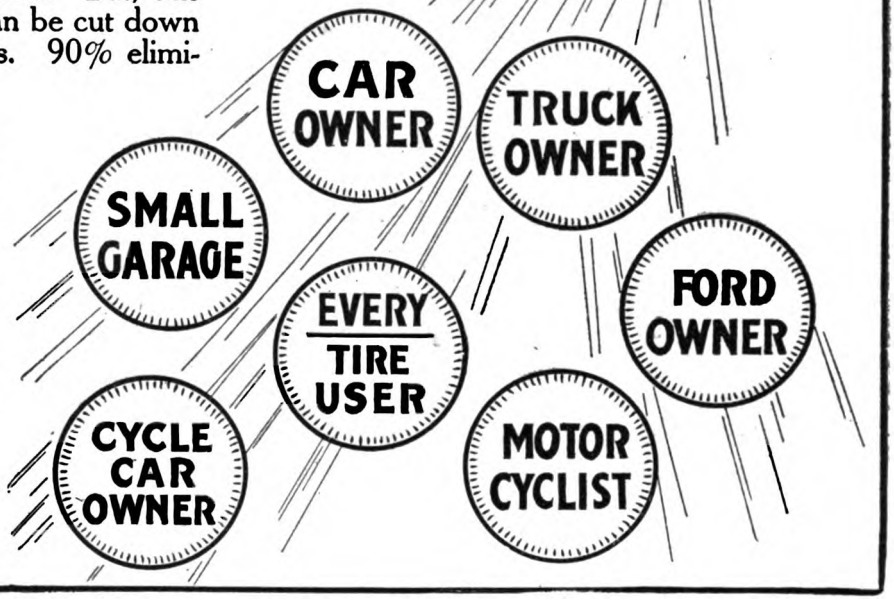
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DRAW PROFITABLE BUSINESS!



Every tire user has **trouble.** And so far as we can see, he always will have! But, this trouble can be lessened. It can be cut down to one-tenth of what it now is. 90% eliminated. This: by using the "ADAMSON" Vulcanizer. Every tire user sees the logic in our principle--and BUYS SOMETIME, for it's economy to carry an outfit in every car. Are you going to gather in some of these dollars which the "ADAMSON" is attracting? They will come to your place of business--if you've "ADAMSON" outfits on your counter. **Write for the dealer's proposition to**

Adamson Mfg. Co.
East Palestine, Ohio **Hamilton, Ont., Canada**



EVERY FORD NEEDS A WALDEN WORCESTER WRENCH

MR. FORD OWNER

Walden-Worcester wrenches for Ford cars have been built *specially* for use on the Ford. They are designed to meet the hardest service. Every wrench is *guaranteed*. Your money back, if it fails to do the work required. If your dealer tries to substitute and hand you a cheaper tool, demand the **Walden-Worcester**—(Look for the name on the tool and get your money's worth. Insist on a **Walden-Worcester.**

No. 1620—Triple Socket Wrench for Cylinder Head and Housing Bolts



The most useful single wrench for Ford cars. Cylinder head bolts, rear axle nuts and housing, water intake pipes and sundry other places. The offset gives necessary leverage for tightening or releasing bolts, the tee handle feature being wonderful for quick work.

PRICE **38c**

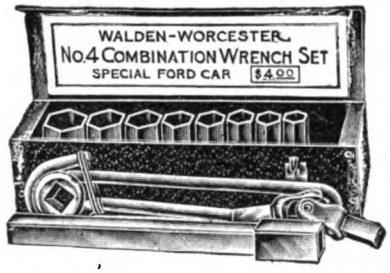
No. 4564—For Reverse and Brake Bands



The only wrench for use on brake and reverse bands, giving a full clearance around nuts. The peculiar shape of the handle allows full working space at all times. A Ford car is not complete without one of these wrenches.

PRICE **50c**

No. 4—The Set That Fits Every Bolt and Nut on Fords

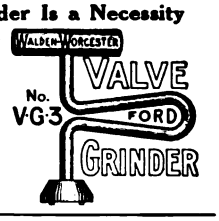


A complete outfit that enables you to reach *every* nut and bolt on the Ford. It is the strongest, simplest, best constructed ratchet wrench set ever devised. Every part of this set is made for service and absolutely guaranteed against defects. With this outfit you are prepared for any emergency. Every Ford owner endorses it. It will pay you to invest in one of these sets today.

PRICE **$4.00**

A WALDEN Valve Grinder Is a Necessity

Consists of a special brace having a grip hold attachment that fits into the Ford engine valves. Will grind Ford valves better and in less time than any other valve grinder on the market. Made of Bessemer Steel Rod. You will like this little tool and will be glad to recommend it to your friends.



PRICE **30c**

ASK FOR OUR LATEST CATALOG

We have a money-making proposition in our new catalog that will be of extreme interest to you. It's something you have always needed. It will pay you to write. Just say, "Tell me about that 'box' you are giving Free."

MR. FORD DEALER

Walden-Worcester wrenches for Ford cars are *big sellers.* They are the most practical, most reliable tools that you can handle. Every Walden-Worcester specialty is backed by a *guarantee* that protects you and your customer. Why sell inferior, unreliable tools when you can sell the *best* at the same price? You will make *more* money in the long run by giving your customers **Walden-Worcester Wrenches.** Ask for our Wholesale Price List.

No. 5810—For the Connecting Rods



A tool of the greatest practicability and service, one that reaches any position without removing the motor from the car. Its peculiar shape affords splendid grip and powerful leverage. No Ford owner should be without one.

PRICE **35c**

No. 1824—Double Socket Wrench



A splendid double end wrench for removing main bearing and engine base bolts, etc. Sockets are of different size and are steel machined. They are case hardened and applied to the rod by our special process. Guaranteed not to twist or shear off.

PRICE **35c**

WALDEN MFG. CO. Specialty Department 64 CENTRAL STREET **WORCESTER, MASS.**

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INLAND

1 PIECE PISTON RING



A marvel of simplicity and efficiency. Made of only one piece, it has all of the virtues of eccentric, concentric, and more than one piece construction, and none of their disadvantages.

A continuous ring cut spirally for half of its circumference, heat-treated, so that the free ends will hug tightly together. That's the construction—the result is :

An absolutely gas-tight ring that uncoils in expanding, insuring uniform pressure and perfect contact with the cylinder walls.

The strongest ring on the market, because it is made of one piece, and

1 The gap is less than 1/3 the width of the ring.

2 The free end is supported by the full depth (cross section) of the ring.

3 The friction surface of the free end is less than 1/3 its depth, making it relatively very strong.

4 It is easier to put on and will not break in handling.

The best ring on the market, at a better price. Absolutely guaranteed. Money refunded on any ring not giving satisfaction at the end of 90 days.

The Inland will be the biggest seller. Dealers and jobbers, write for interesting prices. Full description in booklet. Free.

INLAND MACHINE WORKS,
802 Mound St., St. LOUIS, MO.



IMPERIAL WELDING AND CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS

For Emergencies!

Speeding along a country road to do some emergency work the torque rod of this car broke. The man quickly adjusted the Imperial Equipment he had with him and *in 25 minutes* the rod was repaired and replaced—saving considerable time, trouble and expense.

Every garage should be equipped with Imperial Welding, Cutting and Decarbonizing Equipment—*a portable repair shop in itself.* Safe, efficient, *economical.* Hundreds of uses. Pays for itself.

New catalog explains 30 days' trial offer, uses, prices, etc. *No garage should be without it. Write today.*

Imperial Brass Mfg. Co. 52 S. Racine Ave. CHICAGO

Welds
—broken aluminum cranks,
—transmission cases,
—crank shafts,
—cracked cylinders,
—rear axle housings,
—all automobile parts in brass, bronze, copper, aluminum,
—everything in metal.

Cuts
—axles,
—frames,
—rivet heads,
—any thickness of steel or wrought iron.

Removes Carbon
—from gas engine cylinders in a jiffy.



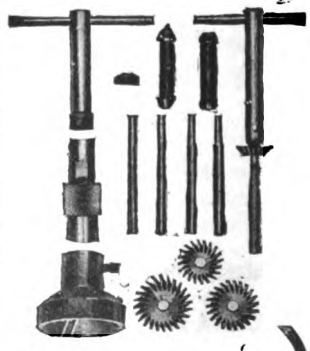
Welding Broken Torque Rod on Road

Every Garage Needs This Valve Reseater

Grinding valves and valve seats isn't the difficult, time consuming task it used to be. The old hand process of valve reseating was tedious, slow, and inaccurate. By doing the work with the modern, efficient, time-saving **FOSNACHT VALVE RESEATER** you get absolute accuracy—cleanliness—and use but a quarter of the time formerly required. An inexperienced man can do perfect work with this remarkable appliance. There's no emery—no dirt—no tearing apart of motor—where the

FOSNACHT VALVE RESEATER

is used. Every garage needs the **FOSNACHT.** Its speed and reliability brings increased repair business. The price of $25.00, with a 5% cash discount, is an actual investment, with liberal profits from valve grinding work the certain returns. Will pay for itself in a short time. Many in successful use.



You ought to have our book telling all about this machine. Your name and address on a post card, with a request for the **FOSNACHT** book, will bring it by the next mail.

H. C. Paro

Address
Suite 700
30 No. Michigan Blvd., CHICAGO, ILL.

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If You Knew

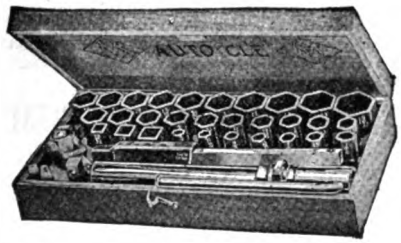
of the efficiency of **Socket Wrenches**—you would speedily buy them.

When you buy **Socket Wrenches,** you naturally would prefer the best, providing the Best cost no more than the rest.

Just ask your dealer what he knows about

Auto Clé Socket Wrenches

Ask any man his experience with them—we will abide by the opinion of any user.



The famous large **Auto Clé, $10.00.**

The positive, reversible **ratchet** handle and the full assortment of

Mossberg Guaranteed Sockets

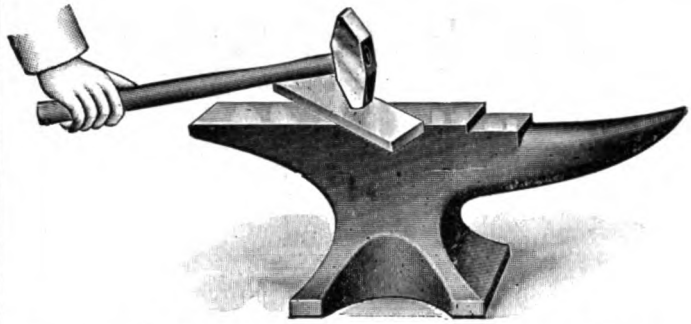


are Absolutely Guaranteed.

Sent prepaid upon receipt of price—if your dealer cannot supply you

By the way—why don't you ask us for our complete Catalog? No. 171B.

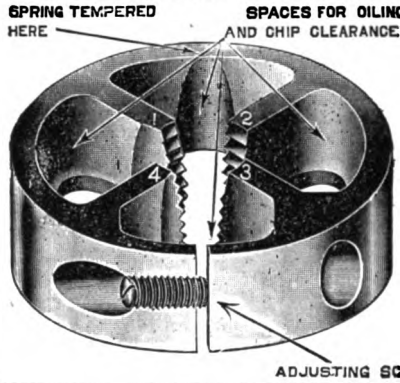
FRANK MOSSBERG COMPANY
Attleboro, Mass.



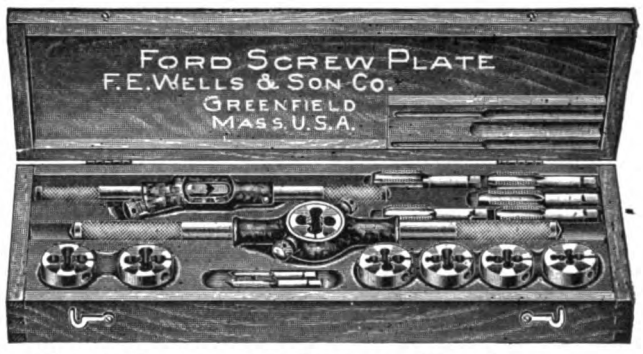
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

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For Dealers Only

ADVANCE EDITION 1915 CATALOG AUTO SUPPLIES

Off the Press July 26th

—and chuck full of everything new and good including staple lines that have made good.

A Copy for Every Dealer in the Country.

Something New

A large, complete catalog of auto supplies, **exclusively for dealers,** published in mid-season and containing many new lines that you would not get ordinarily until next year.

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If you are not on our mailing list your request on your business letterhead will bring your copy by return mail, but get it by all means and be correctly informed before you buy further; our prices are a revelation. Send tonight for the new 1916 SMS CATALOGUE.

Dealers Protected

The Service Motor Supply Company sells to legitimate Dealers only—no orders filled from consumers.

SERVICE MOTOR SUPPLY COMPANY
Washington Boulevard and Desplaines Street
CHICAGO, U. S. A.

NATIONAL RUBBER TIREFILLER



An ingenious treatment of small Pure Rubber particles which holds them together in solid form—solid enough to carry the heaviest load your engine will pull—resilient enough to give that "ON AIR" feeling that brought popularity to pneumatics—cannot puncture, rim cut nor blow out—makes your tires cost less by wearing longer.

National Rubber Tirefiller in your tires is like Tire Life Insurance Policies—they insure you more miles out of your tires—complete freedom from all tire trouble—against serious accidents from blown out tires and the real tire service you are entitled to.

It eliminates the delicate and expensive inner tube entirely—it replaces uncertainty with certainty and makes your car absolutely dependable. Let us send you small sample and tell you more about them.

NATIONAL RUBBER FILLER COMPANY,
208 College Street, MIDLOTHIAN, TEXAS.

Add $250.00 A MONTH EXTRA To Your Business

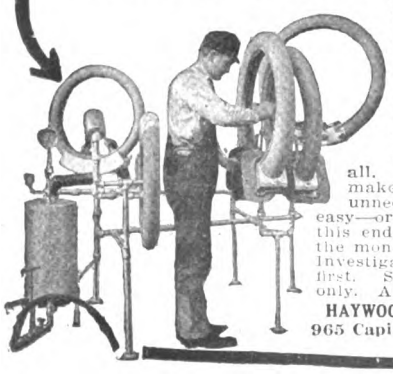
REPAIR AUTOMOBILE TIRES

Sounds like a whole lot of money to clear extra every month. Seems almost impossible, but that is what hundreds of men are doing who have added a Tire Repair Department to their business. **The investment is small, the profit large** and **returns quick and all cash,** besides the demand for tire repairing and retreading is constantly growing. Your garage is by no means complete, your business is not as profitable as it can be until you get in on the Tire Repairing and Vulcanizing end.

THE HAYWOOD TIRE REPAIR EQUIPMENT

Answers all the requirements to successfully handle this end of the business. With it and a little business judgment, success is certain. Every year adds thousands of new auto owners. They are looking more and more to economical tire service. The day of discarded tires is over, the Haywood Equipment makes this possible.

HERE IS YOUR OPPORTUNITY



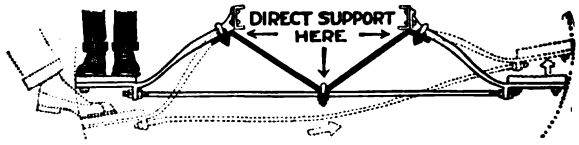
Either as a side line to your present automobile business or as a business by itself, the Haywood Equipment will make money for you. **Tires go wrong all the time.** You know that. Keep them in tune. Give your customers complete service—repair their tires and all. This builds business and makes you rich. Experience unnecessary. You can learn easy—or teach a boy to handle this end. Be the boss and make the money. Learn the details now. Investigate. Act quick. Be the first. Send name and address only. A postal will do.

HAYWOOD TIRE & EQUIPMENT CO.
965 Capitol Ave., Indianapolis, Ind.



Running Board Braces.

Make Your Ford as Quiet as an Electric and as STRONG as a Truck.



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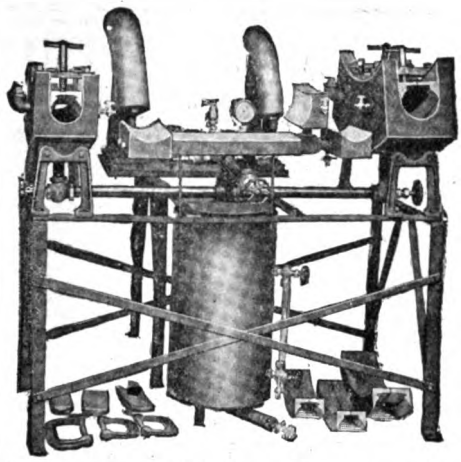
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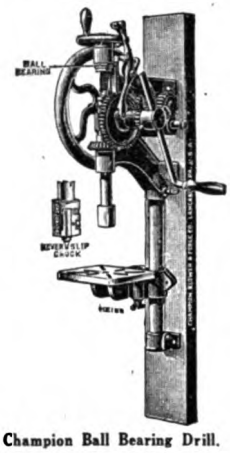


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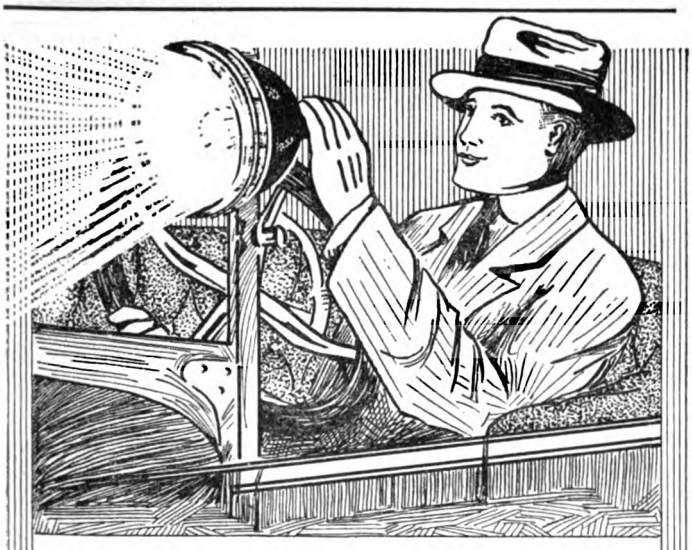
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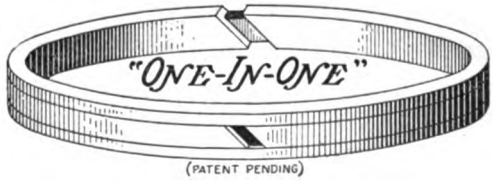
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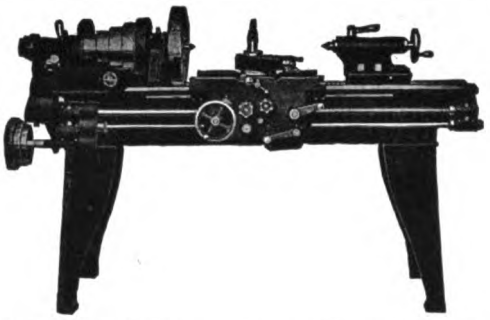
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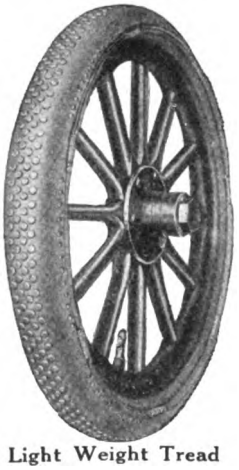
Woodworth Trouble-Proof Tires are guaranteed against punctures for 5000 miles. They are also guaranteed to outwear any other make of tire on the market and if used on one side of the machine against any other make on the other side and they do not wear longer except when destroyed by accident, we will refund 2½% of the purchase price for every one hundred miles they fall short of the mileage given by the other make.

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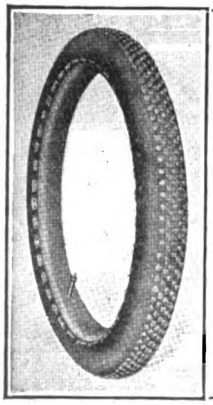
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Sent postpaid to any part of the U. S. on receipt of price.

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Spring Oiler Strap

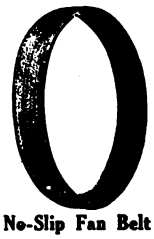
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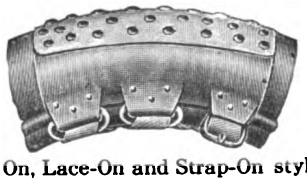
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VOL. XIX. No. 6. NEW YORK, AUGUST, 1915. PRICE { 10c PER COPY $1.00 PER YEAR

DRY BATTERIES.

Their Evolution and How They Can Be Made to Give Good Service.

BY SYDNEY F. WALKER, M. E.

No. 2.

As originally designed, the Le Clanché cell was not intended to furnish currents continuously; it was intended to use intermittently for electric bells of private houses, the electric signals of mines, and later on, of telephones. The same principles that had ruled in the Daniell battery ruled also in the Le Clanché, though they were applied in quite a different manner. It is the hydrogen gas that is given off at the carbon or copper plate of each cell that causes the trouble. If it is allowed to accumulate it sets up a counter electromotive force, a counter pressure which tends to reduce the pressure available from the cell. It will be remembered that every pair of metals, when immersed in a liquid, give rise to an electric pressure between them. In this matter hydrogen gas behaves just as a metal, but the above statement may also be extended by saying that any two dissimilar substances which are together in presence of a liquid will set up an electrical pressure. When hydrogen gas comes away at the carbon or copper plate a galvanic couple is set up consisting of the carbon and hydrogen gas, with the liquid that is surrounding the carbon or copper plate. If the hydrogen gas is immediately got rid of the cell will go on working. In the gravity Daniell battery described above the constancy of the pressure is maintained by reducing the current to such a figure that the sulphate of copper present in the cell can easily deal with the hydrogen as it is given off. If such a battery is worked beyond a certain rate it quickly begins to drop its pressure because the hydrogen gas cannot be neutralized as quickly as it is given off. It will be seen later how important this is in the matter of the dry cell.

In the Le Clanché battery a property possessed by oxide of manganese is employed to perform the same work as that performed by the sulphate of copper. The hydrogen gas given off in a battery is in a very powerful state, and oxide of manganese very readily gives up a portion of its oxygen, the salt being reduced to a lower oxide. The oxygen so given up unites with the hydrogen, one atom of oxygen combining with two atoms of hydrogen to form water, which of course is merely added to the solution in the battery. The oxide of manganese in the wet Le Clanché battery, which is still upon the market, is contained inside a cylindrical porous cell, as shown in Fig. 7. A carbon plate stands in the middle of the porous cell, and the space around it is filled with a mixture of oxide of manganese and carbon, both crushed to about the size of a pea. It is of importance that there shall be no dust present in the cell. The top of the porous cell is closed by a pitch seal, a glass tube being inserted in the pitch to allow of the escape of gas.

A zinc rod was employed in the early forms of Le Clanché cell and is to-day employed usually in the wet cells. It is shown in Fig. 8. The zinc rod stands in a solution of sal ammoniac, chloride of ammonium. Ammonium, it will be remembered, is a hypothetical

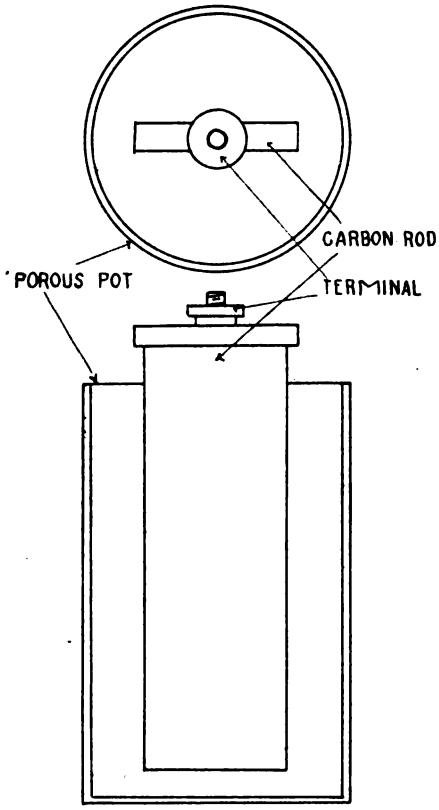


Fig. 7—Section and plan of the filled porous cells of a Le Clanché battery, showing the carbon plate and the porous cell. The crushed oxide of manganese and carbon referred to in the text are filled in round the carbon plate.

metal; it does not exist. But there are a number of salts formed with the hypothetical metal in the same manner as with zinc, copper, etc. There is for instance sulphate of ammonia, which has at present a large sale for agricultural purposes, and which is made largely in gas works and as a by-product from coke ovens. Chloride of ammonium is a white salt, sometimes placed on the market in large blocks, but more usually in a crushed form, as it more easily dissolves in water in that condition.

When the cell is working zinc combines with oxygen from the water, and with chlorine from the ammonium chloride, hydrogen being liberated by decomposition. The hydrogen appears at the carbon plate, and there it seizes upon the oxygen set free by the oxide of manganese, forming water as already explained. There are several points in connection with the wet Le Clanché cell, that bear very strongly upon the working of the dry cell, and they will probably be more easily understood if explained in

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connection with the wet cell. The working of the cell depends upon several important provisions. In the first place, like the Daniell cell if the current taken from the cell is beyond a certain figure, if it comes away at more than a certain rate, the oxide of manganese is not able to apply oxygen sufficiently fast and the pressure furnished by the cell is then quickly lowered.

But there is a very important saving clause. Any size of cell may be worked beyond its proper current, supposing that the current was taken from the cell continuously, if there are periods of rest between the times when the current is taken. Thus, in the case of mining signals, for instance, though the current

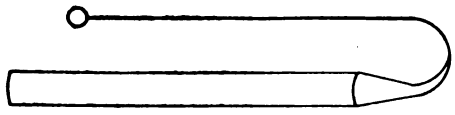


Fig. 8—Zinc rod with copper connecting wire for Le Clanché cell.

required to strike the bells is fairly large, at each signal, the battery has a rest during the time the cage is being hauled to the surface and the oxide of manganese is able to recover itself. The process of recovery has not been thoroughly investigated but it is probable that the surplus hydrogen gas and ammonia gas which is also given off at the carbon plate are able to escape during the period of rest so that the cell again becomes normal, providing the period of rest is sufficiently long. It should be mentioned that the ammonia that the hypothetical metal ammonium splits up in the process of working the battery into ammonia and hydrogen gas, no attempt is made in the Le Clanché cell to neutralize the ammonia gas, it is allowed to escape through the glass vent mentioned above. The quantity of ammonia gas given off apparently is not sufficient to interfere with the working of the battery, providing that the hydrogen is neutralized and also providing that the rate at which the battery is worked, the strength of the current taken from it does not exceed a certain figure. There are, however, certain secondary actions in which the ammonia gas plays an important part, which will be dealt with later. If a Le Clanché battery, and all dry cells, it will be remembered, are Le Clanché cells, is worked at a very high rate, at a higher rate than it was made for, there will be a strong smell of ammonia gas. Everyone knows the smell, and when attending to a battery of this type it is a sure sign that it has been overworked if there is a smell of ammonia gas. Incidentally the writer might mention a cell which he introduced a good many years ago, upon the same lines as the Le Clanché, in which sulphur, crushed to about the size of a pea, was employed, instead of oxide of manganese. The action in that case was the same in the zinc cell but in the carbon cell the hydrogen gas combined with the sulphur forming sulphuretted hydrogen gas, and the ammonia gas came away freely. The great objection to this cell was the very unpleasant smell produced by the sulphuretted hydrogen. Some cells that were tested by a divisional superintendent of the British Post Office, during the time the writer was endeavoring to put it upon the market, revealed this defect in a very striking manner. The battery was left to work a buzzer the whole night the whole apparatus being in the divisional superintendent's office. When the latter arrived in the morning the sulphuretted hydrogen gas was so very much in evidence he could not enter the office until the windows had been opened. The test which the post office man put the battery to was one which that size of battery was not intended to stand, but the result illustrates very forcibly what happens when a battery of this kind is worked at too high a rate. Sulphuretted hydrogen would be formed in the working of the battery under every condition, but when the cells were only furnishing the current for which they were made the gas would be absorbed by the porous carbon contained in the porous cell, and would work back into the liquid, or come away in such small quantities, through the vent tube, as to be quite inappreciable.

(To be continued.)

CARBON IN CYLINDERS.

How to Burn it Out Safely by the Use of Oxygen Gas.

BY M. KEITH DUNHAM.

Burning the carbon out of cylinders by the use of oxygen gas is a system praised by one, condemned by the other. Because it is a chemical, rather than a mechanical process, the mechanic may wholly misunderstand the use of the simple apparatus required, he fails to remove the carbon, and the conclusion immediately drawn is that the system is no good, when as a matter of fact, the process, with good oxygen and correctly done, will destroy the carbon.

Carbon is caused by imperfect combustion. It is present in both the oil and gasoline and is deposited

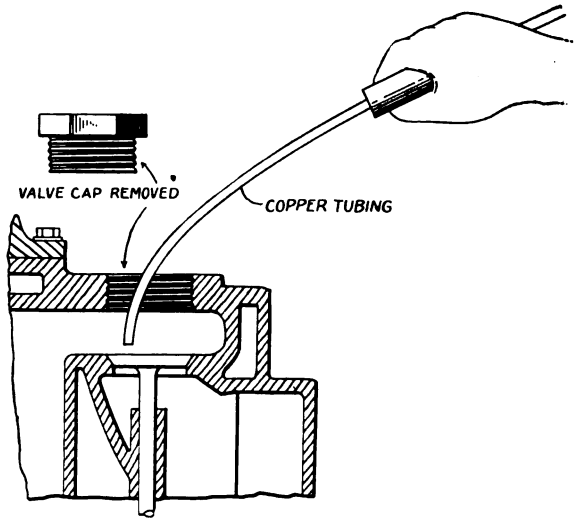


Fig. 1.

on the top of the piston and cylinder head and around the valves solely because the air admitted through the carburetor is insufficient to completely burn the fuel present, which may be some gasoline and some oil. The mechanic usually figures that carbon is caused by "too much oil," but inasmuch as oil will be completely consumed if there is sufficient air, the better explanation is that there has been too little air. Now air consists of practically two elements, 1-5th oxygen and 4-5ths nitrogen and it is the oxygen which supports combustion—that is, which is necessary to burn anything. The nitrogen acts as a dilutent only and its presence always acts as a check—in other words pure oxygen will burn any combustible very quickly and air, being diluted with 4-5th nitrogen, will burn it considerably slower.

Carbon is one of the best combustibles there is

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and with oxygen to feed it, or support combustion, it will burn completely away in the form of a gas, leaving no deposit. The mechanic is undoubtedly familiar with the usual directions sent out with apparatus to shut off the gasoline with the motor running and to have the piston at the top with the valves closed and to then remove the valve caps, light the carbon with a match or taper and the work is done. These directions are all right up to the removal of the valve caps.

Note Figure 1, showing the copper tube inserted through the valve cap opening. The oxygen being under pressure, acts as an injector and sucks in air, the inevitable result being that combustion is retarded or stopped before the carbon is completely

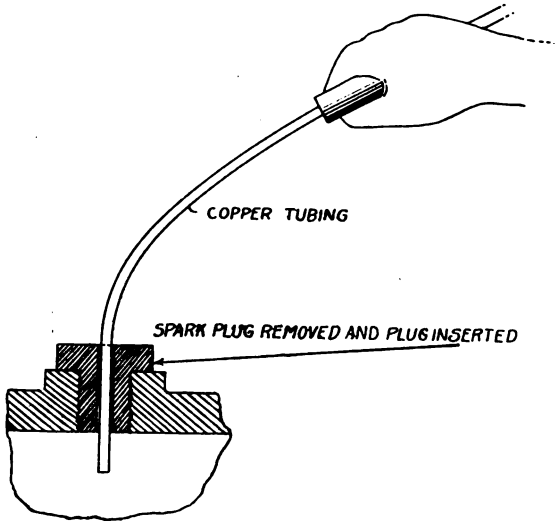


Fig. 2.

burned, because the air acts as a check. To prove better the dilutent effect of the air, take the valve cap and try to burn the carbon on it, while it is lying on the floor. The carbon stops burning almost immediately after it is lighted. Put the valve cap in a deep can, where the air can be more or less driven out by the force of the oxygen and the carbon on the valve cap burns quite freely—not completely, however, since the air can still get to it and dilute the oxygen. Then if the copper tube, carrying the oxygen, can be put into the cylinder with as little air space around it as possible, the results are going to be a lot better, since carbon must burn in an atmosphere of oxygen.

In Figure 2 is shown a screw machine part fitting over the copper tubing loosely and threaded to fit the spark plug opening. After the carbon is lighted, slip this part down the tube and thread it in one or two turns, the idea being of course to keep the air from being sucked in to the cylinder. There must be some escape for the burned gases, however, and if the cylinder has no pet cock to leave open, this screw machine part must fit loosely enough to allow these gases to come away. Carbon may be deposited in sections—that is the top of the piston completely covered and very little on the valves and there might not be enough to burn from one to the other. This can be more or less determined by the appearance of the spark plug. If very dry, squirt about a teaspoonful of oil, kerosene or alcohol in the form of a spray (a cleaning gun will do nicely), into the cylinder to assist the burning. If the spark plug is oily, however, this procedure is wholly unnecessary.

The pressure at which the gas must be used depends of course upon the size of the hole in the copper tubing. This hole should be about ⅛" and the pressure used about five pounds. The tubing is soft copper and should be kept moving around in the compression head to come somewhere near the carbon. Actual contact with the carbon by this tube is not necessary. Keep the pressure down. A high pressure means a rapid burning and is very likely to cause too much heat and consequent damage to the valves or piston. With a low pressure, there isn't the slightest danger of damaging the cylinder.

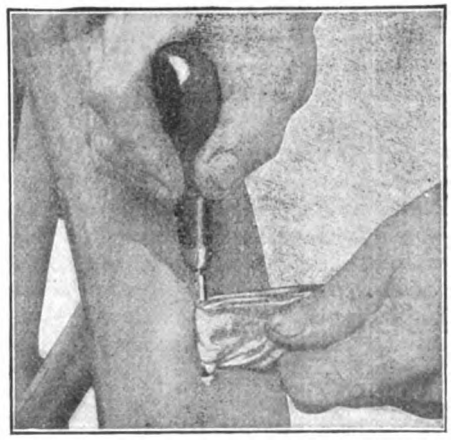
The writer believes some of these ideas are new, he is well aware that they are directly contrary to those advanced by some manufacturers of apparatus but a trial of them calls for no new investment and may place the ill-advised user of a carbon burning outfit on the right road.

TIRE REPAIRS.

Simple Directions for Roadside and Garage Vulcanizing by an Expert.

From C. F. Adamson, Ohio.—When the sudden bumping along the road announces to the alert driver that one of his tires has "gone flat" he immediately throws out the clutch and applies the brakes. He knows that fifty yards of travel on a deflated tire may mean the end of the career of both the shoe and tube, on account of the deadly rim-cutting. This stopping of the car immediately is really the first step in the work of repair. Every foot of unnecessary travel of the deflated tire means just that much more terrific strain and distortion on the tire, and a serious increase of the damage already done.

When tire casings are in good condition, the chances of a blow-out are much smaller than when they are old, and when the flat tire occurs it will



Cleaning Out a Cut With Screwdriver and Rag, Using Gasoline.

probably be in the nature of a puncture. Should there be no extra tubes along, the problem will be one of making a roadside tube repair.

The tube is removed from the tire, and the location of the leak is found. This will be possible by pumping some air into the tube, and either finding the leak by listening for hiss of the escaping air, or if it is very small, by dipping the tube in water, and watching for the bubbles at the point where the air is finding its way through.

When the leak is found, the remaining air should be removed from the tube. If it is a very small leak, the valve will have to be screwed out by inverting

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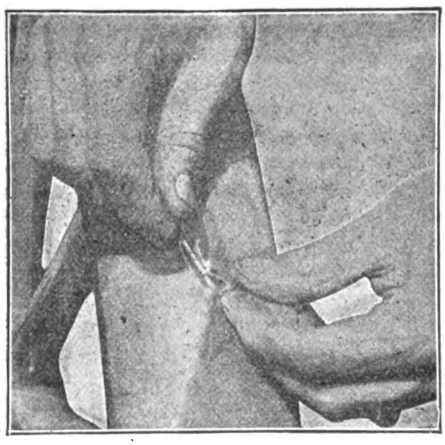
the valve cap, and using it as a screwdriver, or if it is a large leak, the air can be squeezed through the hole. The tube is exhausted of air by rolling it up towards the opening used for the passage of the air, whether it be the valve or the leak itself. After the air is entirely exhausted spread the tube out flat with the leak up.

There are two methods of repairing an inner-tube. Either cement or no-cement patches may be used, or a vulcanized repair may be made by using a small portable vulcanizer. In making repairs with patches, the cement patches are harder to put on, but give better results than the so-called no-cement patches. The tube is prepared in the same way with either patch. With a small piece of emery, or sand paper, the tube is roughened around the cut, and then it is thoroughly cleaned with gasoline. The cement patch is prepared in the same way, first being rubbed with emery, and then cleaned with gasoline. An application of rubber cement is made to the tube and patch, and allowed to dry. Another coating of cement is added to the part to be mended and the patch, and when thoroughly dry a third coating is put on, and when nearly dry, the patch is pressed firmly on the tube, which will be very sticky.

The tube should not be used for about ten or fifteen minutes after the patch has been put on, and during this time a weight should be placed on the patch to hold it firmly in place.

With no-cement patches, the method of procedure is the same, except instead of applying cement to the patch, the tube is cleaned with gasoline, and the especially perpared patch is dipped in gasoline, and applied to the cut.

There are now on the market, vulcanizers which are so small that many car owners carry them on the road and make their repair permanent instead of using the always uncertain patch, which may last only a short time. These portable vulcanizers are



Filling the Cut with Repair Gum.

very easily operated, the exact method depending upon the type that is used, whether gasoline, steam or electric. The two latter types are particularly adapted for garage use, while the former is the type that is carried on the road.

When using one of these vulcanizers, the tube is prepared the same as if cement patches, referred to above, are used, except that vulcanizing rubber is used instead of the cement patches. It requires but fifteen minutes to vulcanize a tube. When the tube has been cleaned, some repair gum, which is supplied with the vulcanizer, is cut to a size to fit the hole in the tube. After the hole has been carefully fitted, a large piece of repair gum is cut to fit over the hole at least one-half inch all round its circumference. The larger piece of rubber is laid over the smaller piece, which has been placed in the hole tube, and the vulcanizer clamped down upon it. The tube is then ready to have the heat applied.

The method of doing this will depend upon the type of vulcanizer that is being used. With the gasoline type referred to a small amount of gasoline is placed in the receptacle and ignited. This will be consumed in from 10 to 15 minutes. After the vul-



Cutting Away the Excess Material After Filling a Cut.

canizing process is completed, the vulcanizer is removed and talc dusted over the point at which the repair was made. It can then be placed in the casings and used.

Long tears and large blowouts in tubes should always be repaired by vulcanizing. If they are very large, it is customary to cut out a section of the tube and put in a new piece. This new piece may be cut from old tubes, and it is good policy, for this reason, to save old tubes for a time when it is necessary to do some work of this nature.

"A Stitch in Time," Etc.

An hour spent in the garage, saves three on the road. An evening spent on the tire when the car is in the garage, will save many dollars during the season, and will save many an unpleasant experience on the road. The first work to be done is the permanent repair of the tubes which have been punctured or hastily patched. Slow leaks should also be located and vulcanized. This is the tube work.

On the shoes, the vulcanizing of cuts and tears and the curing of bruises will be cases to diagnose and heal. Repairing tubes in the garage will be the same as on the road, except that the repair should in every case be vulcanized. There are many owners of cars who rely on the cement or no-cement patch in making these repairs, but they are, without exception, the ones that will be found under the blistering sun, on the road, changing tires. A small vulcanizer can be bought for two or three dollars for use on the road and in the garage, and will have more than paid for itself after a season's use. Tire casings, or shoes, perish in two ways:

First—By the wearing away of the surface until the fabric is worn through.

Second—Through cuts, bruises and breakdown, due to underinflation or other abuses.

The object of the car owner is to have his tire

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wear out in the first mentioned way. The second is poor economy. The first step in maintaining the health of a tire until it dies a natural death is the mending of the small cuts as fast as they appear. This is the biggest tire economy that can be accomplished by the owner, and it actually means dollars in his pockets at the end of the season.

It takes less than 15 minutes to prepare and vulcanize the average cut, and it is perfectly possible for an occasional 15 minutes to add 2,000 miles to the life of a tire. Tire cost on the car is generally three to four cents a mile. In other words you are earning $80 in this 15 minutes' time! The reason that the use of the vulcanizer is so important is perfectly familiar to anyone who has had experience with tires. It is the source of the greatest wonder to tire repairers themselves that people do not seem to realize the amount of money that is lost each year for failure to keep water out of the cuts in tires. The water goes into the fabric and ruins it in a remarkably short time. Sand works its way in and in a short time forms the much dreaded sand blister below the tread. When the tire is badly gone, the owner commences to think of having a section put in, that is having the bad part of the tire come out and a new piece put in. This is expensive, and it is always doubtful whether a tire repaired in this way will last long.

A small vulcanizer will do wonders with minor cuts. It does the work better than it can be done with plastic material, because it closes the hole or seals the hole, instead of merely filling it. Plastic material is gouged out after a time, or it deteriorates, while the vulcanized cut leaves the rubber in about the same condition as before it was cut, if the



Cleaning the Shoe With Gasoline and Cloth.

work is done correctly. The method of procedure is as follows:

Jack up the wheel with the tire inflated. Sit on a stool in front of the tire with the light coming over your shoulder, and have within reach the following: Thin bladed pocket knife; small screwdriver; small bottle of gasoline; roll of repair gum; small pair of scissors; some waste and soft cloth.

Revolve the wheel slowly, the top coming toward you, closely examine the surface of the tire for cuts. If the tire is dirty, wash the surface with soap and water, and dry it off with a piece of dry waste. When you come to a mark which has the appearance of being a cut, take the knife and carefully probe it. Very often you will find beneath the surface of the tire a small piece of glass, a piece of metal, or a sharp stone. Remove the offending article and scrape around the cut until there is clean rubber or fabric throughout the entire injury. This will give a good surface for the repair gum to take hold. After the roughening process is completed, a piece of raw rubber, which comes with the vulcanizer, or which can be secured from any auto supply dealer,



Gasoline Vulcanizer Applied to Inflated Tire.

is fitted into the cut. If it is a long cut that has taken off a considerable portion of the tread, a piece of repair gum is cut to the same shape as the piece torn off, or, if it is a cut merely to be filled, a small piece of repair gum is inserted in the cut. In the case of a cut or tear in the tread, the rubber is cut away from the damage portion in a rectangular shape, and a new piece of rubber is cut approximately to size and then pressed into place. The excess rubber is then cut away. If the cut is deep, two, and sometimes three, layers of rubber must be placed on top of the other, to bring the rubber up to the level of the surrounding tread.

The vulcanizer is applied to the damaged spot by means of clamps. On a very shallow cut, the vulcanization can be accomplished as quickly as 10 minutes. On deeper cuts, where there are two or three layers of rubber to penetrate, it will take about 15 minutes. The average time required for vulcanizing a cut will be from 12 to 15 minutes, from the time the vulcanizer is ignited to the time of removing it from the tire, when a vulcanizer of gasoline type is being used.

For the owner who does not care to do his own vulcanizing, it will be cheaper in the end for him to have small vulcanizing jobs done as they present themselves, rather than wait for the shoe to blow-out before anything is done toward the sealing of the cuts. If the cuts are allowed to go too far, it will mean that the shoe will either have to be replaced at the price of a new one, or an extensive repair will have to be made, with the usual doubtful results as regards economy.

"Under deflation and overloading are first cousins." The effect on the tire are similar, but the cure for the trouble is a higher pressure in the first case, and oversize tires in the second. It is not feasible to attempt to meet an overload by increasing the pressure in the tire. An overload for a given size tire can soon be met by putting on a larger size. Proper inflation is necessary at all times, but the user of the car must know that the

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tires are capable of economically handling the load placed upon them in regular service. The tire manufactureers agree very closely on the amount of weight to be put on each size tire. They are also practically agreed on the inflation pressure, and a study of the tables published by them will show the proper inflation for any given size tire.

It is well recognized that an ounce of prevention is worth a pound of cure. Whether it be vulcanized cure or otherwise, it may be well to mention a few points of material benefit in lengthening life of a shoe: Keep spare tire protected from direct action of the sun. Heat and light deteriorate rubber rapidly, therefore, keep tires in a cool, dark place. Do not run along in ruts, car tracks, against curbs, or cross intersected pieces of car track. Apply the brakes as easily as possible, start gradually, run at moderate speed on hot days, turn corners slowly, and always keep the eye open for broken bottles, or any other tire destroying objects along the road. Either in a public or private garage, insist upon having the floor upon which your car is standing free from grease or oil.

Best for Carbonized Cylinders.

The method of cleaning cylinders by oxy-acetylene flames is gaining headway all over the country and there is no objection to it. Its temperature is less than that of the combustion of the gasoline in the operating motor and by the use of the flame, scraping by hand is done away with, which not infrequently caused the surfaces to be scratched. The work is quickly done by any expert garage man and does not call for removing cylinders or cylinder heads.

HELPFUL KINKS.

Simple Methods of Doing Certain Repairs Easily and at Little Cost.

From J. N. Bagley, Nebraska.—Hardly a day passes but some simple way may be found to do a hard thing, and if we make notes of it they will prove of value at some future time. To make a good repairman one must have inventive ideas and be a jack-at-all-trades, so to speak. For a good many years the writer was engaged in the gunsmithing business and it seemed that every little device that needed repairing was brought to him. Just why this was so I could not understand, but they were always turned out in working condition, and they came as long as I continued in the business.

When one sets out to do the repairing of all the little things that come to the shop he must be a handy man in order to handle it. The successful man in this line is the man who can figure out the how and why and get the parts to working in harmony. Many times one cannot take the time to order repairs from the factory and must make the little parts needed, such as springs, nuts, bolts, etc.

There are a number of parts about machines that are put together with hot rivets and to do this well is no easy job. A hot rivet will not work loose as a rivet placed cold, therefore it is much more satisfactory in many places. Take the auto frame, for instance. If these frames are bolted together they would shake apart in a very short time, and not stand the strain they are subjected to. To do a job of hot riveting we should have a tool shown at A, in Fig. 1. This tool is made from steel and the end drawn down and sunk as shown in section on the end at B. This permits of a head being formed on both sides of the rivet, and if the work is done well it will be hard to tell which side was the original head of the rivet.

At C we have two plates to be put together with hot rivets. At D the rivet has just been placed at almost a white heat and the tool, A, placed in position. Now, by striking A with a heavy hammer the rivet takes the position as shown at E, and also spreads out in the hole until it fits perfectly in the hole of the plates, C. Now by a few quick hard blows on the tool, A, the rivet assumes the shape shown at F, making both sides look the same. The rivet should be long enough to make a neat round head and should not be so long that the rivet would bend instead of forming into a perfect head.

Another very annoying thing is a nut that is con-

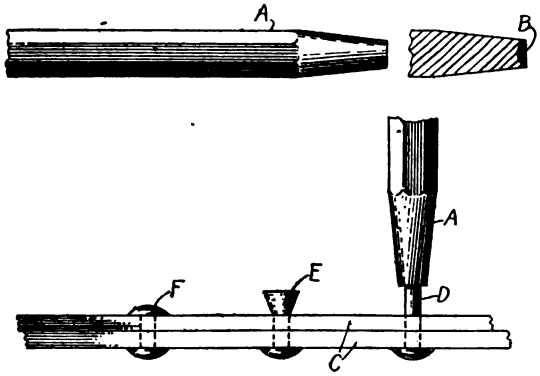


Fig. 1.

tinually working loose and playing havoc with some delicate adjustment that takes much time to remedy. There are many locking nut devices on the market and some of them are very efficient, but these are not always at hand and some other means must be used to bring about the results. A kink that I have found to be very successful is shown in Fig. 2. At A we have a nut which works loose quite easily. To prevent this we saw into the nut about half way through as shown at B. Now we place the nut and make the desired adjustment and take the punch and set it on the nut as shown at C, and strike the punch a sharp blow. This closes the top half and

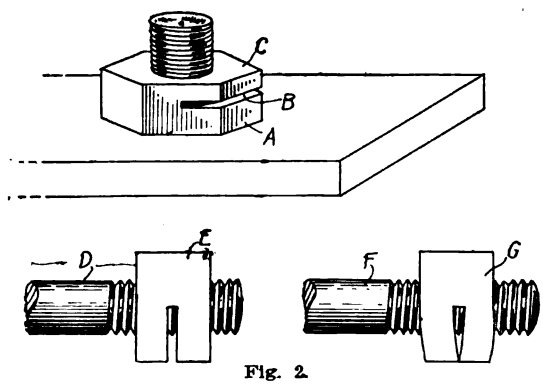


Fig. 2.

causes the threads to bind sufficiently to prevent the nut working loose. At D we have the nut in position on the bolt, but the nut, E, is not closed. At bolt, F, we have the nut, G, closed, and note the side of it as it locks the threads, so to speak. This does not prevent the nut being removed at will. In case the nut is removed it should be locked again when being replaced as already described. I have used

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this method of locking many times in places hard to get at and hard to keep from working loose and have found it to be very satisfactory. In case, after many operations, the nut cracks at the opening and closing it is but necessary to saw a slot in a new nut with the hack saw and place it as already described. This method comes quite handy about threshing machines, harvesters, and the like.

Still another simple and handy device for the

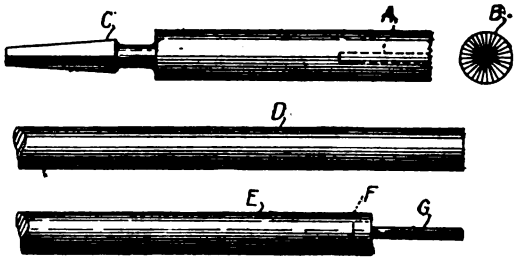


Fig. 3.

manufacture of small screws in an emergency is shown in Fig. 3. This consists of a steel rod with one end fitted for a brace, as shown at C, and the other end with a hole drilled into it as shown at A. The end of the tool has teeth arranged in such a manner that when the tool is turned to the right the metal from the rod will be cut away and the part not cut will run into the hole, A. The cutting edges, B, should be hardened and tempered in the usual manner. At D we have the rod of which we intend making the screw rolled at the end to allow of the tool being started more easily. At E we have the same rod with the exception that the tool has been worked on, forming the screw ready to thread. After threading, G, with the thread desired the

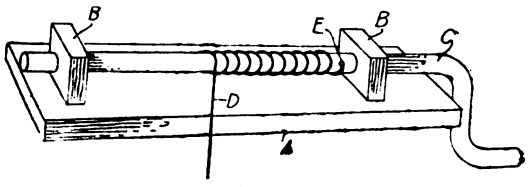


Fig. 4.

screw is sawed off at F and a slot sawed to permit of the screwdriver being admitted.

A number of tools of this kind can be made and placed in the tool box and will be found very handy, especially if no lathe is at hand. Of course it does not come up to the modern screw machines but will answer the purpose in a case of emergency, and we have many such cases from time to time.

Another small tool that any one can make is shown in Fig. 4. This is a small hand spring winder which can be made by any one in a few minutes. Very often a small spring is wanted for some particular purpose and if one were to carry an assortment of springs to meet the needs of all repair jobs it would take a truck to haul them. With a small spring winder and a few sizes of music wire it is possible to make many sizes and kinds of springs to meet the demands. We have at A a small piece of wood to which is fastened to it blocks, B, with holes in them to admit of the crank-shaped rod to be passed through them. The crank rod, C, can be made from different size rods, depending on the size of the spring wanted. Each rod should have a hole as shown at E to permit of the wire being held at one end while winding the spring. Now by revolving the crank rod, C, in the direction wanted and holding the coil of wire, D, tight, the spring will be formed as the crank, C, is rotated. As soon as the spring is wound the length wanted a file can be used to file the spring at hole, E, and rod drawn out leaving the spring ready to be formed for the job to which it is to be applied. This comes very handy in repairing smaller machines such as typewriters, guns, sewing machines, etc. The music wire can be purchased in rolls ranging from ¼ to 1 pound, and is not expensive. It needs no tempering after winding as it is given the necessary temper before being rolled and placed on the market. In case this wire is to be subjected to the weather it should be well oiled as it will rust quite easily.

In Fig. 5 we have a simple tool, yet quite useful and easily made from wire. Of course these tools can be purchased very reasonably, but many times it is not the price that hinders but the having them when wanted. The tool is a caliper made from about No. 9 wire. The ends from F to the ends are flattened and shaped up smooth, while the remaining

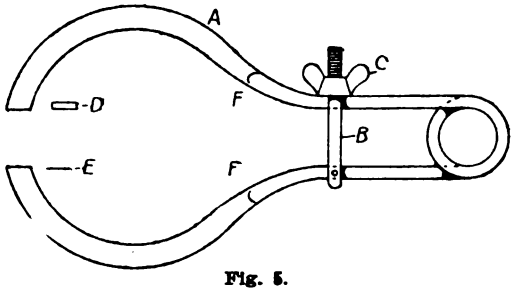


Fig. 5.

part of it is round. After forming it as shown the adjusting device is made of wire. It consists of a wire with one-half of the round filed away and the two sides placed together and threaded to take a wing nut, C. The bottom of the part, B, should be drilled for a small pin. By adjusting the nut, C, the jaws are opened and close as little or much as the user desires. The jaws, A, can be shaped at the ends to meet requirements as at D or E. D is the ordinary jaw for common work, and by making them both sharp-edged like a knife we can use them for a thread gauge, getting the bottom diameter of the threaded bolt. In case the caliper is wanted for some particular shape for a special job one will have to shape the jaws to have the tool to meet requirements. In case the work to be done is to be un-

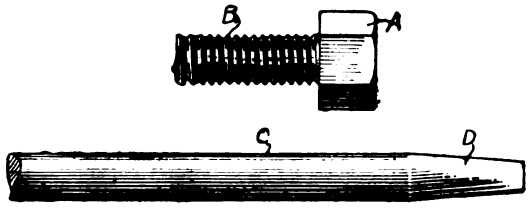


Fig. 6.

usually accurate the tool would probably spring until accurate measurements could not be taken unless it was made of heavy material.

One of the most annoying things that a repairman can be called to look after is a stuffing nut that some one has screwed down so hard that the threads are injured and it cannot be made to hold. I have found so many of them that I have devised a way to take care of them until a new one could be ordered, and many times these nuts will last for a long time. We have at A, in Fig. 6, a nut with threads B, worn or rolled down until when screw-

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ing onto the packing it will jump back and refuse to tighten. To overcome this I made a small mandrel C, with the end D, slightly tapering. Now I placed the nut on the anvil with the end A downward, and placed the mandrel C, taper end into the nut and forced it into the nut with a hammer. This expanded the lower or threaded end of the nut sufficiently to make it hold its thread from the very start and the packing could be held just as firm as with the new nut. I have made repairs of this kind when machinery was shut down and the owner was lamenting over the fact that he would have to shut down until a new one could be ordered.

A simple device for lining down the center of a shaft or pipe is shown at D, in Fig. 7. The bar B, has a slot cut into it to slide through the locking nut C, which allows for the adjustment to fit the different sized rods or pipes. Now by placing the

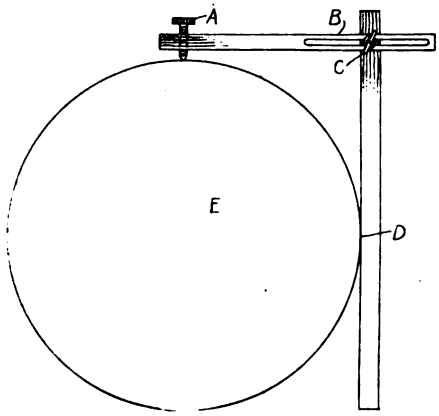


Fig. 7.

device over the shaft in such a manner that the scribe A, will be at center, and slide the instrument down the entire length of the shaft E, the center will be marked for drill holes or cutting a series of key seats, etc. In case the key seat is to be laid out with the width, it will be necessary to set the instrument and make two runs with it, leaving the space as desired for the width of the seat.

THE AUTOMOBILE ROUND TABLE.

Lubrication, Second-Hand Cars, Tires and Selling By Mail.

From G. D. Crain, Jr., Kentucky.—Most automobiles are so economical in the consumption of oil that it will pay the motorist to be a little extravagant along that line, in connection with frequent changes and replenishment.

Many an owner keeps filling up his crank-case with fresh oil, never stopping to think that the dirt and the residue from all that has been used before have not been eliminated, and that his oiling system is not going to give satisfaction in that condition.

Not long ago an automobile was brought into a garage because of engine trouble. The cause was located in a clogged oil strainer, dirt and other foreign matter having accumulated to such an extent as to make the circulation of oil very inadequate. It was a wonder that the car was running at all, and as it was the owner was lucky not to have injured his engine.

After the oil was drained out and the case cleaned, and fresh, clean oil substituted, the engine ran splendidly. All that had been needed was a fair chance to work properly, and this the automobile had not received.

Don't be so chary of wasting oil by draining it out of the case that you will interfere with the efficiency of your car by not having the oiling system working properly.

Selling Second-Hand Cars.

One of the best ways to sell used cars, in the event that the automobile concern is big enough to justify this plan, is to have one man completely in charge of this department. The idea is that his work is to be concentrated on second-hand machines, and therefore he is not expected to attempt to sell new cars; on the other hand, he is even to compete for sales with them, and to get business for second-hand automobiles instead of new ones, if he can convince the customer that it is to his interest to buy the used car. This creates a strictly competitive condition between the salesmen who are handling new cars and the man who is exclusively employed to sell old ones, and makes for better work all around.

Another phase of the question is that the salesman who doesn't have to blow hot and cold, and argue first in favor of one car and then for another, is able to do his work better. The man who is selling new cars—on which the main effort of the automobile company is obviously being expended—cannot usually work up much enthusiasm over an old machine of another make. He will be a "bear" as far as it is concerned, and will be inclined to regard it as a rather undesirable proposition. Prospects for the sale of such cars will not impress him nearly so favorably as if they were in the market for new cars.

On the other hand, the salesman whose sole job is to convert old machines into cash isn't worrying about whether the company sells a single new car or not. He is not interested in them, at all. He studies his stock, puts it into the best possible condition, and by working with the cars and driving them he becomes just as enthusiastic as though he were selling machines fresh from the factory. He can talk more convincingly than the other type of salesman, because he is sincere in what he says about the merits of what he is offering.

This plan of dividing the work along this line has been used by a number of successful automobile concerns, and because it is based on common sense it is bringing unusually good results.

Tire Service Stunts.

It is wonderful how far competition will drive members of any trade, in creating service which they are willing to offer their customers.

Tires have been the subject of more competition in connection with automobile supplies than any other item, and consequently tire dealers will go further to give service than business men in any other line that can be named. Here is the development of the service situation in one typical city:

First, the dealers offered to send out a man to change tires for the customer, at a charge of 60 cents an hour, this including the time consumed on the road. Second, this plan was extended so as to give free service to customers who were using the tires principally dealt in by the concern furnishing the service. The old charge was continued for tires of other makes. Third, the free service feature was extended to cover every kind and variety of tires. You can now get tire changes in that city from any

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one of several dealers without any expense, no matter what tires you have on your car.

The service has also been extended as to the territorial limits. At first the dealers agreed to send their machines as far as 10 miles from their stores, which meant about five miles into the country. Now they will give service anywhere within a radius of twenty-five miles, and one dealer, particularly anxious for business, has agreed to send anywhere the customer wants him to come, no matter how far, and no matter how little business there is in it for him!

One of the dealers in the city referred to has figured the cost of handling this business, and finds that it costs him 13 cents to make a run. If he gets only a tube repair, the profit on this operation will just about enable him to break even on the service. If a tube is purchased, or a case required, or a blowout requires a vulcanizing operation, then there will be a little money in it. But it is easy to see that competition along service lines is making the margin of profit rather slim for the members of the tire trade.

Can Business Be Forced?

The extreme efforts of tire dealers to hold business by giving unusual service were referred to above. Now and then, however, one finds an automobile concern going to the other extreme and trying to force people to patronize it, by withholding service.

For example, a certain automobile dealer, who has the agency for an unusually popular car, lost his grip on his trade by failing to run his garage in a business-like way. Customers could not get attention, repairs were not promptly made, and the dealer ultimately found that his whole business had been undermined. He could not get the repair business on the cars he had already sold, and was thus deprived of the revenue involved in this way. With sales of new cars falling off, he needed the other business badly.

He wrote letters to old customers, asking them to come back, and promising better service, and when they did not return in number, he adopted the plan of refusing to furnish parts to other repairmen who had work to do on cars which he had sold. Thus far this plan has not worked any better than the other, and about the only result which one can be sure of is that people are not going to buy any more cars of the first dealer, if they know his attitude on the subject of supplying parts.

Novelty Advertising.

Dealers in automobile supplies, especially if they are just starting in the business or have changed their locations, often need to attract the attention of the motorists of their community, and to get them to the store. Once an owner has formed the habit of coming in, and has familiarized himself with the location of the place, his business is almost assured, assuming that the store is not inconveniently located.

Hence offering a novelty of some kind to get the autoists to come in is often good business. A concern recently sent out a circular letter to a large list of owners, describing its stock and service, and offering to supply each of those receiving the letter with a tube bag, free, if the card which was enclosed was presented during the current month. The returns from this stunt were good, and inasmuch as a great many new customers were brought in through this medium, the dealer felt that the expenditure for the bags was well worth while.

Another good way to get customers started to buying is by offering special values on certain items from time to time. Cutting prices is not a good policy, as a permanent proposition, but it undoubtedly attracts attention. One big supply store constantly has goods which are in regular demand shown in its windows at reduced prices, and these attractive items have the effect of getting a great many motorists to come in and see other goods which may be sold at the normal margin of profit.

Selling by Mail.

So many automobiles are owned in the country that there is a good opportunity for the dealer to do business with their owners through the medium of the parcel post. A number of automobile supply dealers have built up a productive mailing-list of owners in the country within a reasonable radius of their stores, and by advertising in local newspapers, sending out circular letters, etc., they are able to get constant returns in the way of orders for specific items of goods. It is a big convenience to the country owner to get supplies that he needs in this way, especially from a nearby dealer; and the concern which covers its own local territory for mail-order business will capture a great deal of it that otherwise would go to the big houses hundreds of miles away.

A FEW REPAIR KINKS.

To Drill Special Holes, Holding the Drill and Pulverizing Glass.

From N. G. Near, New York.—Most automobile owners who do their own repairing own a breast drill and a few of the standard sizes of drills, which suffices for most work. But, when they want to drill a special size hole they are "up against it."

There are two ways to drill a hole of odd size,



Fig. 1.

either with a standard drill or by means of a home-made drill forged from drill rod. With a standard drill, simply grind the point over a little (off center) as indicated in the drawing, Fig. 1. The size of hole will then be approximately like A-A. Of course, a standard drill cannot be made to drill a hole smaller than itself without grinding down the

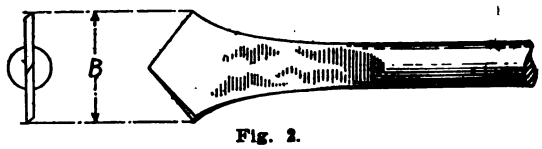


Fig. 2.

drill, which would be a foolish and expensive process.

The other way is to forge drill rod to the shape indicated in Fig. 2, with distance B, equal to the diameter of the hole to be drilled. Grind accurately so that the point of the drill will come exactly in the middle, and as for cutting angles, the best way to get them right is to follow the cutting edges on the standard drills. Make the angles just the same. Heat to a cherry red and harden. Draw the temper to a straw color, or slightly softer, and the drill is

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complete. Judgment, of course, must be added in both cases.

Sometimes it is desirable to enlarge the bottom of a hole for purposes of anchoring solidly. Fig. 3 shows how this can be done very easily with the

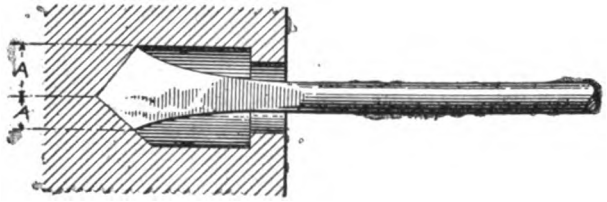


Fig. 3.

same drill that was used to start the hole. Simply grind the forged drill "off center," as at A-A, just as the standard drill, Fig. 1, was ground. The diameter of the enlarged part will then be as shown. The finished diameter can be computed to a nicety



Fig. 4.

beforehand, before the drill is even started, as is obvious from observance of the sketch.

How to Hold a Small Drill.

I show herewith my scheme for holding a small drill in a common brace-and-bit chuck. Saw two slits, C and D, at right angles in a 3/16 inch rod E, of

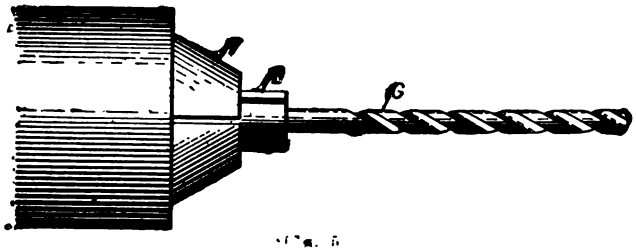


Fig. 5.

suitable length which has first been turned down in "steps" as shown in Fig. 4. Then insert the split piece E, in the chuck F, at the suitable holding point, insert the drill G, and clamp, Fig. 5. Care must be

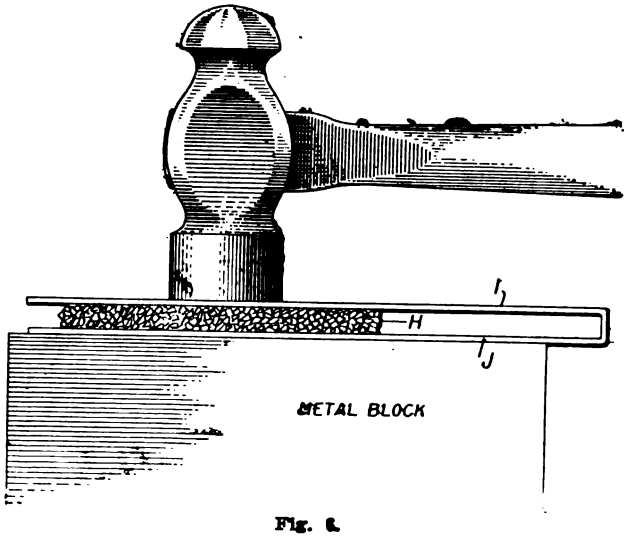


Fig. 6.

exercised in sawing to center the drill as closely as possible.

Pulverized Glass for Valve Grinding.

It may not be very well known among automobile men that pulverized glass is an excellent material for valve grinding. The trick is, how to pulverize the glass in safety. The best scheme I know for pulverizing in safety is shown in Fig. 6. Place the glass H, between two pieces of sheet tin, I and J, or other light sheet metal, and hammer on top as shown. There will be no danger of getting glass particles in the eyes or face.

REPAIR HINTS.

Something About Worn Engine and Other Automobile Bearings.

A car that has been two years or more in use often requires some repairs. The engine being the most important part of the car, it is advisable to give it attention first. The eliminating of any slackness in the bearings is not at all a difficult job, but at the same time it needs to be done carefully.

Only one special tool is needed for the job, that being a scraper for the bearings. It is usually made out of an old half-round file, forged in the form shown in Fig. 1. Grind the face, A, flat, or better still, grind it hollow to within 1/8 inch of the edges, BB, after the style of a hollow-ground razor. The end with the cutting edges is hardened, and is then finished off on an oilstone. These scrapers can be purchased at any shop stocking engineers' tools. If it is only intended to take up slackness in the big-end bearings it will not be found necessary to remove the engine from the chassis, assuming there is an inspection pit in the garage, or that there is no objection to lying under the car.

Dismantling.

First remove the radiator, and all connections to the cylinders. Lift the cylinders off and remove the crankcase bottom, taking care to drain the oil from the latter before taking it down. If the main bearings are to be taken up also it will be necessary to remove the remaining part of the engine from the chassis and to take off the flywheel. Before completely dismantling see that all the timing wheels are marked, and such other parts you may not be sure about when it comes to reassembling. If it has not already been done, mark the connecting rods so that each may be fitted to its original journal, and in the same position. Also mark the bearing brasses in the connecting rod ends, the gudgeon pins and the pistons.

The Journals.

Examine the crankshaft journals. Sometimes they will have worn a little rough and require polishing. If not in a bad condition obtain a long piece of smooth emery cloth about an inch wide. Give it one complete turn round the journal, and impart a steady movement backwards and forwards, applying a little oil. This will soon remove any slight uneven wear on the surface. Sometimes the journals will have worn oval a little. The best treatment is grinding. In case this cannot be done, remove the worst of the oval formation with a dead smooth file, testing it frequently with calipers. Then finish off with emery cloth.

The Bearings.

Begin on the main bearings. The greater part of the wear will obviously be on the lower half. It will therefore be necessary to raise this to bring the crankshaft to its original position. Remove both brasses and file the flat faces until they fit the journal a little tight when clamped around it. It is im-

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portant that this should be done properly and evenly. Be very careful not to remove too much metal.

If the brasses are now replaced in their original position they will be slack as regards the outside diameter. To compensate for this condition the bottom brass must be packed at the back with brass foil. The latter can be obtained in various thicknesses. For our requirements 4-1000ths of an inch is most useful; cut a piece the full length of the brass between the flanges, but only wide enough to cover about three parts of the circumferential surface. This can be laid at the back of the brass, but it is best soldered, at least along one edge to prevent it moving.

Replace the brasses, and screw down the cap without the crankshaft being in position. Try to move



Fig. 1.

or turn them. If they are still loose, more packing must be added, but at the back of the other half. Before screwing down the cap tightly measure the inside diameter with calipers. Now screw down firmly, and see if there is any perceptible decrease in the diameter. If there is, the packing is too thick, and should be reduced with a file or replaced by something thinner. It may be possible to take a little more off the flat faces, providing it does not require too much scraping out to fit the journal. Take the case of a connecting-rod bearing, Fig. 2. When the bolts are drawn up tight the faces of the brasses, C, and those of the connecting rod and caps, D, should be close together, so that nothing could be passed between them. At the same time the brasses must not be pinched at EF.

Bedding In.

Now proceed to bed the crankshaft into its bearings. Probably there are three, and it is of the utmost importance that they should be on the same level. The brass should be forced down until its back is well in place. This can be tested by smearing the casing with marking composition. The latter is made of either red lead, or lamp black and oil, mixed to the consistency of a thick paste. It should only be applied very slightly. When the brass is forced down it is marked where it touches. The high places are removed until it is marked evenly all over.

Smear the crankshaft lightly with the marking, place it in its bearings and revolve it several times. On being removed again the bearings will be marked in several places where the journals have touched. Remove a little of the metal with the scraper where it is most heavily marked. Use the scraper with a light circular motion in the direction of the curve of the surface, as indicated by arrows in Fig. 3. Continue the process until an even bearing surface has been obtained on each brass. The journal must touch every part of the bearing evenly, not merely at the bottom. This operation will probably take some hours, or even a day to complete, so do not get impatient if it is found tedious. The better the surface the longer the subsequent life of the bearing.

Having completed the work so far, now proceed with the other half of the bearing. It will be obvious that the crankshaft is first fitted into the top half of its bearings. The top half of the crankcase is inverted for fitting main bearings. Take one bearing at a time. Bolt the other half of the bearing down until it is just possible to turn the crankshaft. Revolve the latter several times, having first smeared it with marking. Remove the half-bearing and scrape the high places, i. e., those most heavily marked. Continue the process until the crankshaft can be turned freely—at the same time marking the bearing evenly all over—when the bolts are pulled up as tightly as possible. There must not be the least slackness, and a very good bearing surface must be obtained. This half has the greatest amount of wear when the engine is running. Scrape all the bearings, clean them thoroughly, and smear with clean engine oil before bolting them up finally. The crankshaft should have just an inclination to "stick" if the work has been properly carried out.

Big-End Bearings.

To fit the connecting rod big-ends, proceed precisely as with the main bearings. File the faces of the brasses and pack the backs. If very little packing is necessary only use it at the back of the brass in the connecting rod, and none in the cap. Referring to Fig. 2, it is exceedingly bad practice to file the machined faces, B, of the rod itself.

Bolt the rod and its brasses together before trying it on the crankshaft, to see there is no slackness or that the bearing is not deformed when the faces,

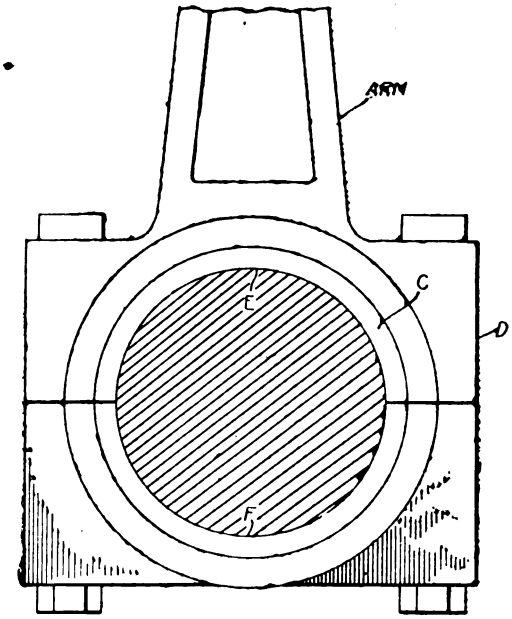


Fig. 2.

D, are drawn close together. Being satisfied on this point, now try the connecting rod on the crankshaft, having first smeared the journal with marking. Tighten the bolts up until it is just possible to turn the rod on its journal. Scrape the high places as before and continue the process until a good bearing surface is obtained. When finished, it should be possible to draw the bolts up quite tight without any tendency to grip the crankshaft. As a final test, clean the bearing and journal and assemble it, having lubricated it with engine oil. Place the connecting rod on its top dead center. With perfect fitting it should just fall over by its own weight.

Before assembling the engine examine the small-

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end bushes and gudgeon pins. If the latter are at all slack they will cause a knock when the engine is running. It is possible to obtain from the makers of most cars gudgeon pins which are over standard size. If new ones are obtained and found a little too large the bush will need scraping out until the new pin fits properly.

The Valves.

As a rule with second-hand cars the valves are found much worn and grooved. No trouble is taken to turn the faces down true before grinding in. If the grooves are removed with a very smooth file while the valve is revolved in a lathe, a very satisfactory surface can be obtained. With a little care

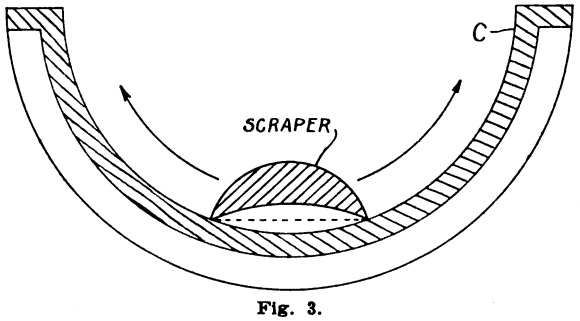


Fig. 3.

a valve can be filed up fairly true in the vise. It is very seldom indeed that the valve seats in the cylinders need trimming. Many repairers are very fond of cutting the seating, much to the detriment of them.

When grinding in valves remember that the smallest leak quickly increases and lessens the compression in the cylinder. Use very fine emery powder, with a good supply of oil for grinding. Get an even surface all round the valve and the full width of the seating, not merely on the top or bottom edge. Finish off with scarcely any emery powder in the oil. Some of the grinding compositions sold are very satisfactory, but should be used sparingly and with plenty of oil. Before finally replacing the valves thoroughly clean off all traces of emery and oil with a paraffin rag. Especially give attention to the valve guides, or excessive wear will take place.

Assembling.

When assembling the engine be very careful that all parts are clean and free from grit and dirty oil. The piston rings must have their split ends spaced equally apart to prevent leakage and loss of compression. It is advisable to remove the rings and clean off the carbon in the grooves. This will ensure the rings being in contact with the cylinder walls all round. Examine all the inlet, exhaust and water joints, and renew where necessary. Special care should be taken with regard to the induction pipe joints. Any leakage past these will make it difficult to start up the engine. Examine all bolts and nuts to see if the threads are in good condition. When replacing these pull them up tightly, and put in split pins where needed.

Carburetor and Magneto.

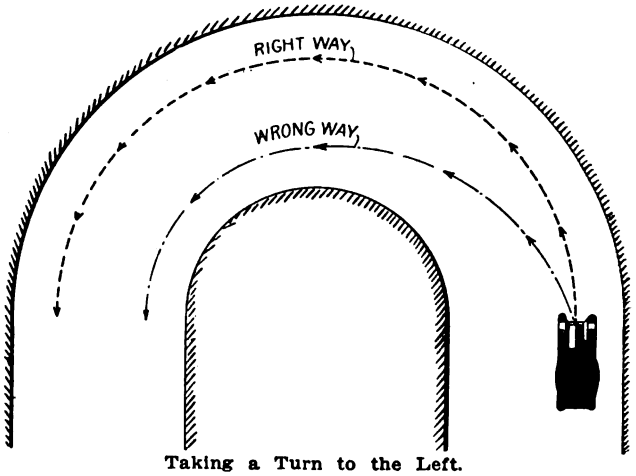
Take the carburetor apart and clean it out thoroughly. Grit will invariably be found in the float chamber. Examine the float for leaks. By shaking it one can hear if any gasoline is inside. To find the leaking place, hold the float under boiling water and air bubbles will rise. The faulty place must be carefully and very lightly soldered.

The magneto is generally considered a sort of delicate mystery, but it is quite simple for an amateur to take it apart. All parts should be cleaned and the contacts also. It will make a difference to the running of the engine. The contacts should be adjusted to the gauge attached to the spanner supplied by the makers. If too wide apart, the engine will be difficult to start. See that the magneto is replaced to its original marking to get the setting correct. It is quite likely the engine will be difficult to start for the first time. A very little gasoline injected in the cylinders before replacing the plug will assist. If the instructions given are carefully followed the owner will be greatly pleased with the improvement in the running of the engine.

ROAD RULES.

More Accidents Due to Wilful Neglect than from Ignorance.

The roads of New Hampshire are as crooked as the proverbial "ram's horn." They must necessarily be so to avoid as much as possible the hills and valleys that give the "Granite State" its just claim for rare scenic beauty. But in a recent somewhat extended automobile tour there the writer could not fail to note the utter lack of compliance with the ordinary and rational rule of sounding the signal when approaching a sharp turn in the road. Again and again approaching automobiles appeared around sharp turns in narrow roadways without having given the slightest warning of such approach, and frequently the passing was made only by the quickest possible action upon the steering wheel. Unfortunately, the heedless if not criminal driver who ignores the rule of the road is less



Taking a Turn to the Left.

liable to suffer than the one who acts upon it. Hearing the signal, he can keep to his own side of the road, but the one who gives it may not have any such impulse.

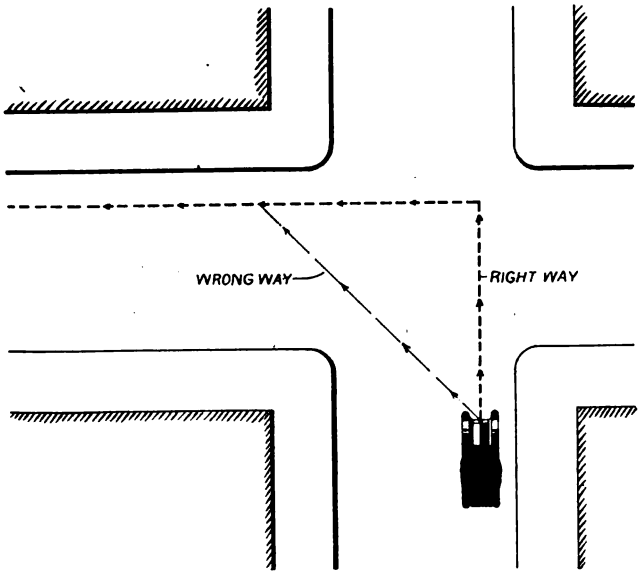
Road driving rules are not complicated or difficult, and more trouble is made in a day from wilfully violating them than in a month from ignorance of them.

Those who are familiar with city traffic regulations and apply them as well on country roads, will not be likely to encounter difficulties. The burning of at least three lamps, including two head or side and one tail lamp, is enforced from sun-down to sun-up in practically every state. In many cities the headlights are not allowed to glare and most cars are now fitted with a dimmer.

The driver of a car should be careful to observe

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the rules of the road, for in case of accident, damages cannot be collected if he can prove that he followed these rules. Throughout the United States, the invariable rule is to keep to the right; in England it is the opposite. In passing a slower moving vehicle going in the same direction, swing out to the left. It is a courtesy, and in some localities even a law, that one traveler shall not hold the road to the same exclusion of other travelers, but shall turn whenever possible, to permit the vehicle following him to pass. Many accidents are caused by vehicles crossing in front of others. The rule is that one who attempts to pass another on the highway going in the same direction has the right to do so in such manner as may be most convenient under the circumstances, and where damage results to the person passed, the former must answer for it, unless the latter, by his own carelessness, brought the disaster on himself. The same rule is applicable in



The Wrong Way is the Usual Way.

passing a standing vehicle approached from the rear.

In many of the larger cities, as in New York and Chicago, all north and southbound traffic is given the right-of-way over traffic moving east and west. The rule does not exist in smaller communities nor outside of city limits.

A little diplomacy and good nature are invariably advisable, and if every motorist would show the drivers of horse vehicles a little more courtesy, it would bear fruit and horse drivers would be more willing to give a fair share of the road.

Go slow at turns in the road and thus avoid a collision with the vehicle that may be coming toward you. Go slow at cross roads also, for another car may be coming across at the same instant. Take bridges, embankments and narrow roads at a slow pace, keeping the car under instant control. Bridges in the country are apt to be shaky, and it is dangerous to cross them at speed, besides being against the law.

Slow down when a horse ahead shows signs of fright, and if necessary stop the motor. There are laws in some states compelling an automobile to come to a stop as soon as the driver of a horse-drawn vehicle holds up his hand, and there is no reason for the motorist not to obey it.

Raise the right hand when about to make a stop or turn, as a warning of your intention, to vehicles in the rear. Always regard this signal when it is made by the man in front. Another signal that is coming into use is the raising of the left hand with two fingers extended, as a warning to cars coming that they will find a police trap.

Do not follow a car too closely, for it may stop without warning. When a car comes up from behind, and shows signs of desiring to pass, give it fully half the road by swinging to the right.

Drive slowly through the towns and villages, and when passing schools, churches, bicyclists or pedestrians. Stop when there is an accident, whether it is your fault or not. Render all the assistance possible, and as a safeguard get the names and addresses of the witnesses.

Excessive sounding of the signal is evidence that the motorist is a novice. Sometimes, as in the presence of a frightened horse, it may be better not to use the signal at all. No accepted rules exist in regard to the meaning of horn blasts, but it is reasonable to assume that prolonged signals indicate that the car behind is going to pass and desires a clear road. Bear in mind that a nervous driver may pull the wrong rein, that a pedestrian cannot make up his mind in a hurry when he wants to cross the road, that it is your business to avoid danger, not the other man's, that the road is free for all, and that it pays to be courteous. Do not use the electric headlights turned to the "bright" position when approaching or passing a car or other vehicle on a narrow road, unless you are traveling in the same direction. The light confuses and may result in a serious accident.

The two accompanying illustrations show frequent and dangerous practices. A driver should be arrested for violating the sensible rule of not keeping well to the right side of the road or street when making a turn to the left. As a matter of fact, he never or seldom is taken to account for these offences, although accidents have occurred again and again when they have been overlooked.

SELF STARTERS.

More About Some of the Popular Devices and How They Work.

BY C. P. SHATTUCK, M. E.

No. 3.

The control of the current flowing from the storage battery to the electric motor of the starting system is by a form of switch and these vary considerably. The location of the control member also varies, some being mounted on the instrument board, others in the heel board, while some manufacturers of motor vehicles place the control on the steering column under the wheel. When the last named installation is utilized the control is incorporated with the ignition and other control units. The control or switch of the motor starter is not always separate from the motor but is mounted on the housing of the unit with the contact making part attached to or incorporated with the shifting rod of the pinion. Starting switches may have one or more contacts. The first contact permits of but a small amount of current to flow to the motor, causing the pinion to rotate slowly. This reduction in the strength of the current is generally accomplished by inserting a resistance in the circuit, assisting the pinion to mesh with the flywheel gear. A further movement of the lever or pedal makes a full connection through an-

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other contact, allowing the necessary amount of electricity to pass to the motor.

A simple form of control is shown at Fig. 24 which illustrates the Bijur system. In includes a series wound motor, a pedal switch and a storage battery. As may be noted the application of the motor's energy is through suitable reduction gears to the pinion which is meshed with a toothed flywheel. The switch is actuated by a pedal which when depressed by the driver, closes a contact and also shifts the motor gears into mesh with the teeth on the flywheel. The construction of the switch provides two arms, 1 and 2 (Fig. 25), which are connected to-

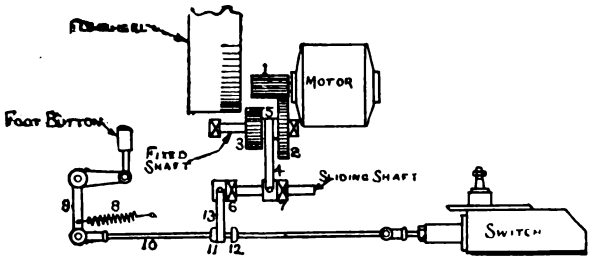


Fig. 24—Control of Bijur Starting Motor by Foot Button.

gether through a resistance, 3, but which are otherwise electrically insulated from each other.

Operation of Bijur Switch.

When the pedal is depressed, the switch rod is moved outward, and the first action is to bring the contact arm 1 and 2 into contact with the advance fingers 4 and 5. When in this position a circuit has been established from the storage battery through the switch and the motor. The path of the current may be easily traced. Beginning at the storage battery the current traverses the wire, 6, through the main contact, 7, of the switch, then through the advance finger, 5, to the arm, 1, thence through the resistance, 3, to the arm, 2, through the advance finger, 4, the main contact, 8, thence through the wire, 9, to the motor. The current then passes through the motor armature and field coils and then

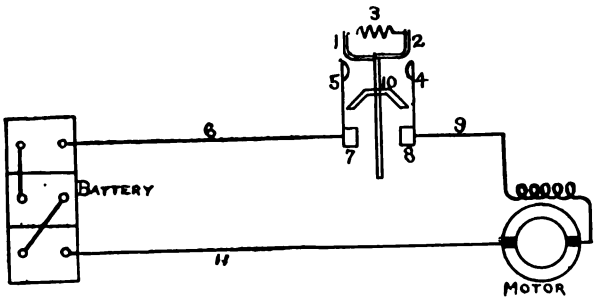


Fig. 25—Diagram Showing Connections made by Switch of Bijur Starter.

back to the battery through the wire, 11. The circuit being complete, the electricity passes through the motor.

The value of the current through the motor is limited by reason of the resistance which has been placed in the circuit, the resistance being sufficient to cause the armature to rotate at a very low rate of speed, resulting in rotating the pinion into mesh with the flywheel.

When the pedal attains its final or maximum position, the main switch brush, 10, is across the contacts, 7 and 8, and the current from the battery is shunted around the resistance. The circuit from the storage battery is as previously described, except at the switch, in that the current entering the switch through the main contact, 7, passes across the switch brush, 10, to the main contact, 8, thence through the motor to the storage battery. With the switch in this position the resistance, 3, has been eliminated from the circuit and the motor is directly connected to the battery. The resistance is not cut out until the gears are fully meshed. After the engine starts to operate under its own power, and upon releasing the starting pedal, a contracting spring moves the gears and switch to their normal or non-operating position.

Fig. 24 shows the arrangement of the components. The pinion, 1, of the motor is constantly in mesh with the gear, 2. This gear has an over-running clutch, the inner member of which is rigidly connected to a pinion, 3, which is designed to mesh with the flywheel. The gear and pinion are mounted on a stationary shaft and move horizontally along it. A movable member, 4, engages the trunnion, 5, on the sliding gears and is loosely connected to the rod which is actuated by the pedal, and which in turn operates the sliding gears and the starting switch. The movable member, 4, is attached to a horizontally moving shaft. As illustrated, a spring, 8, retains the gears and the switch in their normal off position when the pedal is not touched or depressed. Depressing the pedal causes it to move downwardly

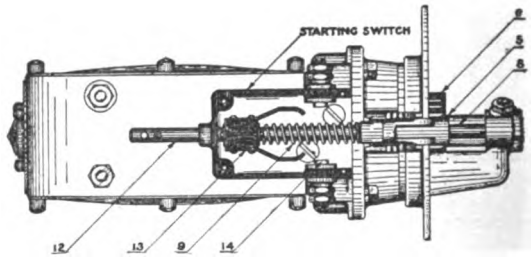


Fig. 26—Contacts of switch utilized in Gray & Davis System.

against the tension of the retracting spring, and this vertical motion is transmitted through the bell crank, 9, moving the rod, 10. Mounted on the rod, 10, are two collars, 11 and 12, which engage the member operating it with the trunnion on the sliding gears. As the rod, 10, moves forward, the switch rod moves before the collar, 12, picks up the member, 13. This arrangement allows the motor to start rotating slowly before the gears move into engagement. After the rod has moved sufficiently to permit of the initial switch contact being made, the collar, 12, picks up the member, 13, and the gears are then moved forward until the pinion is fully meshed with the flywheel at which time the resistance is cut out.

Bosch Switch.

The motor starter manufactured by Bosch Magneto Company employs a switch that is operated by means of a pedal which is moved downward to make the electrical contacts. The wiring plan of the starter and switch is shown at Fig. 29, and the insulating plate which forms one side of the starting switch carries the three terminals for the battery and motor cables. The two heavier cables are for the main circuit, and the single small cable for the shunt circuit. When the switch plunger is operated, the current from the battery first flows through the field windings of the motor, after which it is diverted through the shunting cable and armature of the motor. The operation of the system was fully explained in the previous installment.

The motor starter manufactured by Gray & Davis,

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Inc., is an example of the switch being incorporated with the motor but operated by a pedal. The switch is illustrated at Fig. 26. The pinion meshing with the flywheel is operated mechanically; that is, the pinion is slidingly engaged. The mechanical and electrical connections are practically made at the one and same time. Attached to the switch rod is a shifter fork which moves on an intermediate shaft a sliding pinion. The intermediate shaft carries an intermediate gear with an over-running clutch. When the pedal is operated, the movement of which moves the sliding pinion into engagement with the flywheel gear, the movable switch member makes contact with the stationary switch contact and current flows from the battery to the motor. The shifter fork on the switch or shifter rod is provided with a spring which tends to keep the contacts out of engagement as when the starting pedal is released. This type of motor starter is of the enclosed design; that is, is known as the enclosed flywheel type.

Aplco Motor-Generator Switch.

Fig. 28 shows the wiring plan of the switch utilized with the Aplco motor-generator which operates

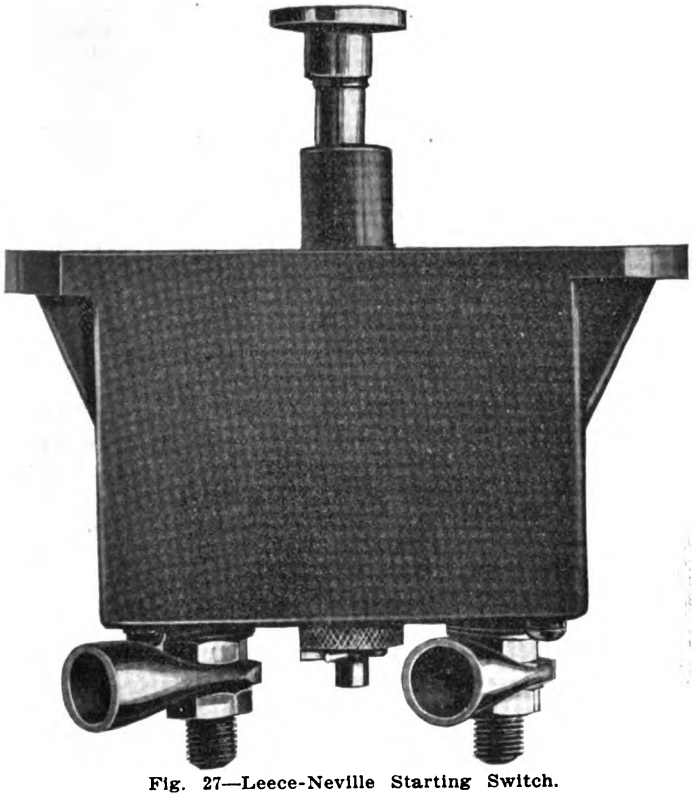


Fig. 27—Leece-Neville Starting Switch.

as a 12-volt unit as a starter and as a six-volt unit as a dynamo. The motor-generator is connected across the terminals of the battery through the starting switch when employed for starting. The 12-volt current is obtained by pressing the starting pedal down or starting position at which time the two six-volt cells are connected in series. Upon releasing the pedal to the running position the cells are connected in parallel and are charged by the dynamo as a six-volt unit.

With the mechanical pinion shift of the Westinghouse starter, one motion of the starting pedal starts the motor at low speed and cuts off the current supply until the gears have meshed, then the full voltage is thrown out of the motor and continued until the pedal is released. Releasing the pedal disengages the pinion and cuts out the current supply. With this system an over-running clutch is employed. The mechanical shift switch can be mounted separately, or on the gear case with the contact making part fitted in the pinion shift rod. The latter method is favored as it is stated to prevent all lost motion between the operation of the switch and

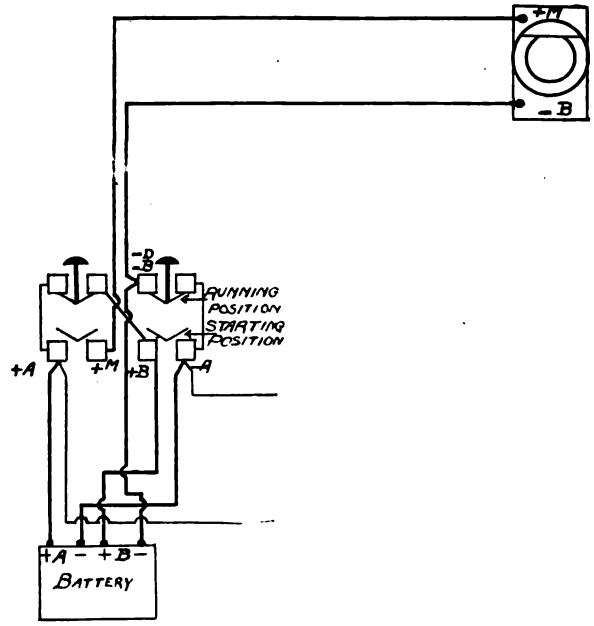


Fig. 28—Illustrating the Running and Starting Positions of the Aplco Switch.

that of the gears. The stationary part of the switch consists of a metal casting containing the contacts and a starting resistor in ribbon form inside the case. The moving contact, arranged for mounting on a shift rod, provides a rubbing, self-cleaning contact for the temporary connection and a butt contact for the full power connection.

Automatic Gearshift.

With the automatic gearshift, which was fully described in the previous installment, either a foot-

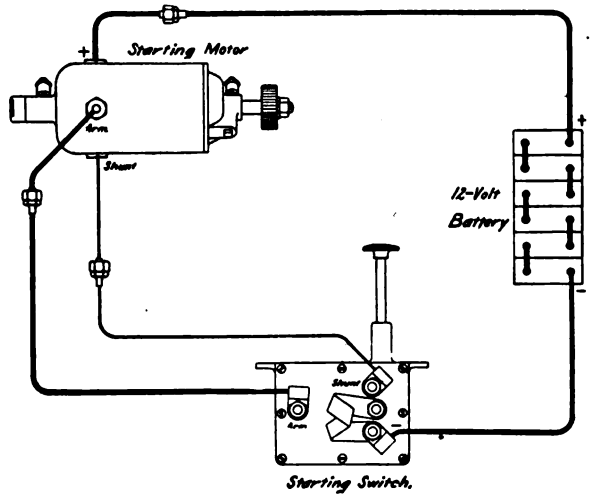


Fig. 29—Wiring plan of Bosch Motor Starter Switch.

operated switch or a push button controlling a solenoid switch can be used, the type depending on the service expected. The switch for ordinary service has a drawn metal case and a face plate for mounting either on the dash or the footboard. In either type a motion of ¼ inch closes the contact. The foot pin of the heavy service switch can be removed

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by the driver when he leaves the car, making it impossible for anyone to operate the switch.

In the electro-magnetic pinion shifting system, either a push button is used to close the electrically operated switch, or a switch similar to that employed with the automatic pinion shift is used. Closing the main switch first starts the motor at low speed, then operates the electro-magnetic pinion shift. This in turn cuts off the power from the motor so that it rotates from its own momentum until the gears mesh, then throws the full voltage on the motor. Releasing the push button opens the electrically operated switch which cuts off the current from the motor and returns all components to their normal or non-operating positions. The electrical connections are so arranged that in case the operator fails to release the push button, the electrically operated switch will open.

Starting and Running Torque.

There is considerable difference between the power or torque required to start an engine and that needed to keep the crankshaft rotating once it is started in its movement. It is practically the same principle that requires four horses to start a heavily loaded vehicle that two can haul after the wagon is in motion. Fig. 31 is of interest as it shows a chart illustrating the torque required to turn a four-cylinder motor having a bore of 3¾ inches and a stroke of 5¼. The foot pounds required for a stiff motor are greatly in excess of an engine that has been limbered up with service.

The current consumption or momentary rush of

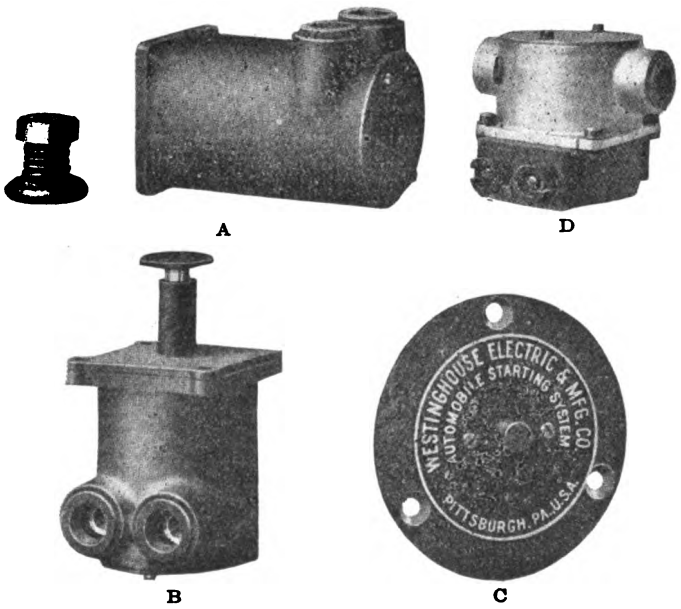


Fig. 30—Westinghouse Starting Switches: A, for mechanical pinion shift; B, automatic pinion shift; C, push button type; D, electrically operated.

electricity at starting is given out by the manufacturer of the starting systems, but one authority holds that exact information has not been forthcoming on this point. A well known electrical authority conducted a series of experiments with a starting system, using a four-cylinder engine having a 3¾-inch bore and 4-inch stroke, giving a cylinder displacement of 177 cubic inches. It was found that the first rush of current in starting was 236 amperes, that the peak of the curve was at the time the starter pulled the engine over the first compression. The time lapsing between the closing of the switch and the passing over the compression was .043 seconds, and the torque exerted by the motor with the current of 236 amperes was 28 foot-pounds or 84 pounds at the engine shaft. The tests developed the fact that the torque required to pull the engine over the first compression was 35 foot-pounds, and that the difference, 39 foot-pounds, was utilized in overcoming the inertia of the motor and engine. As

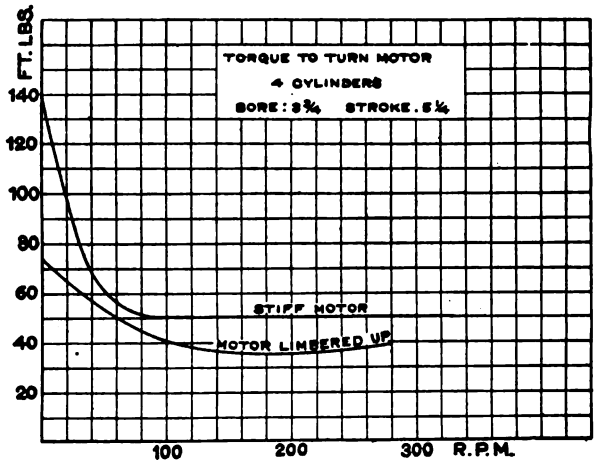


Fig. 31—Chart showing pull required to start and run a stiff motor after it has been limbered up.

soon as the crankshaft of the engine began to rotate the current consumption dropped to 63 amperes. It is estimated that a normal start requires about half a second.

(To be continued.)

AUTOMOBILE CLUTCHES.

Their Importance and a Comparison of the More Recent Designs.

W. F. Herst, M. S., before the New York Society of Automobile Engineers.—The development of the automobile clutch should receive far more attention than it is given by the average automobile engineer. Nothing is more objectionable to the occupants of a car or more destructive to the car itself than a clutch that cannot be smoothly engaged. A clutch that grabs not only operates to the detriment of the motor but will in time destroy the transmission and rear axle gears, as well as injure the axle housing, drive-shafts, springs, wheels and tires. A bad clutch, carelessly operated, will reduce the life of the rear tires at least 20 to 25 per cent., loosening the tread on the tires and permitting small cuts to form sand blisters, with the usual result.

Care should be exercised in designing the clutch to see that it is not of too great capacity. Experience has proved conclusively that the best operating clutch is one that will just hold the maximum power developed by the motor. It is also very important to have a clutch that releases freely and quickly. A clutch that does not release properly will often prohibit quick shifting into second gear on a hill, with the result that the car loses momentum, and it becomes necessary to shift into low gear to climb a hill that should ordinarily be taken on second. Such a defective clutch will also cause clashing of the gears in shifting, premature gear replacement becoming necessary and the quality of the transmission being unfairly criticized. No transmission will withstand such abuse long. In this connection it seems advisable to provide always

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some kind of a clutch brake to be used as occasion requires.

The clutches most commonly used in automobile construction can be subdivided into two distinct types; cone and multiple disk. The single-cone type seems to be most commonly used in small cars on account of the fact that it can be manufactured most cheaply. When properly designed it seems to give universal satisfaction in this type of car. The angle used varies from 9 to 12½ degrees, the latter being preferred. This angle practically eliminates all possibility of trouble in releasing the clutch and with springs inserted under the facing the clutch can be engaged easily without grabbing, and good efficiency maintained. The common practice is to use a good chrome leather or an asbestos fabric for facing. Extreme care should be exercised in selecting the leather. It should be kept pliable by a slight application of neatsfoot oil not too frequently. If asbestos fabric is used, care should be taken in securing a material that is not too hard. It should be carefully and thoroughly carbonized.

A new type of multiple-cone clutch has made its appearance recently. It consists of a series of three small cast iron cones in a single cast iron shell. Light springs are inserted between the cones, a heavy spring actuating the rear cone. When engaging, the forward cone comes into contact with the shell first, then the middle cone, the rear cone being the last to come into contact. When fully applied the three cones form a unit, each doing its own share of the driving. It is claimed that the clutch operates very smoothly. It is, however, still in the experimental stage.

The driving plates of multiple-disk clutches composed of all-metal disks, have in some cases been made of phosphor-bronze, the driven plates being of soft steel, but the best satisfaction seems to be obtained with all steel plates hardened and ground. The clutch is enclosed in an oil-tight housing, oil being necessary to keep the clutch from becoming overheated. The greatest trouble with this type of clutch is to keep it supplied with oil of proper consistency. Good practice is to use a light motor oil cut with a small quantity of kerosene, varying according to weather conditions.

The dry-plate multiple-disk type of clutch is becoming very popular. The driving plates are faced on each side with asbestos fabric, the driven plates being made of steel, generally hardened and ground. Since the efficiency and life of the clutch depends to a large extent on the selection and preparation of the fabric facing, to get the best results the same care must be exercised in preparing it as in the case of the single-cone type of clutch.

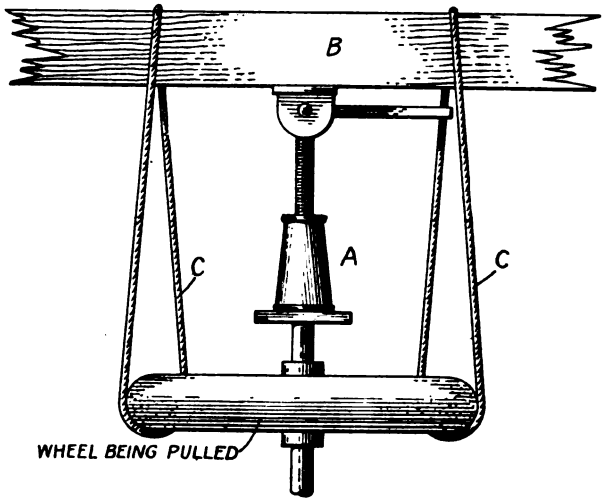
In the three-plate type of clutch the facings when used are generally fastened to the single driven plate, although it seems more practicable to fasten them to the driving plates. In this clutch the power factor is obtained mechanically by the use of toggle connections operated by a reasonably light spring. This type of clutch is becoming gradually more popular. It is claimed that some recent designs are very satisfactory.

Warped Valve Stems.

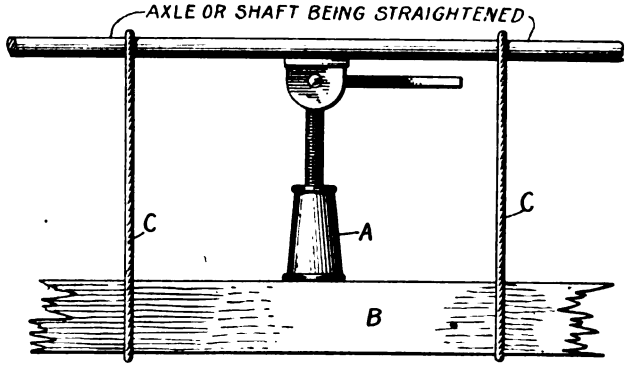
If there is lack of compression and the valve heads seem clean and perfect, examine the valve stems for heat warping.

For Bending or Pulling.

From N. G. Near, New York.—I illustrate herewith how a common jack screw can be used to great advantage by any automobile owner for heavy pulling or bending work. All that is needed in addition to the jack screw is a good stiff beam B (a wooden 6x6 or 8x8 will usually do), and odd lengths of rope or cables C. Since all of these are usually available



in any small shop, and since owners frequently have them in their private garages, I am calling attention to the good use that can be made of such materials. Even where there is no jack screw, and if you have nothing but ropes, pulling power can be created by use of the old "Spanish Windlass" which will pull off any wheel, and bend any anxle by merely placing



a lever between two ropes and twisting the ropes together, as in the old-fashioned buck saw.

A regular pulling and bending machine is better than the arrangements I show here, I admit, but it would not pay an owner to buy such an outfit for work that he has to do so seldom.

IGNITION CIRCUITS.

How to Trace and Remedy Frequent Troubles in Connections.

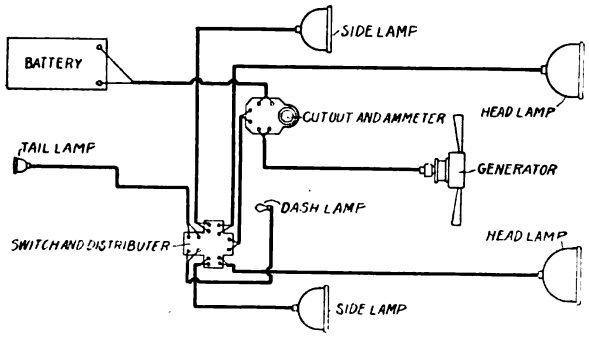
One advantage of the magneto was the elimination of a great deal of wiring and its attendant connections, where trouble could develop. In the days of the coil and accumulator there were very few cars that had the wiring carried out in a manner capable of passing a critical examination, and this is not to be wondered at when the fact is taken into account that the wiring was often left to young apprentices, or, at best, an ordinary chassis fitter, who could not be expected to know anything of the

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electrical characteristics of good wiring, that is to say, he had to work to rule of thumb. As the magneto simply requires four cables connecting between the plugs and magneto there is little scope for any faulty workmanship other than would result from gross carelessness, such, for example, as running the cables through a metallic tube, and in such a way as to cut through the insulation, instead of taking care that the ends of the tube had well-smoothed bushes of fibre or vulcanite fitted in. It will sometimes be noticed also that the cables touch the top of the cylinders, and unless this is seen to it will cause trouble eventually. Fortunately, engines are not air-cooled, otherwise there would be much more trouble with the insulation than is experienced in such cases. The best of rubber, however, will not indefinitely withstand the heat of a water-cooled engine head. The fault is so easily corrected that it is worth while arranging for the proper clearance between the cable and any heated part. Abrasion of the insulation, due to persistent friction or chafing, even if very slight, is practically the only other fault to be guarded against, so far as ignition cables are concerned.

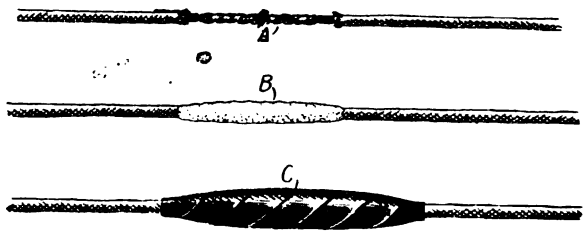
Lighting Installations.

In the case of lighting installations the possibilities for mischief due to minor faults on the wiring are increased. This is one of if not the most serious sources of trouble that the makers of lighting sets have to provide against. Most people are aware what an intolerable nuisance a badly-wired domestic bell circuit can prove, and this is about the simplest electric circuit that can be imagined. A car-lighting circuit is about ten times as complex, and any faults may not only prove to be a nuisance, but may be extremely dangerous to the car user, inasmuch as the light may fail at a critical moment. The leading manufacturers of lighting sets, therefore, take great pains in arranging for the wiring up to be as free from sources of trouble as possible, as shown in the diagram, particularly as regards providing special contacts and terminals, also cable of good quality and heavy enough to carry the maximum load of current without appreciable loss of voltage and consequent reduction of light.



Wiring Diagram for Lights.

Perhaps the most important fact in this question of wiring is that every connection on a circuit is a possible source of inefficiency. Every connection must be made, both mechanically and electrically, as sound as possible. Thus, an unclean, corroded or greasy connection would almost certainly be bad in the electrical sense, even though it may be mechanically good and screwed up well enough to be proof against vibration. On the other hand, a loose contact, even of clean metallic surfaces, would be just as bad. Any faulty connection through which current is passing will nearly always become heated, and this serves as a means of locating a faulty connection. It is an electrical axiom that resistance introduced into a circuit generates heat. Lamp-holders often prove to be sources of trouble in this respect, and nearly always it will be found that it is due to the small spring plungers in the holder being weak and not pressing firmly on the small sectors in the cap of the lamp. Very often it will be found that the lamp gives a bad light, as the result of faulty contact at the plungers. The best remedy is to fit a new lamp-holder.



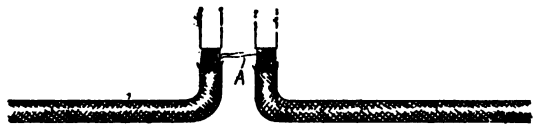
Right and Wrong Way to Connect Wires.

No Joints in Wires.

No properly-wired lighting installation should have joints in the wires, as shown at A. Each length of cable should be complete in itself between terminal and terminal. If circumstances should ever make jointing necessary it is important that the joints should be made in the approved electrical manner and soldered up, as shown at B, with resin as a flux and not with chloride of zinc, despite the fact that it is much quicker and easier to make joints with the latter than with resin. Corrosion of the joint is inevitable sooner or later with chloride of zinc. Proper insulation of any joint is indispensable, and this should be done with the rubber-proofed tape made for the purpose, as shown at C. This is not only necessary to prevent the joint making metallic contact with another wire or any adjacent part of the car, but also to keep moisture from getting into the cable. Owing to the capillary attraction of the fine strands of wire there is a strong tendency for moisture to be absorbed.

Switchboard Connections.

Particular care should be paid to the connecting up at the switchboard, where there are so many terminals in a very limited space. Unless carefully watched in the connecting up odd strands of the cable are liable to touch those of an adjacent cable, as shown at A, or be close together, so that the vibration will cause them to touch at times and produce short circuits, and in some cases cause some of the fuses to break and extinguish the lights. As regards connections to the accumulator terminals, the great faults to guard against are loosening, as the result of vibration, and corrosion. The first could easily be made impossible by the use of a lock nut on each terminal, in fact it is difficult to understand why the accumulator makers do not provide it. Corrosion should never occur on a well-made battery, as the one-time objectionable "creeping" of the acid can be entirely prevented by good



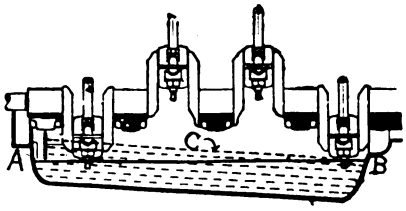
Switch Connections .

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design. A little of the acid might get splashed out, particularly if more than is necessary to cover the plates is used; therefore, as a safeguard, it is as well to smear vaseline over the terminals.

Overcoming Oil Troubles.

When the symptoms of over lubrication of the first and second cylinders appear, particularly of the former, the owner is inclined to lay the trouble to poorly fitting rings, a worn piston or scored walls. These conditions may exist, but as a rule the trouble is due to the level of the crankcase, as shown by the illustration, which represents an exaggerated case. With the "all loss" system of lubrication, and particularly where the crankcase is not divided or partitioned, the oil will gather at the forward end as indicated. Under this condition the level is not normal as represented by the line A B. As may be noted the spoon of the connecting rod of the first cylinder is dipping too deeply, and the result is that an excess amount of lubricant is splashed to the cylinder walls, flooding them. A portion of the oil is bound to find its way past the rings, depositing an excess amount of lubricant in the combustion chamber where it burns, forming carbon, and fouling the plugs.



Note the Oil Level.

The cause is generally due to the front springs settling, and half an inch will make considerable difference to the motor lubricated by the straight splash system. The remedy is to level up the crankcase. It is a simple matter to measure the height of the lubricant. Drain off the old oil and wash the case thoroughly with kerosene or gasoline. Next use a colored fluid, such as an ordinary dye employed for dyeing cloth. Use the same amount of fluid as you would oil, but do not crank the motor to splash it. Remove fluid and crankcase, and the height will be noted as well as how deep the rods dip by the color. Measure to ascertain how much the level is out, and block up with pads the springs to that amount. This remedy is more satisfactory than the fitting of baffle plates or drilling the pistons. The straightening or blocking up of the springs will improve the riding qualities of the car as well.

AUTOMOBILE WELDING.

Expansion and Contraction of Metals in Using the Oxy-Acetylene Flame.

BY M. KEITH DUNHAM, OXY-ACETYLENE ENGINEER.

One of the very difficult points to drive home to the automobile mechanic, in the application of oxy-acetylene welding, is the power of expansion and contraction. A shaft is out of true, a pair of cylinders won't fit the stud bolts of the case after the lugs have been welded, a lower half of a crank case does not line up with the upper half, the welding is all right but the effects of welding have been overlooked and provision has not been made to offset or overcome the shrinkage caused by the cooling weld.

A pattern for a casting is always made oversize "to allow for shrinkage." When the foundryman pours the metal into the mould he knows, and so does every mechanic, that as the metal cools, it contracts and when cold it is shorter, not so wide and not so thick as it was when it was poured.

Nothing can prevent the contraction or shrinking of cooling metals.

Oxy-acetylene welding is a fusion process—not soldering or brazing. The metal to be joined is melted; so that if we consider the process merely a re-casting, locally applied, it is easy to understand the futility of putting shafts in bearings of crank cases or bolting angle irons to the sides to prevent contraction.

Some apparatus manufacturers with more theory than practice recommend such devices—their use not only does not prevent contraction but their weight on aluminum may be a positive danger when the casting becomes sufficiently hot from preheating, in crushing or collapsing the heated area. If we heat metal, we must expand it and it must occupy a smaller space cold than hot—therefore, if we bolt the case to an angle iron in cooling either the angle iron will bend or the casting will crack. If we preheat the case with the angle irons or shafts firmly attached to the case we again get into difficulties for aluminum and iron have a different ratio of expansion and we are very likely to break the case by reason of the angle iron or shaft not expanding as fast as does the aluminum.

When a case is broken into many pieces, it may sometimes be deemed advisable to use angle irons and shafts in order to secure alignment. Take these off before welding, however, as their use is really a detriment—they lead you to believe that they will prevent contraction. As well try to dam Niagara.

How then prevent distortion or warping of the article welded or contraction cracks? In some cases it may be done by bending, by limiting the heated area by the use of wet cloths or asbestos or in the case of sheet metal welding by opening one end of the weld a certain percentage of the length of the weld.

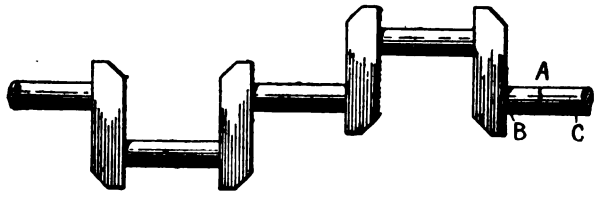


Fig. 1.

The best way and the one which must be applied in nearly all cases of automobile repairing is to offset the contraction of the welded area by preheating another section or in some cases by slowly heating the whole article.

Preheating, however, is not necessary on all kinds of automobile repairing but is absolutely essential in many instances. Three things must be taken into consideration in judging whether an article must be preheated to overcome the effects of contraction, first, whether there is an opportunity for the expansion and contraction to take place naturally; second, the conductivity of the metal welded, and third, the ductility of the metal.

Take a crank shaft as an example of the first in-

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stance, as in Fig. 1. Here the weld is made at A. The distance from B to C will increase as the metal becomes hot and decrease as it becomes cold. The end, C, being free, there is nothing to prevent its moving and it does so. No preheating in this instance is necessary therefore to offset contraction, though it is helpful in saving gas and in keeping the metal in proper fusion. A weld in the chassis, a lug or an arm on an aluminum casing, a truss or torsion rod or tube, are further illustrations of this character.

Take a break in a water jacket of an automobile cylinder, roughly outlined in Fig. 2, A to A. If we weld this break, as we would the shaft in Fig. 1, how about the contraction? The jacket is one solid piece and is firmly joined to the cylinder in many places. Furthermore, cast iron is not ductile and will not bend readily. The welded section must cool and in cooling in must occupy a smaller space than the molten metal. It being impossible for the metal to shrink along the general lines, B to B, and cast iron being brittle (not ductile) the weld being the weakest section (because it is hot) breaks. If the jacket were steel, which is a ductile metal, it would be possible to make the weld without contraction

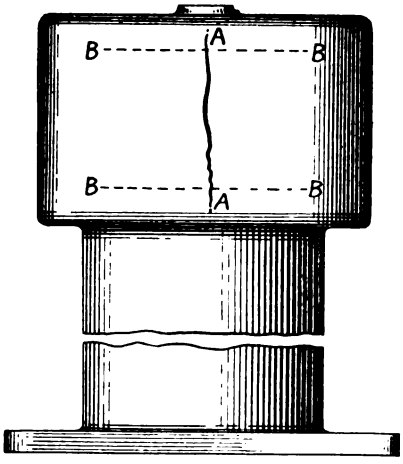


Fig. 2.

breaking the weld for the reason that other portions of the jacket would twist or warp and so take care of the contraction.

But if we take the cylinder and warm it all over to a dull red heat, we expand all portions of it, the weld is quickly made and the cylinder being practically the same heat everywhere it cools and contracts equally everywhere.

The same condition holds true in an aluminum casting but in this instance contraction breaks are not always the case, as this metal will many times twist or warp out of shape instead of breaking. Aluminum is an excellent conductor of heat, therefore the expansion set up by the welding flame is a considerable one and the shrinkage in cooling is correspondingly more than in other metals used in automobile construction. Cast iron will usually break in cooling unless allowance is made for this contraction by preheating. Aluminum, on the other hand, may bend other sections in cooling, due to its ductility, and this is the reason why at times after welding a case will be found to be shorter on the welded side. The welder has "taken a chance and welded it cold." The weld held but the case was useless because it was not in alignment.

One-half of a malleable rear housing is brazed and when assembled it leaks grease badly. Because it didn't break in cooling (malleable iron being ductile) the job is considered successful. If the housing was preheated carefully the machined surfaces would have properly fitted together.

Each repair job is of course different. Each has to be studied but if the law of expansion and contraction is recognized and you have a full understanding that you cannot prevent contraction by clamps but that you can offset it by preheating and careful cooling, you are on the way to becoming a successful repairer by the oxy-acetylene process.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1648 E. M. F. Valve Timing.

From W. S. Haines, New Jersey.—My car is an E. M. F. 1912. When adjusting the valve stems and timing same, should they be adjusted when the piston is at the top of the cylinder? If so, they make quite a clatter, but if adjusted while running, then the valves leak from not seating properly.

Reply.—The inlet valves ought to open in time to give the pistons a chance to draw in a cylinder full of gas. The practice is to allow the piston to descend about 1/8 of an inch in the cylinder before the inlet valve opens. This reduces the pressure and creates a suction. The inlet valve should close just after the piston has reached the bottom of the stroke or about the time it has traveled a half inch up on the compression stroke. The exact point at which the inlet valve should close depends something upon the speed of the engine, but whatever setting is arranged it will not be quite suitable for all the speeds of the engine. The usual practice, however, is to set the valves according to the average speed of the engine, or about 1,000 revolutions per minute. As to the exhaust valves they must open before the piston reaches the end of the explosion stroke, or about a half an inch from the bottom of the dead center. Different manufacturers give slightly varying instructions as to valve timing and it would be well if you could get the instruction book of the E. M. F. Company, or what is now the Studebaker Corporation, at Detroit, Mich.

1649 Trouble With a Lozier.

From C. N. Osborn, New Jersey.—I drive a 1913 six cylinder Lozier car. It has a Rayfield carburetor, model D 4 X, size 1½ in. 1.—Motor seems very sluggish at starting, sometimes on the road, especially on up grades. Will not "pick up" as it

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should. In damp weather the motor runs decidedly smoother. Have tried various carburetor adjustments, but don't get results. Float in carburetor allows chamber to fill about one-third with motor running idle about 12 M.P.H. 2.—When going down grade—throttle closed, switch on—there is a noise, similar to a strong puff of air (not an explosion), that comes from the muffler at short intervals—not regular. What might cause this? 3.—Carburetor has large water jacket between "butterfly" valve and base of intake manifold, besides the regular water jacket, both connected by pipe line. Could I safely connect the upper jacket to the exhaust manifold and run a pipe from the lower one out under the motor or back into the exhaust manifold back from the motor? Would this make the gasoline too hot? 4.—Spark plugs now used extend only half way to bottom edge of valve caps. Would using longer plugs improve running or power of motor? Could the two plug system increase the power of the explosions to such an extent as to injure the bearings? 5.—Could worn valve lifter parts affect the lift of valves enough to interfere with the proper intake and exhaust of the gases? 6.—Have trouble in getting my brakes (internal expansion) to hold. Can tighten same so that wheels bind and yet car will slip with a hard pressure on pedal. All linings are almost new. On inside of drum is a slight groove caused by wear. Could it be the edges of the grooves prevent the whole surface from touching. 7.—Have you ever had inquiries regarding a mysterious metallic grind in this make of car? The noise seems to come from the vicinity of the clutch or transmission only when the engine is under load with the car in motion. When coasting with the clutch out the noise is not heard. At the New York Service Station I was told the trouble was with the clutch. A new one was put in and the same noise was worse than before. I have had the transmission apart, examined every gear and bushing, all of which were in excellent shape, and am satisfied the noise is not there. Would worn or loosely meshed "spider" gears in the differential, with the vibration of the drive shaft, make such a grind?

Reply.—Your car is probably the Lozier "Big Six," a few only of which were put out. 1.—You will probably find that a more modern carburetor will give you better results than the D 4 X. 2.—Puffs are probably due to infrequent explosions of a weak mixture of gas. 3.—If you desire, although it would probably make little difference. It would not make the gas too hot. 4.—Probably, although they might foul more easily. Bearings would stand considerable more power. Some of this model car were equipped with two-point ignition, but chauffeurs rarely employed it except for high speed work, on account of tendency to pound from too rapid combustion when running at low engine speed. 5.—Possibly, but hardly probable. 6.—Brakes on this car are inadequate, hard to adjust and need almost constant attention. Braking surface is small. 7.—We have never before, so far as our recollection serves us, had any inquiry concerning this model car. Information here given is following two years observation of the car in almost daily use.

1650 **Certain Assumptions.**

From J. B. C., Massachusetts.—1—When an automobile weighing 4,000 pounds or more, requires a gallon of gasoline to run from 7 to 8½ miles, a car weighing less than 3,000 pounds should go from 8 to 9½ miles per gallon. Ford cars should go from 15 to 25 miles per gallon of gasoline. What is your opinion? 2—A car going at the rate of 15 to 20 miles per hour requires less gasoline than when going at a speed of 30 miles per hour. If a car will go a certain distance on 7 gallons of gasoline at a speed of 30 miles per hour, at a speed of 20 miles per hour it should run one or two miles more on a gallon. What do you say? 3—Does a four cylinder motor require less gas than a six or eight cylinder motor, used in the same car?

Reply.—1—The tendency is about as you claim but the results would probably vary widely. A good many other things besides weight must be taken into consideration in making estimates of this sort. 2—The amount of gasoline consumed depends a good deal upon the speed, the car, and upon other facts in relation to driving, but the difference would vary so much under different conditions that it is not possible to estimate by figures, except approximately. 3—Other things being equal, a four cylinder car uses somewhat less gasoline than a smaller car having six or eight cylinders. Tests have been made, however, where a greater number of cylinders have run with even a less amount of gasoline than the less number. In all of the foregoing assertions or inquiries the tendency may be about as stated but the facts are altogether uncertain.

1651 **Wiring for House Light.**

From Lee Bugg, Arkansas.—I want to fix up a strip of lamp sockets like diagram enclosed to take 60 volts off a 110 volt arc line. Can you tell me how much voltage each 32 c.p. lamp will carry? The current comes into my house at 110 volts and I have an arc light that consumes only 40 to 60 volts. The rest of the current is disposed of through a resistance rheostat at present. This rheostat gets red hot and of course is very uncomfortable in the house these hot days, besides I think this arrangement consumes more current than it should.

Reply.—Your plan is impracticable. You might use two arc lamps in series, in which case the strength of the current would be approximately 55 volts to each lamp. You can put in an oil transformer, but in either case the expense would be considerable. Incandescent and arc lamps do not work well in the same circuit in series, but are often placed in parallel, in which case they all take the current at the same strength or voltage. This latter arrangement would not help you in the least. Arranging lamps as per your sketch, which is in parallel, would not decrease the voltage but would increase the amperage, taking a greater quantity of electrical energy at the same pressure or voltage. Thirty-two candle power carbon lamps consume about 100 watts of current per hour. The product of the volts by the amperes is the number of watts. Thus: 110 volts at 5 amperes per hour would be 550 watts, or watt-hours, and 55 volts at 10 ampere hours would also be 550 watts.

1652 **Faulty Lubrication and a Short Circuit.**

From L. C. H., Vermont.—I have a model 37, 1915, Buick, which has been driven less than a thousand miles and has given good satisfaction, except the following: For lubrication the directions are to "remove the wing plug on the right side of the timing gear case of the motor, and fill with motor

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oil. This is for the pump and generator shaft." If this is done a part of the oil leaks out into the pan and the greater part into the crank case. The motor begins at once to smoke badly and the only way to stop that seems to be to draw nearly a gallon of oil from the petcock. 1—Should the packing around the crank shaft be replaced? 2—Is this difficult? 3—Would supplying the necessary oil to the crankcase through the oiling place mentioned, insure a sufficient amount of oil for the pump and generator, shaft, gears, etc., and would it be advisable? The ignition system is the Delco. In one instance, without any cause which I have been able to determine, the motor while running on a level, suddenly ceased firing and a loud cracking noise called my attention to the switch which I found to be heated. Pulling out or pushing in the "M" or "B" button made no difference, the motor would not fire or the loud cracking sound stop. After a little I found, without knowing just how I did it, that I could stop the sound with my fingers underneath the combination switch, but that it would begin again when I removed my fingers. In this way, trying to locate the cause of the short circuit, it stopped as suddenly as it began and has not troubled me since. I would like to know the cause of this short circuit and how to prevent it in the future.

Reply.—1—Looks as if the forward crank shaft bearing were defective. We do not know of any design of engine using packing to prevent leaking of oil from the timing gear housing to the crankcase. 2—To put in new bearings is rather expensive. 3—Probably not. 4—The short circuit was probably in the timer, where the contact was made and did not break. Careful examination of the timing head may explain the short circuit.

1653 **Defective Ignition.**

From H. E. Mitchell, Colorado.—Would you tell me what is the matter with a Case car, model 1910, Remy low tension magneto, Stromberg carburetor, type B? We do not seem to be able to get the spark past the distributor. We have a new set of batteries, and by taking the high tension wire from the distributor plate and pushing the push button we can get a spark nearly an inch long, but on starting the engine it will run a few turns and quit sparking at the plugs. As we have "sparklets" on the plugs we can see when it sparks. The platinum points are in good condition, one of them being new, and they break about one-sixteenth of an inch. The engine is O. K. in other respects and the carburetor is adjusted according to the Stromberg instructions.

Reply.—Trying to see how long a spark you can "pull," according to your confession, in itself is sufficient to ruin any jump spark coil. Your coil probably has a perforated condenser or a broken down secondary wiring. Our advice is that you send the magneto and coil to the nearest Remy service station, providing, of course, the engine itself has sufficient value to warrant this expense, and that a more modern design of carburetor be purchased. You must remember that the engine is some six years old, and that it may need expensive overhauling. One-sixteenth of an inch seems like a wide setting of the contact points. It is barely possible that the gaps in the "sparklets" are too wide, or the plug gaps themselves may be excessive. There are several conditions that may be present, any one of which may give ignition trouble such as you describe.

1654 **Missed Explosions.**

From Foresman & Lowe, Indiana.—We are operating an automobile garage and have 5 Maxwell Special cars that we are having a time with. We seem to have too much resistance at the spark points. I have stood and watched the spark from the top of the plug to the steel shell, a distance of an inch. These cars use Splitdorf coils and they will only last about a year. Setting the points as close together as it will hit has no effect. At times the spark will jump from one point to the other on the magneto rather than go to the right plug. We have tried all kinds of plugs, but they all seem to give out in a short time. The missing is worse after the engine has stood for a while or when started up in the morning. The plugs "foul" very easily. The engines do not seem to get too much oil, as they do not smoke any more than any other car does. Can this be oil or compression trouble? And what would you suggest as a remedy. We have trouble in keeping the sparks from coming through the cables. It will come through a new Packard cable at these missing times.

Reply.—It seems to us that for very best information the Splitdorf Electrical Co., Newark, N. J., or the manufacturers of these cars, should have been consulted. The jumping of the current does not do any harm so long as it does not cause ignition failure. The "fouling" of the plugs may be due to impaired compression, faulty lubrication, worn piston rings, or it may be a result of missed explosions. It is possible that a slightly thicker oil may help you. We think that a personal letter to Dr. R. H. Cunningham, care Splitdorf Electrical Co., Newark, N. J., setting forth conditions as you have described them to us, will result in a helpful reply to you.

1655 **Road Rules.**

From R. E. Shepard, Iowa.—1—I wish you would print a column in your paper about the road law. There are people everywhere, I believe, who do not know what side they are to travel on. 2—Is the fourth speed on a car very valuable or not? 3—On an average do you think it pays to buy non-skid tires? 4—How is the constant level splash oil system kept to a certain level? Is it done by float or how? 5—About how many automobile manufacturers are there in the United States?

Reply.—1—The rules of the road are very simple indeed, and should be known and followed by every driver of horse drawn, as well as motor driven vehicles. The trouble is not so much because of not knowing as in not caring. 2—It must be, else motor car manufacturers would not use four speeds ahead and a reverse when three ahead would be ample. 3—Without any doubt. 4—Usually by a tube extending a short distance into the crankcase compartments, connecting with the pump, or reservoir beneath, to drain off the excess. 5—Between two and three hundred, and the number is constantly varying.

1656 **Uses Ford Engine in a Motor Boat.**

From A. J. Applegate, Kansas.—I enclose you a clipping taken from a recent number of the Automobile Dealer and Repairer, and as I know that you would not willingly create a wrong impression to any subscriber asking a question, I wish to state that you have wrongfully answered this gentleman.

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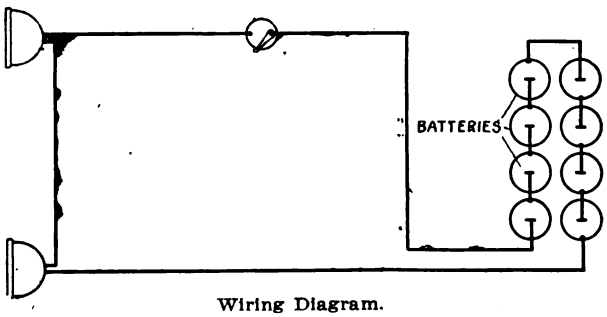
I have been using a Model-N, four-cylinder Ford automobile engine in my boat for several years with perfect success. It controls readily, cranks easily and certainly, and in my judgment is far superior to the two-port engine that is usually installed in motor boats. I will be glad to answer any questions about this that you or your customers may desire, and would like for you to print the letter.

Reply.—Of course we know absolutely nothing of your boat, its design, construction or to what use it is put. We do not know whether this is your first motor boat experience or you have been shipmate with "real" marine engines. It is not that we would discourage any one who can afford to make a manifestly improper application of power to boats, from experimenting such as you have, but to dissuade those who perhaps can ill afford to waste their time and money. Again we reiterate that "Our advice is not to even consider using a Ford or any other automobile engine for a boat," fully believing, in spite of your installation, that our contention is justified in the premises. The writer of this reply has had some twenty or more years of practical marine gas engine experience, and is considered an authority in matters pertaining to this application of the internal combustion engine, and has observed hundreds of marine installations, as well as scores of unsatisfactory attempts to utilize used motor car engines for marine use. Every such one being unsuited to motor boat use.

1657 Lamps Lighted from the Battery.

From Edward Snyder, Pennsylvania.—I have two lamps which run with a dry battery, and would like to know if I have them wired up right to give the best light. Send me rough sketch and what voltage, bulbs and candlepower to use to give the best light.

Reply.—Use eight cells which will give you about twelve volts, sufficient to light two 6-volt lamps in



Wiring Diagram.

series. Instead of "grounding" the pole of one lamp and one side of the battery to the frame of the car, run a wire from the lamp to the battery so there will be a complete circuit without using the frame. The lower the candlepower the lamps are the longer the battery will last. You will find it expensive illumination.

1658 For Keeping Gasoline.

From Reader.—I have a bill from the Fire Department of the City of New York for the privilege of keeping gasoline in my car in my private garage. Will you kindly let me know whether this is a proper charge and should I pay same. I understand that the Automobile Club of America or some other such club says that it is not a just tax and have instructed its members not to pay same.

Reply.—The keeping of explosives is prohibited by the ordinances of the City of New York and it follows therefore that if the city officials wish to enforce this ordinance against you that they could prevent you from keeping the gasoline in your garage. I should think that the wisest and cheapest thing for you to do would be to pay the bill, provided, of course, the bill is not an exorbitant one. If you refused to pay the bill and the city officials acted arbitrarily in the matter, the ensuing trouble and annoyance would cost you many times the amount of the bill. If the Automobile Club maintains that the tax is unjust, it is up to them to fight the case in the courts, but I hardly think it worth while for you to shoulder the burden of establishing that fact. If you are a member of the Automobile Club, it would be well for you to notify them of your case so that if they determine to make a stand against the tax, they should include your case along with the others now under their observation.

1659 Wiring for Lights.

From Edgar Norris, Indiana.—I would like to know whether it is possible to wire a Ford, 1915, touring car, with a system whereby I can use the

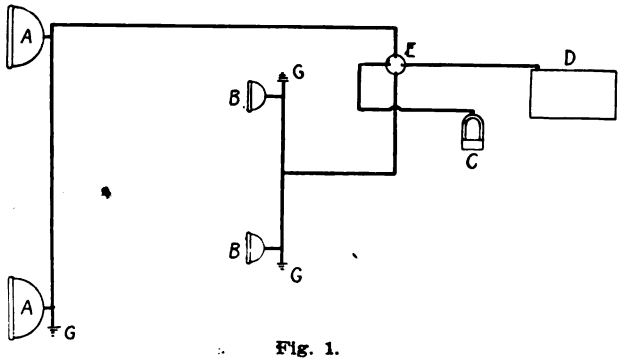


Fig. 1.

magneto and storage battery for lights. The idea being to shift my light in town to the magneto and in the country to the storage. It would save my battery some and also comply with the dimming ordinance, as one does not get enough light from a Ford magneto to blind anyone, except when in neutral and speeding the motor. I have asked several good electrical repairmen about it and they say it can be done, but cannot tell me how to do it, nor what kind of a switch to use.

Reply.—Remembering that the current produced by the Ford magneto is approximately of 12-volt

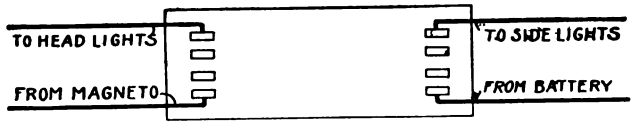


Fig 2.

strength, and that the three-cell storage battery is 6-volt, in order to use either source of current supply at will it would be necessary to have a rather complicated system of series and parallel wiring, except you were to wire your headlights for magneto current, connecting them in series so as to use 6-volt lamps and then wire your side lights in parallel with your storage battery, using also 6-volt lamps. The diagram accompanying this reply, Fig. 1, should be sufficiently clear for your understanding. AA represent the head lights, BB the side lights, C the magneto, D the battery, E the switch and GGG lamp grounds. The switch is a circular affair with

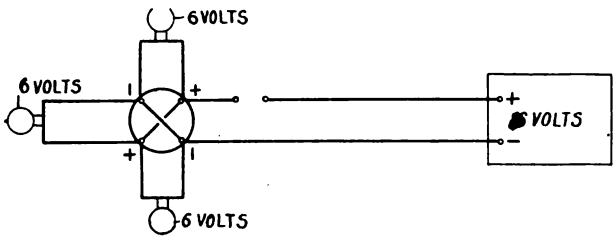
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four contacts and a lever which may be made to connect opposite contacts. If desired a double pole double throw switch might be adapted for use by making a metallic contact between the two arms, as in Fig. 2, a strip of soft copper being fastened under the insulated crosspiece to which the handle is fastened.

1660 **For a Dash Light.**

From C. F. Abbott, Maine.—As I am a subscriber to your valuable paper, I would like to ask you a question. I would like to put an electric light on my dash near the coil and take the current from the magneto. Will you send me a diagram of wiring and how and tell me how great a candlepower to use? My car is a 1914 Ford. Do you know of any company that sells this equipment?

Reply.—You can purchase from almost any electrical supply house or from garage stores, such an outfit as you describe. All you will need to do will be to run a wire from the one which connects the binding post on top of the magneto to a small switch, another wire from the other pole of the switch to one binding post of a small 12-volt lamp and connect the other pole of the lamp to the metal frame of the chassis or some part of the motor. If you can-



Electric Light Diagram.

not purchase small 12-volt lamps use two 6-volt lamps in series, running the current through both lamps and "grounding" the second one. If you connect the two lamps in parallel you will burn them out.

1661 **Magneto Bearings.**

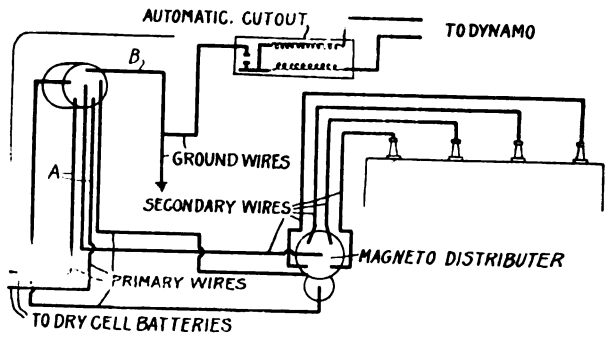
From John A. Kelley, California.—1—Can magneto armature ball bearings be reground? 2—Is there any way to take up wear in magneto armature ball bearings?

Reply.—1—The ball bearing races can be reground providing the proper appliances are at hand, such as are used in their manufacture, but it will necessitate using new and larger balls. New complete ball bearings are not expensive and can be purchased at almost any supply house. The number and letter on the bearing is standard for size among all ball bearing manufacturers. 2—No.

1662 **Starting Ignition.**

From George K. Weller, Michigan.—I have a model 79 Overland equipped with Gray & Davis starting and lighting devices, Willard storage battery, one wire or grounded system of wiring. Ignition is by Splitdorf magneto and coil, using dry cells for ignition in starting. Can I successfully attach my storage battery to the coil to replace the dry cells? I understand that in some systems using dry cells it is necessary to connect one of the wires to engine or car frame, or in other words "ground" one side of dry cell circuit, but on this car both wires from cells lead to coil and then the coil is "grounded" to engine. Would I "short" my battery in trying to use it for starting ignition? If possible kindly give wiring instructions. I suppose my inquiry should have been sent to the Splitdorf Company but it seems that it would be of general interest to discuss through your journal.

Reply.—If it were possible to dispense with the battery of dry cells, you may rest assured the Willys-Overland Company would do so. The only reason they furnish a battery of dry cells for this purpose is because it is cheaper than a separate 6 volt storage battery would be. When the starting battery switch is closed to operate the starting



Mr. Weller's Diagram.

motor, current can only be drawn from this battery for the purpose of starting. It would be an extremely simple matter to operate the engine, using the starting battery for ignition, after it is once started, but one cannot start and furnish current for ignition from the same storage battery. Grounding on the engine itself results in less resistance in the circuit than grounding one pole of the battery to the chassis frame. A hotter spark would be obtained if both electrodes of the spark plug were insulated and instead of grounding on the engine base the circuit could be completed without grounding at all. In your car one wire leads to the coil while the other leads to the switch. The opposite pole of the coil is connected to the magneto make-and-break mechanism. If both poles of the battery were to be directly connected with the primary winding terminals of the coil you would have a dead short circuit, and your batteries would last but a few minutes. You had better look your wiring over again and make a diagram of it, when you should be able to understand why both leads from the battery could not be connected to the primary winding coil terminals.

(SECOND LETTER.)

From George K. Weller, Michigan.—I shouldn't care to edit the "Trouble Department." When a fool question were asked I might be tempted to squelch the asker and incidentally make interesting reading for subscribers. In my case, if my question seemed foolish to you, I can assure you that I had given the matter considerable thought before writing you, and although you say that it would be a simple matter to use my storage battery for ignition after getting started, I fail to see how to do the wiring. The circuit from my battery to lights, horn, etc., is through positive wire to starting motor. The same terminal connects to the chassis frame, forming a circuit through the frame to the lights, through lamps, lamp wires to the switch, to the negative wire and back to the battery. These circuits,

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or the direction in which they flow, is reversed when the dynamo is charging. Now in some cases where dry cells are used for starting ignition, one pole of dry cells is connected to "ground" and the other to the switch. The circuit is through the switch to the coil, to the H. T. wire, to the spark gap, across the spark gap to the ground and grounded wire back to the dry cells. While in my case (as I see it) the circuit is through one of the wires (marked "A" in diagram) through the switch to the coil, to the H. T. wire, to the distributor, to spark plug gap, across the gap to ground, through ground wire "B" to a circuit, through the coil to the opposite "A" wire, back to the dry cells. If I have "doped" it right I can see no way to utilize storage battery current for ignition. If you can, and you did say so, will you kindly publish a diagram showing how it can be done.

Reply.—If you carefully read our reply you will note that we said it would be a simple matter to use storage battery current from the starting battery for ignition while this battery is not being used for starting purposes. You would simply connect the storage battery, by means of an independent switch, or a two way switch which would control both the dry and storage battery, in parallel with your lights, etc., and also in parallel with the dry battery. We do not advise it, however. It does not matter in which direction the current flows. The circuit, by which we infer that you mean the primary circuit, is not through the high tension wire nor to the distributor, the current flowing through these two elements being the induced or secondary current which in its circuit usually passes over a part of the primary circuit, and may be in the opposite direction at that. One of the battery wires is "grounded" when the switch is in battery position, completing the circuit through the make-and-break mechanism. If you were to use your storage battery for ignition you would have to put in an additional switch to perform the function now performed by the switch when using the battery of dry cells. We will not publish such a diagram as you request for we think by refusing to do so we will save some of our readers a lot of trouble, in case they were to attempt such a stunt as you apparently contemplate. Our advice to you is to forget entirely what we said in this connection and let well enough alone, unless you are prepared to replace your expensive storage battery, in case you should not make the connection correctly.

Remedy for Knocks and Thumps.

From Frank F. Casseday, California.—I see that several of your correspondents complain of knocks and thumps in their autos, and are unable to remedy or locate the trouble. Make a practice of washing out the radiator once a month with a hot soda solution. Drain all the water out of radiator. Put a large handful of common house soda to a ten-quart pailful of boiling hot water. Shut the drain cock and fill the radiator system full of this hot soda water. Turn your engine over a few times while the soda solution is in radiator. Empty and fill again and repeat until two pailfuls of the hot soda solution have been put through the system. Then drain the soda solution all out, and fill with clean cold water. You will be delighted with the effect on engine. The outside of cylinders become coated with rust and dirt and the soda solution cleans it off. This coating stops the radiation of heat and consequently the engine overheats, and trouble results. A similar condition is seen in steam radiators in buildings used for heating. Certain kinds of paint cut down heat radiation so much that their use is contra-indicated. If your auto is run up hill and down and is doing lots of work drain and wash out radiator system twice a month. The machine will do better work, will run easier and will make more mileage on less oil and gasoline.

For Starting the Ford.

From Dr. F. F. Casseday, Oregon.—Several of your correspondents have complained about inability to start their Ford cars after running for some time and standing from 15 to 20 minutes. I had some trouble on that score. The Ford plant here looked the car over carefully, but could not find cause. I have come to the conclusion that some gasoline engines should have a good supply of explosive gas in the cylinders when the engine is stopped after running for some time. It is my custom now before killing engine to open gas throttle wide and then shut off magneto. If in spite of this precaution the engine balks, turn the carburetor to right and shut off gas. Either or both of these will start the engine. After engine starts put carburetor back to place where it usually works when engine is running. Some drivers say they leave the carburetor in the same place all the time. That seems an impossible thing to me, for as weather conditions change from hot to cold less gas and more air, or vice versa, are necessary. Again when climbing hills, advance the spark until there is a knock, and drivers will be surprised and delighted how the Ford or any other car will climb hills on the high, and how little gasoline is used for road work and hills. It is no uncommon thing for me to get from 25 to 30 miles on a gallon of gasoline with my Ford, but to do this it is necessary to give the engine a good fat spark. The fat spark and free ignition burns up the gasoline clean, gets the maximum of power out of it, and keeps your cylinders clean of carbon.

Road Pigs.

From N. G. Near, New York.—While motoring with a friend the other day it was forcibly brought to my attention that there is a vast difference in the demeanor of our co-motorers, especially in the matter of turning out of the road enough to give a driver who is in a hurry an opportunity to pass.

My friend was anxious to make a town in New Jersey by a specified time and was therefore in a greater hurry than were the car drivers ahead. However, we weren't going fast. Ahead of us, in a certain length of road where there was room enough for two cars to comfortably pass there were six automobiles, all going in our direction. My friend "gave each the horn" and the five first drivers immediately turned out enough to allow us to pass. There was no hesitation whatever on their part about giving us what we wanted.

The sixth and last man, though, was differently constituted. He had several young ladies with him and evidently thought it was "smart" to block the path. Every time my friend sounded the horn I could see the front wheels swerve slightly "toward" the side on which we wanted to pass. My friend tried the other side then, sounded the horn again, and again the car ahead swung directly into our front. The ladies turned back and giggled, for, I suppose, they were just out for a pleasure ride any-

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way. After several miles this car turned and took a direction different from ours and we had no more trouble, but the incident created a most unpleasant feeling in all of us anyway. I am sure the conscience of the driver ahead must have troubled him.

The gravest danger in playing this game is the "madness" of the driver behind who wants to pass. I know of instances where he has lost entire control of his good sense and has crashed into the rear of the blocking car only to admit later that he did the wrong thing and voluntarily paid for the ruination of both cars. The blocking driver also usually admits that he was in the wrong, that he should have turned out, and thereafter views the subject from the more ethical standpoint.

My object in writing this, therefore, is to point out the fallacy of hogging the road, especially on a road where there is no dust, where there is plenty of room, and where you are traveling at a comparatively slow rate. Keep your head at all times. The best rule I know of, applicable to this case, is the old Bible verse, "Do unto others as you would have them do unto you."

Coasting and Compression.

From J. J. Gloudemans, Wisconsin.—Regarding the coasting test of N. G. Near which has been so vehemently criticized by F. L. Angier, I wish to state as my opinion that Mr. Near is right. Other things being equal, a motor with good compression will coast further than one with poor compression. The reason is very simple: The compression in one cylinder is fully neutralized by the simultaneous release of compression in another cylinder. These two forces counterbalancing each other, we may say that under good compression the engine runs idle, as far as the compression and release strokes are concerned, whilst under poor compression there is a continual air friction. This also applies to a one or a two-cylinder engine, because at the proper velocity the release immediately succeeding the compression in the same cylinder will act as a neutralizing force. In other words, whatever amount of power is necessary to push a piston up against the compression that same amount of power will be a help in pushing the piston down on its downward stroke, whilst the momentum of the flywheel or rather of the car itself will take care of even running.

Woodworth Leather Treads.

From Paul L. Maltbie, New York.—I wish to give you my experience in relation to the benefits derived in using Woodworth leather treads on my tires. I have read in your paper that some autoists are skeptical as to their use. Now I have a Buick, model B 25 car, which I purchased October 23, 1913, and I put the Woodworth treads on all four tires at that time. I have run the car over 4000 miles on brick, macadam and dirt roads, through ice, snow and mud. During the length of this period of time I have never had a blowout or a flat tire. I have never had any occasion to bother with my tires, only to keep them pumped up to a proper pressure, 70 pounds. It is a pleasure to motor when you feel confident that you are not going to have tire trouble. I would not drive my car without these treads. There is scarcely a time that I am driving along the road but that I meet one or more cars by the roadside, who are busy repairing a puncture or a blowout. I think to myself, when I see them, if they only had these treads they might be on the road rejoicing. I have never seen my inner tubes. I do not know if they are grey or red rubber. The rubber shoes are in perfect condition, like new at the present time. I have recently put on a new set of treads and expect to get over 10,000 miles wear from my tires. When I replaced the new treads, it offered me an opportunity to examine my rubber shoes, and I found them to be in perfect condition, as aforesaid. I find it much more economical to buy the treads than to buy new tires and new tubes destroyed by blowouts.

Gasoline Fume Dangers.

From Dr. Lester Curtis, Illinois.—It may interest you to know that from the four or five friends with whom I have talked since they read the article on auto-gas poisoning in your June number, I have heard reports of three fresh cases of the poisoning. Two of these were told me by trustworthy people and were probably true, but they were second-hand stories and I was unable to get the details of them.

I learned of the third case from the patient himself. He is a prominent business man, experienced with machinery and drives his own gas car. While busy one day in his garage he suddenly noticed that he was feeling unaccountably drowsy and weak. It occurred to him that he was suffering from gas poisoning. By this time he had become so weak that all he could do was to drop to the floor and with difficulty roll to the door. He was unable to turn the lock, but fortunately found a crack into which he pressed his face. After a time the fresh air revived him sufficiently to enable him to get the door open and escape from the garage.

The quick and insidious working of the poison is noticeable; the man's life was hanging by a thread before he suspected anything wrong. A little hesitation and loss of time would undoubtedly have been fatal, and he thinks, as I do, that he had a narrow escape. It is also noteworthy that scant heed was given to the case; little was said about the occurrence, and none of his family, whom I have questioned, seem to have known anything of it. Very likely if my friend's attention had not been called to the matter it would never have been disclosed. The first two cases appear to have been considered as incidents hardly worth mentioning. Such indifference to a serious danger is surprising.

If among this small number of people so many cases of poisoning have come to light it would seem that the total must be very large and therefore the situation is grave enough to call for serious consideration.

How to Clean the Differential.

From H. C. White, Pennsylvania.—I am a Ford owner and take care of my car individually, and to get good results from a car you must take care of the differential and clean and get the old grease out. When you come in from a trip, jack up the rear wheels, turn a quart of kerosene in the differential, then start the engine. Let it run for two or three minutes, then take a half-inch hose, 18 inches long, place it in the differential and siphon the grease out in a pail or on the ground, then refill the differential with a quart of clean kerosene oil. Run the engine slowly for five minutes, then draw or siphon the kerosene out and fill with new grease and you have

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a clean differential. This will show you how smooth the car will run on its chain bearings. Try it for the good of a Ford car and you will get results.

Installing an Ammeter.

From R. E. Ingalls, Washington.—Information is requested as to the proper method of installing a two-way, 30-0-30, ammeter on the dash of a car using the Delco Junior, single-unit, grounded-wire system. A connection from the main cable between the storage battery and generator works very satisfactory until the self-starter is used, then the ammeter promptly burns out. This is to be expected, inasmuch as the amperage is probably over 200, as I have been informed. The manufacturers of the Delco system send out a description and diagram of a method to install the ammeter. In this they advise to connect in on the wire leading from the generator to the switch; however, this only registers the discharge.

An Effective Tire Patch.

From Ray R. Lant, New York.—I have read with interest the article by C. H. Kenyon, on page 68, of your June issue, regarding a tire repair. I have a tire which had a hole similar to Mr. Kenyon's. I cleaned the opening and filled the hole with the tire plastic, making a head on both the inside and outside; then I cemented a blow-out patch inside. The tire was well worn when repaired and has had 1000 miles since, and seems to be good as long as the tire will last.

A Cementless Patch.

From Walter N. Benton, South Dakota.—I have found a handy way of putting on a patch without cement, providing you have got pure Para rubber. That is to take this rubber and wash it good with gasoline and let it get dry. Then wash it the second time and if the hole is not too big it will stay by pressing it on the tube good and tight.

Chauffeurs' Cramp.

From E. G. B., New York.—With reference to H. G. Scott's article on "chauffeurs' cramp," I wish to say that it is often caused by not giving the necessary room for the chauffeur, to allow more space in the rear of the car. Many accidents have occured owing to the cramped position of the car driver, this preventing him from being able to act quickly and easily. The writer experienced this cramp himself on one occasion and was glad when he reached his destination. The illustration, Fig. 1, clearly indicates how the cramp may be avoided by giving ample room for the chauffeur to operate the lever, pedals and steering wheel, and yet not be unnecessarily and uncomfortably cramped.

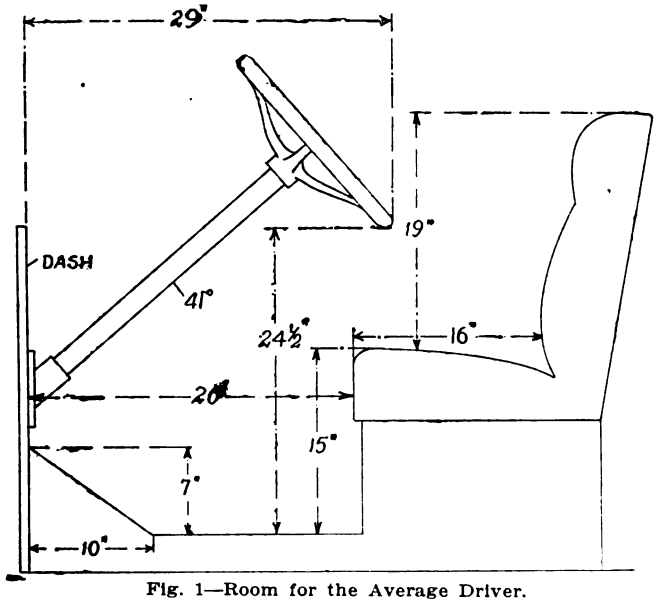


Fig. 1—Room for the Average Driver.

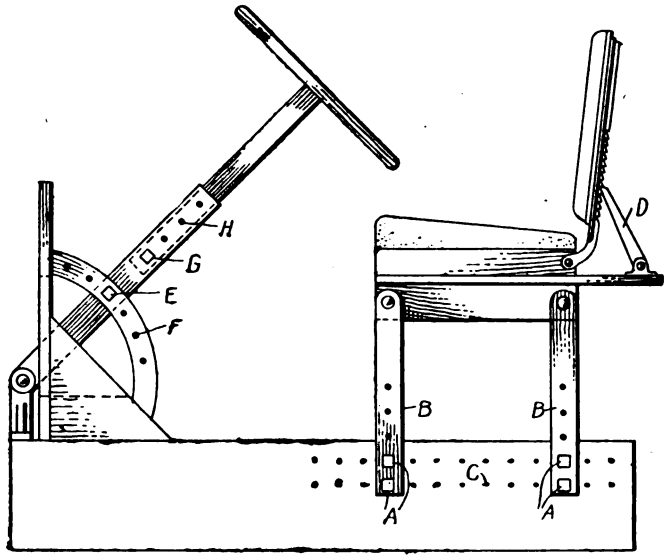


Fig. 2—Device for Regulating Seat Proportions.

In Fig. 2 is shown a useful device for those whose business it is to supply the right size and proportioned seat for the person who is to drive any car. The seat can be lowered by removing the bolts, A, and can be moved forward or backward by placing the bolt, A, through the leg, B, in the holes, C. The back of the seat can be adjusted to its proper angle by the lever, D. The steering column can be raised or lowered by removing the bolt, E, and placing it in the holes, F, or can be shortened or lengthened by taking out the bolt, G, and placing it in the holes, H. With this device put in use in the shop, garage or salesroom, chauffeurs' cramp would disappear.

Rear Axle Oil Leaks.

From H. C. White, Pennsylvania.—I am a Ford owner, a car of reliability for all purposes. I have overcome one of its evil tricks of throwing oil from one rear wheel. Many others have the same trouble. Take an old felt washer and place it or pack it next to the roller bearing and the trouble is ended. This may be of value to many that have not solved the problem.

Throttling Down Ford Cars.

From Morgan Howard, New York.—In the June number I notice one of the Ford drivers said that he could not throttle his car down to 8 or 10 miles an hour on high. I have a Ford car and use a K. W. master vibrator and five-point Bethlehem spark plugs, and I can throttle my car down to 8 or 10 miles and even lower.

A Piston Knock.

From Chas. R. Van Allen, North Dakota.—In relation to question No. 1623, headed "A Constant Knock," in the June issue, I think the answer would be a piston slap. I have some considerable trouble from this source.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, AUGUST, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

WHAT MAKES GOOD BUSINESS?

It is neither confidence nor optimism. If these are based upon reason and good judgment, they are extremely advantageous to the execution of good business, but something else is required to make it. On the other hand, if confidence and hope are not based upon favorable material facts, they are sure to meet with disaster and loss. A man may have never so much confidence that he can undertake a long voyage in a leaky vessel, but it will not affect the disastrous result. On the contrary, optimism and confidence have done about as much injury as help to business. Wisdom is as often "consumed by confidence" as it is strengthened by it.

Good business is made by one thing only, namely: The desires and needs of the people and their ability to satisfy them. A manufacturer may have the hope and confidence that he can sell automobiles, but if no one has the ability to buy them, or having the ability to buy them, if no one wants them, he will be unable to dispose of them. The wants of the people and their possession of the means to gratify them, is cause; the business of supplying them is effect.

Railroads with their freight and passenger cars do not make business; the business is made by the passengers and freight ready to be transported. Overflowing merchandise warehouses do not make business; the business is made by those who have the means and the desire to purchase them. A big stock of automobiles does not make business; the business is made by those who are ready to purchase them. It is true that the creation of railroads and cars, and automobiles and other merchandise, has made business, but their existence does not make it. Nor would they have been made without the prospect of potential business created by the wants of the people and their ability to satisfy them.

The most strenuous "campaign for business," the most hopeful articles in the press, the most glowing periods of the "captains of industry," and the strictest ban upon anything expressing caution or fear, have very little effect indeed upon business improvement, provided the consuming public have not the means to purchase.

Needs and the ability to supply them are the essentials to make good business and there is no substitute for them under heaven.

TRADING STAMP GENESIS.

Some of the influential retail hardware dealers of the country have begun a campaign looking toward abolishing the trading stamp evil. May they be successful. As to that matter, the whole business of offering premiums or gifts of any sort to stimulate purchases is a plant of noxious growth that should be pulled up, root and branch, and thrown beyond the pale of business.

The idea of offering a purchaser a reward of something he does not need or want to induce him to purchase something he does need and want, is wrong in principle and baneful in practice. We are not entirely convinced that it might not well be forbidden by law on the ground of being injurious to the public welfare. Of course this trading stamp business is most hurtful to those who can least afford to suffer the loss. It mostly attracts the poor and the ignorant. It has no attractions for the well-to-do although they often tolerate it when convenient.

But the underlying cause of the trading stamp and premium craze is of far more consequence than the thing itself. Under normal conditions there would be just as much reason for a buyer of merchandise offering a premium to some one who would consent to sell it to him as for a seller to offer a premium to a buyer.

It must not be overlooked that the trading stamp evil as well as the price-cutting evil are each a result of the tremendous present day productive capacity—a productive capacity that has far outstripped the capacity of the people to consume. As a consequence we see the most strenuous efforts being made on the part of producers to find consumers, and not securing the necessary purchasers through the ordinary methods of purchase and sale, they find it expedient to offer rewards to secure sales.

The fact is, all kinds of business is being overdone rather than under-done. One of our New York City papers was complaining the other day because the farmers around the city get such a pittance for their products while the cost is high to the consumer. The blame was foisted upon the retailer. But the retailer is not getting rich, by any means. In a majority of cases he is remaining poor. The principal cause of high retail prices is the fact that there are about three times the number of retailers there should be. In a given locality where one grocer could easily handle the retail trade, there may be four or five, and the four or five necessitate an ovehead charge of at least three times that of one. Result, high prices to the consumer. But you ask the grocer why he embarked in that business

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and he will say: "Well, I had to do something, and that offered as good a prospect as anything I could find." And there you are.

Of course, the foregoing is but a mere scratch of the great field of economics, but if it sets any one to thinking it will have served its purpose.

ASSEMBLED CARS.

Not long ago an assembled car was usually considered a somewhat inferior car, but among those who know, this feeling can no longer exist. A car composed of altogether assembled parts may be an unusually good one, and one which is mostly made in one factory, may be a poor one.

No manufacturer to-day produces all the parts of the car that is sold with his own firm name as an accompaniment, while as for its various accessories, such as the electrical equipment, the tires and the carburetor, 99 per cent. of the manufacturers do not make them.

In fact, wheels, radiators, bonnets, mudguards, ball and roller bearings, rear axles, chains, drip pans, valves, washers, wrenches, as well as other parts may easily be procured from specialists, and as good in quality and at less cost than they can be made by the manufacturer himself, no matter how much capital he may have. In this age of specialization and economy of production as well as superior product the most elaborate machine system and enormous output are absolutely essential.

Of course, there are some parts of an automobile that are covered by patent, and these require special construction. In such instances the manufacturer usually finds it a matter of economy to produce them himself.

But let no one ambitious to become an automobile manufacturer imagine that nothing more is necessary to produce a good car save the assembling of the parts and accessories which are produced by specialists. To produce a symmetrical car by such means is a task fraught with no end of trouble, and even when this is accomplished it is about as far away from becoming a successful automobile manufacturer as the possessor of a Webster dictionary is from becoming a successful orator or writer.

CUSTOM AND LAW.

Some one has said too severely, but not without a modicum of truth, that "Custom is the law of one description of fools and fashion of another." There is another class quite as unwise, which seems to delight in going contrary to both custom and fashion, and many in this last class are as anxious for distinction and to be conspicuous as are those who blindly follow both custom and fashion.

The fact is, however, if the custom or the fashion be a good one, there is no reason why the most wise should not make it a law, and if it be a bad or unreasonable one, why they should pay any attention whatever to it. But the thing that makes either a custom or a fashion popular is not so much its real merit—not so much as to what as to whom stands sponsor for it.

These being the facts, we believe that the concerted action of a few conspicuous and honored car owners in driving slowly and carefully and in living rigidly up to the road rules would be as contagious as any other custom or fashion practiced by the leaders of society.

Sooner or later the dangerous speed craze with its law violating and willful disregard of other users of the highways will stop. If there is no way to reach it by law, possibly it may be mitigated by the custom or fashion of courtesy. For illustration, there is no written law compelling a horse or motor-driven vehicle ahead to turn to the right and give one approaching from the rear an opportunity to pass to the left if the driver so wishes. As a result, this rule of courtesy seems to be "more honored in the breach than in the observance."

Attempts have been made in this State to enact what should be a willing custom into a written law, but they were unsuccessful largely owing to the opposition of the owners of horse-drawn vehicles. As a result, we have known of frequent instances where automobiles approaching from the rear have been maliciously prevented from passing slowly moving vehicles. Instances of this kind are so odious that if a law cannot be enacted to reach them, custom and fashion ought to be able to do so.

Indeed, in some rare instances, putting users of the highways on their honor has accomplished what the letter of the law has failed to do. The authorities of Fresno County, Cal., have recently placed at one side of each of the various highways entering the county a large signboard, with the following inscription:

MOTORISTS, ATTENTION!
YOU ARE ON YOUR HONOR.
FRESNO COUNTY HAS NO SPEED COPS.
DRIVE SO THEY WILL NOT BE NEEDED.
SPEED LIMIT, 30 MILES AN HOUR.
—Board of Supervisors.

It appears from reports that this sign has admirably served its purpose. But whether it has or has not, in cases where a law is almost impossible to enforce, "moral suasion" may well be appealed to, just as custom and fashion may properly be invoked in other instances where nothing else seems to be available.

FIRST RUDIMENTS OF PUBLICITY.

Those seeking publicity for their products, of whatever nature they may be, will do well to bear in mind that it is far better to state the merits of their own goods or devices rather than to state what is lacking in some other competing goods or devices.

There is no place where the truth of the old adage, "Comparisons are odious," is more conspicuous than in the matter of advertising. The public are anxious to know about the merits of what you have to sell, but they are rather indifferent as to your opinion of what others sell. Sometimes they are of the opinion you don't know what you are talking about, and sometimes they imagine you may be prejudiced.

It should be borne in mind that we are always glad to receive circulars or other information concerning new things in the automobile line, and as a rule we take it for granted that such information is reliable. The old method of distortion went out of date long ago. Good business men have learned that "the truth and nothing but the truth," is the best policy as well as the best principle. Yet they occasionally—and with good intent, no doubt—make comparisons, when it would be far better to merely give the merits of their own product.

And mention will be made in the editorial columns of this magazine of things that are not advertised as well as of things that are, provided they are of interest to our readers. But such notices are not

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likely to be as full or complete if the thing noticed is not advertised as if it were. For in the first instance, we are not interested one way or another as to whether or not it is of benefit to the one who receives the publicity; we are interested only in its benefit to the reader. In the last instance, we want the notice to benefit the advertiser as well as the reader, and this is our duty no less than our pleasure.

"WHAT'S HE TO ME?"

It is not often a writer has an opportunity to review his own book; or having the opportunity, that he would improve it. But lest some reader may get an incorrect impression from the advertisement on another page of this issue, we beg to state that "What's He To Me?" is strictly speaking not a great story, nor—if the writer's intention were fulfilled—is there any "fine" writing in it. It is merely a plain narrative of facts, *mutatis mutandis*, and is not fiction—"all of which I knew and part of which I was." If any reader should chance to send to the publisher for a copy of the book and learn by its perusal that the writer had a purpose in writing it other than to merely amuse or interest, the author will be abundantly satisfied. The title was suggested by that old, old question, "What is my fellow man to me?"

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Tossed from the Car.—A man and his wife were badly injured in Madisonburg, Pa., while traveling down a mountainous road. The brakes went wrong and the car was soon descending at a rapid speed. It finally struck a rut and threw the passengers out. They were both painfully injured and may not fully recover.

Death in the Rain.—While in a rainstorm, at Detroit, Mich., the driver of an automobile sent his machine in the path of a railroad train. It resulted in the death of three persons and the injury of three more. It appears that the driver was unable to see owing to the blinding rain.

Burned by Gasoline.—At Windsor, Colo., a man spilled some gasoline on the dashboard of his car when in the garage. When he finished filling the tank he threw the switch to start the engine and some of the gasoline that had fallen on the battery or coil ignited. With a sudden flash it enveloped him in a mass of flames. He was badly burned and it is feared he will lose his eyesight.

He Changed His Seat.—At Hartford City, Ind., while driving one man attempted to change seats with another and thus lost control of the car. The automobile jumped from the road, climbed an embankment and tore down six fence posts. Strange to say there was no great damage done.

Death Ends a Race.—At Los Angeles, Calif., there was a race between two automobiles when one struck a railroad car with terrific force. The driver of this car was killed. Other parties in the race were injured.

The Driver Looked Back.—Near Pine Lake, Wis., a young man and four women were in an automobile and the young man evidently was looking at something back of the car. At all events the automobile in which they were riding went off the road and he was killed. The young women were not seriously hurt.

A Slippery Hill.—At Logan, Utah, a car was being driven on a hill so slippery that it could not ascend it. The driver asked the four other occupants to get out and walk. They did so and he then started up the hill so rapidly that he turned out of the road and plunged down a steep embankment about 40 feet high. He was thrown out and rendered unconscious. The others rushed to his aid and in the darkness fell several feet upon the top of the car and some of them sustained severe injuries.

Plunged Through a Fence.—At Freeport, Ky., a boy was killed when a car plunged through a fence, when attempting to pass another car. One of the cars struck the fence post, beside of the road and broke eight of them, then plunged over an embankment and finally brought up in a field without any of the occupants being unseated. The occupant of the other car was not so fortunate and had his skull crushed.

Struck a Slippery Place.—In Marshfield, Wis., three persons were injured when a touring car upset on a hillside. It was going at a moderate rate only, but struck a slippery rut. The car turned over and the occupants were pinned beneath it. They were all more or less bruised, except a baby which was scarcely scratched.

A Spectacular Collision.—Two women were injured, one perhaps fatally, when two automobiles collided in Indianapolis, Ind. The impact was so great that both machines went entirely across the street, knocking pedestrians down and throwing the passengers of the car out. The drivers were careless in failing to observe the bank, but neither saw the other in time to avoid the collision.

Backed Down Hill.—Near Peoria, Ill., two men were driving a car, but were unable to make a somewhat steep hill. Near the top they met a horse and buggy coming down and the road was too narrow to permit them to pass. They jammed on the brakes but they slipped and gathering headway the car rolled down the hill. The car finally plunged into a gully and one of the occupants was killed beneath it.

Skidded in the Mud.—While driving a light car in Missoula, Mont., it skidded in the mud and before the driver could straighten it out it started down a steep embankment. It struck a telephone pole and was pretty well mutilated. Some of the occupants narrowly escaped instant death.

While Descending a Hill.—At Red Oak, Ia., a car became unmanageable in descending a hill and the occupants were thrown out. One of them subsequently died of his injuries and the others were very much cut and otherwise injured.

A Girl's Neck Broken.—Near Stroudsburg, Pa,. a night ride recently occurred which resulted in the death of one young woman and serious injuries to two others. The car was descending a steep hill and the driver was unable to take the sharp curve at its base and ran into an embankment. Some of the occupants escaped with slight injuries, but one girl's neck was broken. About the only things that were intact in the car was a quart bottle of whiskey and several bottles of beer.

Dropped Thirty Feet.—Near Fresno, Cal., a man and his wife were almost instantly killed when an

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automobile which the man was driving plunged off the road and dropped 30 feet into a creek below. It appears the driver was trying to pass a buggy and ventured too near the edge of the road.

Result of A Glaring Headlight.—In Grand Rapids, Mich., glaring headlights caused a collision of two automobiles and the serious injury of two persons. A woman was driving when she became confused by the blinding lights of an approaching car. She steered her machine to the side of the road and the front axle broke, causing it to overturn. Both the woman and her husband were pinned beneath the car.

Ran Into A River.—In Chicago, Ill., an automobile containing four passengers crashed through an open draw and plunged into the river. The occupants jumped, but one of them could not free himself and sank helplessly to his death. The other three were able to swim to shore.

Crashed Into A Locomotive.—Near Mannington, W. Va., two persons were killed and two others badly injured when the car which they were driving crashed into an engine of a railway train. It appears that something went wrong with the steering gear and they were unable to control it.

In a New Machine.—In Monrovia, Calif., a man purchased a new automobile, and it is believed became confused while trying to cross a railway track. The driver and his wife were instantly killed and the other occupant severely injured by the passing locomotive. The wreckage of the machine was carried 300 yards.

Caused By A Calf.—In Alexandria, La., five young men were driving at midnight and going very fast, when suddenly a calf came across the road before the car. It was struck and carried about four yards and then fell under the wheels upsetting the car and pinning some of the occupants beneath it. One of the passengers was taken to a sanitarium and most of the others were somewhat injured.

Turned Over by the Roadside.—While driving 18 miles an hour at Huron, S. D., the blow-out of a tire threw the car suddenly to one side, with the result that the driver lost his hold on the steering wheel. The car turned over and one of the passengers was caught under it. He lived only a few hours after the accident.

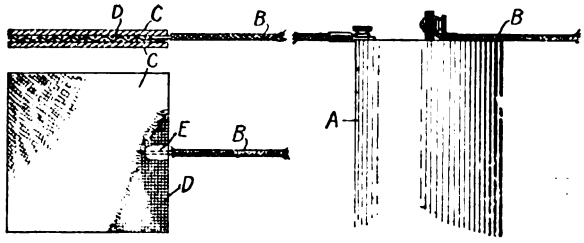
Ran Out from the Sidewalk.—Recently a party of young men were riding through Chatsworth, Ill., going to a ball game when two little boys about 12 years old ran out from the sidewalk intending to get on the running board. One slipped, falling under the car and his head was crushed, killing him instantly.

Struck a Phone Pole.—At Williamsport, Ind., one man was killed, two were seriously injured and another was painfully hurt, while speeding in a high-power car which struck a culvert, swerved to the side of the road, hurtled a wire fence and clipped off a telephone post near the ground, before landing in a field bottom side up, with the occupants pinioned beneath. Immediately after the car landed the gasoline tank exploded, setting fire to the machine with the men under it.

Fatally Struck a Rut.—In Racine, Wis., a party of children and young folks took a car out for a drive with a lad of 15 at the wheel. One girl was killed and several were hurt, and we will let one of the party tell the story. She said: "Howard had permitted me to operate the car for quite a while but when it started to become dark we girls asked to be driven home quickly, and Howard taking the wheel from me began driving fast. I asked him to drive slower. Suddenly one of the front wheels of the car struck a rut in the road and it seemed as though something went wrong with the steering gear as Howard apparently lost control of the car and it went skidding into the ditch and turned turtle. We were all buried underneath the car. Persons on the road must have seen the accident because very soon they were engaged in lifting up the car. Howard was held fast in his seat by the steering wheel. Lorena Schroeder did not move when the car was lifted up and we found that she was dead. She must have been killed instantly. Eleanor Schroeder and I were but slightly injured."

For Worn Nickel Parts.

From E. G. B., New York.—The device shown in the illustration, is for the purpose of re-coating worn nickel parts on automobiles. The necessary parts to construct this device is as follows: One dry cell battery, A, two wires B, two pieces of flannel C, four to six inches square; one piece of brass gauze wire D, four to six inches square. The wire that



Re-Nickeling Apparatus.

connects with the wire gauze is soldered to it as at E. After this connection is completed, sew the flannel pads together, with the gauze between as shown. The solution to be applied to the flannel pads is 6 ounces of nitric acid and 4 ounces of mercury. The application should be made in the open air and care be taken not to inhale the fumes as they are poisonous. This mixture should stand in a 2-quart jar till it stops boiling. Then add ¾ of an ounce of nickel, and let it stand a half hour. Then fill the jar with water. Now place the loose wire of the battery upon the metal to be re-coated and with the pad rub the worn part well. This will completely re-nickel the worn place.

Long and Short Stroke Motors.

The advantages of the long-stroke motor for a given piston displacement are lower rotative speed and consequently lessened depreciation of these, as well as less vibration. The pistons are lighter on account of their smaller diameter, which begets increased mechanical efficiency; there is less distortion of pistons and cylinders due to the heat of the combustion; temperature of cylinder walls and exhaust pressure are slightly lower than with a shorter stroke. The disadvantages of a long-stroke design are the heavier construction of the cylinders and their increased height, by which the center of gravity is somewhat raised; the pistons, assuming a certain number of revolutions per minute, travel farther than those of a short-stroke motor, with consequently greater side friction; and, finally, there is

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more difficulty of getting the oil past the pistons into the cylinder space.

Deadly Exhaust Gases.

From E. L. Ireland, Nebraska.—In a late number of your magazine, I notice an article on auto gas poisoning by Dr. Lester Curtis, of Illinois. His warning is indeed important. One should avoid working about a car when exposed to the exhaust gas while the engine is running. There should be special caution used not to run the engine in the garage while the doors are closed.

This danger of exhaust gas has been forcibly brought to my attention in two instances. In one case a brother of mine who was a very successful practicing physician was found dead at the rear end of his car with the engine running. The rear axle was resting on the jack which he had not removed before starting the engine. Evidently upon attempting to remove the jack from under the rear axle while the engine was running he was suddenly overcome by the exhaust gas thus leaving no possible chance to save himself.

I will cite another case that I know about personally. The Union Pacific Railroad has large gas engine driven passenger cars on some lines of its railway system. A few years ago such a car operated out from Omaha. On a certain occasion two of these motor cars were hitched together and when they reached the next station it was discovered that the motorman of the second car was overcome by the exhaust of the car ahead. The front end of his car was of course right behind the exhaust of the car ahead. This motorman died without regaining consciousness. It seems that one cannot discover his own danger in time to save himself. The particular danger is in working about the exhaust or under the car or in remaining in the garage with the doors and windows closed while the engine is running.

A Cheap Garage.

From E. G. B., New York.—The garage shown in the illustrations is made of brick and covers an area of 27 feet 1 inch by 16 feet 1 inch. It can be erected at a comparatively low cost. The plan, elevations and sectional views presented have been worked out carefully by the writer. There is no reason why even a cheap garage may not have a convenient plan and an artistic exterior, and I have enjoyed working out the problem. The arrangement which I have adopted makes a compact and convenient garage with little waste room. This last named feature may be incorporated in any garage, but it is one that is often neglected. The foundation excavation or ditch is 3 feet 7 inches deep. As for materials, brick being unusually cheap and of easy handling, I have used it for the foundation and walls, and it may also be used for the flooring and pit if so desired. The brick should be hard burned brick, laid in rich gray lime mortar, with all joints well slushed. I have adopted the flat style of roof, covered with sheet tin, as this is both cheap and otherwise satisfactory. It should be a good brand of I. C. tin, 14 by 20 inches, with flat seams, and made secure at the edges in contact with the brick wall. The windows on the sides and rear are all the same size. The two front windows each side of the door are smaller, being 5 feet by 2 feet. The window frames are all for light windows, and are box frames. The door of the garage is as per details, 1¾ inches thick with moulded panels. The upper panels are of glass to give additional light. The ceiling and roof boards are ⅞ by 4 inches Texas star flooring boards. The list of material used in the construction of this garage is as follows:

Lumber for roof beams, 365½ feet —15 feet 6½ inches x 3 x 6 inch beams.

Lumber for roof boards, 112 boards, 4 inches x 13 feet, or 1,456 feet.

Lumber for ceiling, the same as for the roof.

Tin required for the roof, 476 square feet.

Stone projection on the roof, 5 stones, 5 feet 2⅜ inches x 9¾ x 4½. Four stones, 4 feet 1¾ inches x 9¾ inches by 4½ inches.

Bricks used in the construction, 26,376.

Cement for floor and pit, 429 square feet.

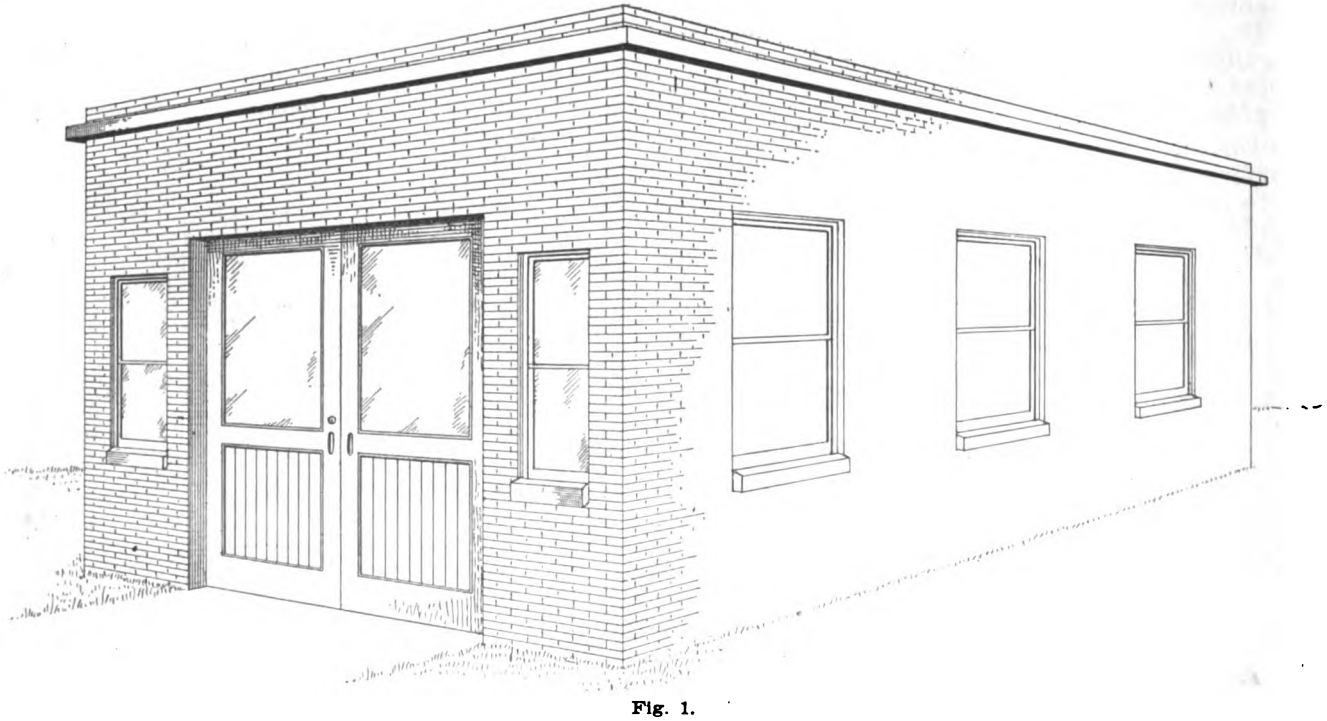


Fig. 1.

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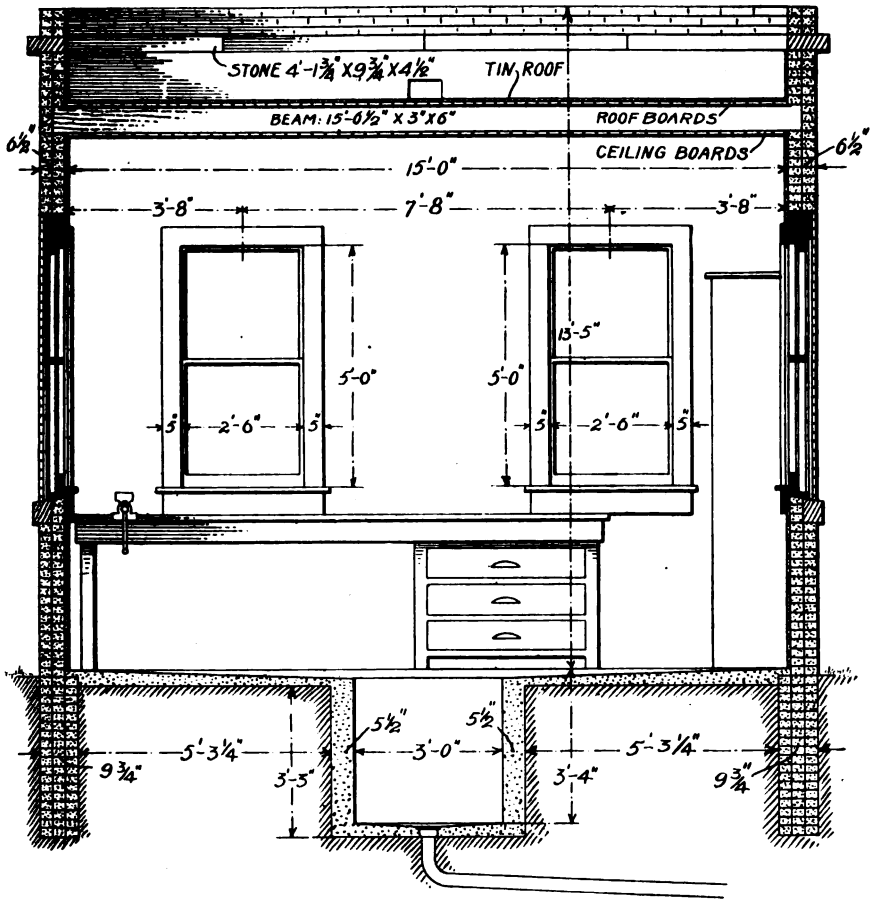


Fig. 2.

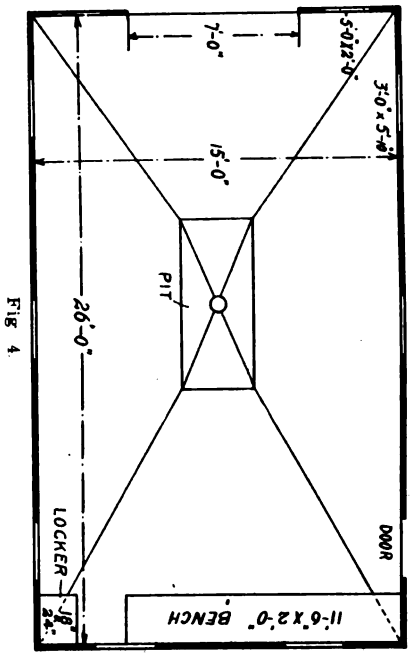


Fig. 4.

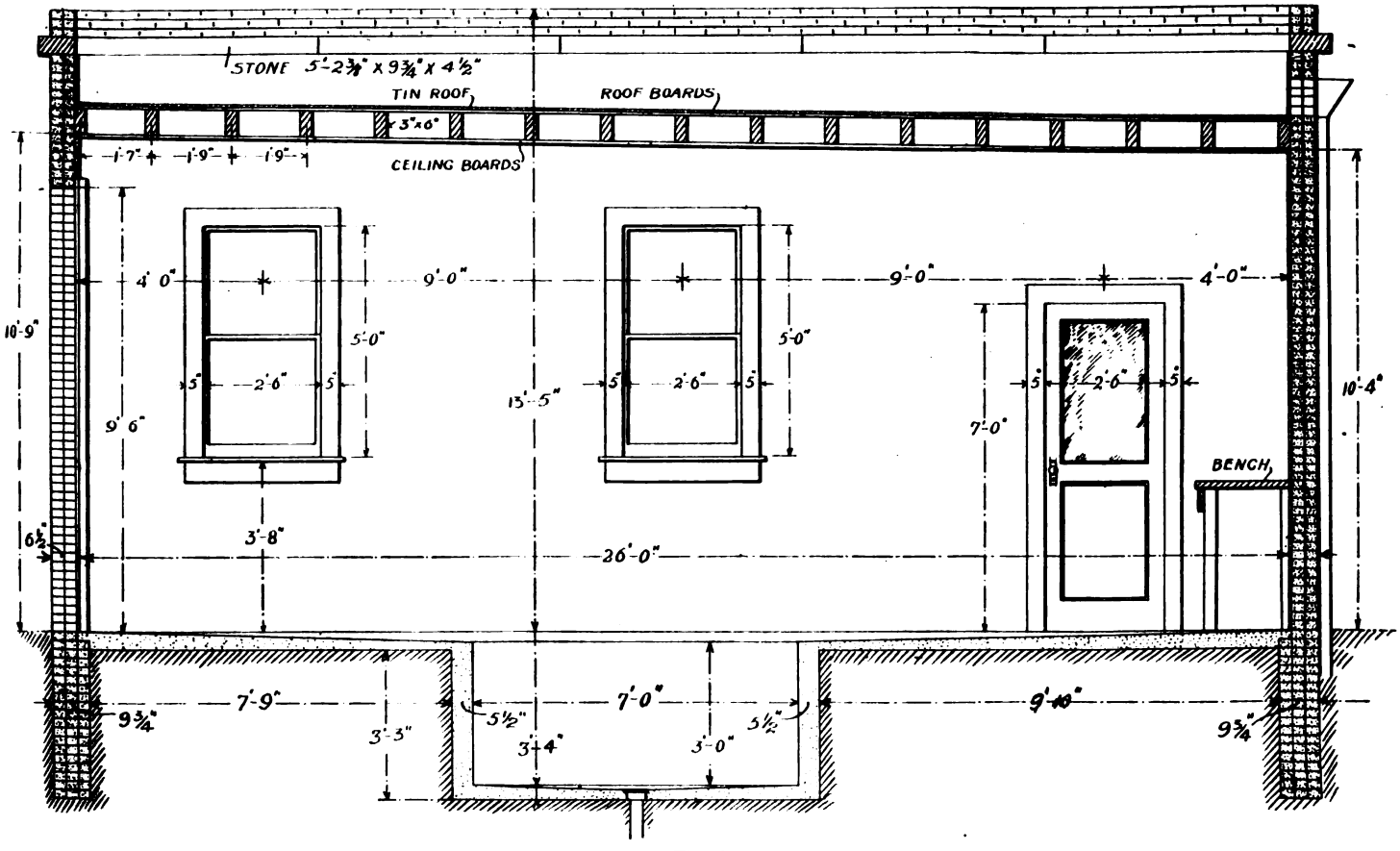


Fig. 3.

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HOW MANY CYLINDERS?

And Other Problems of Pleasure Car Motor Design.

A. P. Bush, Consulting Engineer, before the Society of Automobile Engineers in New York.—There is certainly a majority and probably a unanimous opinion among engineers that the small-bore long-stroke high-speed motor is the best adapted to automobile service, at least in pleasure vehicles. Let us make a brief analysis and see if we cannot accept this statement as an axiom, and base our further considerations of motor car engine design and construction upon this one fundamental truth.

In stationary work efficiency has pretty generally increased with the size of the cylinder, but this apparent contradiction can be easily rationalized if we begin at the beginning and consider the conditions and requirements of the class of motor car service in question. In the first place, weight reduction is a prime requirement; and relatively high speed is the most obvious method of securing weight reduction. In the second place, the class of service under consideration demands flexibility throughout a range unapproached in any other service. If from three to sixty m. p. h. be accepted as reasonable minimum and maximum road speeds on top gear, we have a 95 per cent. speed fluctuation, throughout which speed range our motors must operate satisfactorily at from zero to full power. In a high-speed automobile engine this might represent a speed range of from 125 r. p. m. to 2,500 r. p. m ., a range not only not impossible but not even difficult. For an extreme comparison, let us assume an attempt to get the same speed range on a large engine capable of say a maximum of 100 r. p. m., and we have the impossible minimum of 5 r. p. m. required.

It therefore becomes apparent that we can accept this small high-speed engine as the best adapted to automobile service because of two fundamental requirements, namely: low weight and flexibility. Before we can proceed intelligently in consideration of types and details, we should determine within some limits two things: how small a cylinder should be and how high the maximum speed should be; and in connection with these two questions we must give consideration to efficiency. Power is secured from an internal combustion engine, as we all know, in the following manner: relatively cool gases consisting principally of inert nitrogen are compressed by a piston. At the point of highest compression the relatively small amount of atmospheric oxygen and a suitable proportion of hydro-carbon gas by combustion suddenly raise the temperature and consequently the pressure of the whole volume of compressed gases. As the piston moves outward on the stroke succeeding the compression stroke, these high-temperature high-pressure gases do work upon it by means of their expansion. By keeping in mind this elementary outline we can by a little analytical reasoning begin to see some other reasons why our automobile engine must be both small and high-speed, and also why it cannot be too small without being too high-speed. Since its production of power is necessarily accompanied by high temperatures, and also developed by successive cycles in the same cylinder, and since the conduction of heat is limited in the materials we must use, it becomes apparent at once that there is a limit to the number of cycles per minute to which the non-water-jacketed parts (piston and exhaust valve) which come in direct contact with the combustion, can be subjected successfully. That this limit exists is evident from the necessity of water-jacketing these parts (pistons and exhaust valves) on large stationary engines, in spite of relatively low number of cycles per minute. It is well known that medium-sized engines, of say 10 inch piston diameter, which operate successfully at low speeds without water-jacketed exhaust valves and pistons, are incapable of being operated successfully at high speed under full load.

From this much of our analysis we might conclude that the smaller the cylinder diameter the better, but there is also one fundamental reason why the piston diameter should be kept as great as is consistent with continuous operation at full load and maximum speed, namely: the superficial area of similar volumes varies as the square of their similar line dimensions, while the volume varies as the cube of their similar line dimensions. This means that the smaller the combustion chamber, the greater is its superficial area in proportion to its volume, and consequently at a given rate of speed, the greater will be the amount of heat lost through the relatively cold confining walls.

The heat loss through the limiting walls of the combustion chamber is, of course, a function of the wall area factor and the time factor divided by the volume.

Since the time factor is in direct proportion to the speed, it is obvious that the smaller the volume of the combustion chamber, the greater the speed should and can be.

There is another effect of wall area to be considered. It is well known that the efficiency of a given volume of mixture handled as outlined increases as the compression is increased up to certain or, perhaps I should say, uncertain limits. The cooler the charge is at the time of ignition, the higher the compression can be carried.

The non-water-jacketed parts of the combustion chamber, while lower in temperature than the expanding charge, are considerably higher in temperature than the incoming charge. This being true, these parts pre-heat the charge during compression and thereby tend to reduce the efficiency of the motor. This pre-heating again is affected by the time factor and puts another premium on high speed.

In our analysis so far we have already noted that a physical characteristic of our structural materials (their heat conductivity) tends to set a limit on cylinder size for any given maximum speed at full power. There is a natural law which must also be considered in determining not only size but proportions as well. The strength of any structural element of any given material increases in proportion to its size as its size decreases. To illustrate, a steel ball one inch in diameter will carry several thousand times its own weight, while a ball of the same material one mile in diameter would fall apart of its own weight.

Two fundamental necessities in motor car service (light weight and great flexibility) can be met satisfactorily only by a motor design capable of continuous operation under full load at speeds at least as high as 2,500 r. p. m. From the preceding analysis it is obvious that the piston and exhaust valve diameters will be definitely limited, if satisfactory performance and durability are to be secured in the

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hands of the average user, and it is equally demonstrated that we must not go too far below these limits if satisfactory efficiency is to be secured, because of the already noted geometrical fact of relative volume and area ratios, in connection with the pre-heating and cooling effect of combustion chamber walls.

I will not attempt to say just what the best compromise between these two conflicting limitations is, but in my opinion the zone of satisfactory cylinder diameters lies between a maximum of 3½ inches and a minmum of 2½ inches, and I shall base further consideration upon this assumption.

Bore-Stroke Ratio.

Before we proceed to a discussion of advisable ratios between bore and stroke, I would like to consider briefly, from the efficiency standpoint only, the question of combustion chamber form. Heat and therefore power losses from the combustion chamber are a function of wall area and time. Actual areas as against superficial dimensional areas are least when the surfaces are smoothest; therefore it is desirable, if possible, to have the entire combustion chamber wall surfaces machined. Since a sphere has the least superficial area in proportion to its volume, it is also desirable that the combustion chamber form approach that of the sphere as nearly as structural limitations will permit. If it is found possible to solve satisfactorily the mechanical problems involved, we can safely conclude that inverted valves heated directly in the cylinder head give nearly if not quite the best form of combustion chamber which it is commercially possible to secure. The walls are entirely machined. The combustion chamber volume is naturally very exact, the form being cylindrical. In my opinion this is the most desirable form of combustion chamber and arrangement of poppet valves, and the mechanical problems involved have been solved satisfactorily.

Limiting further discussion to this type and arrangement, let us proceed to an analysis of the next most difficult compromise: the most advisable length of stroke; considering it first with reference to cylinder diameter, and second with reference to mechanical and structural limitations. From the standpoint of increased efficiency by reduction of heat losses through the combustion chamber wall, we must admit at once that for any given cylinder diameter the longer the stroke the better. Our consideration of this problem in compromise resolves itself into the question of how long a stroke can be secured without sacrificing more than is gained. With the assumed form of cylinder and combustion chamber the valves are limited to an outside diameter slightly less than one-half the bore of cylinder and to a throat diameter further reduced by the width of the valve seat. To meet the demands of flexibility, a power curve must be secured that will give good values above 2,500 r. p. m. We have therefore what we may term the valve-chamber-limit on stroke. This limit is sometimes urged as an objection to the specified type of motor. Very satisfactory power curve characteristics can be sevured with a stroke-bore ratio as high as 1.5 to 1, and the said type of cylinder construction and valve arrangement will show with as low a ratio as 1.33 to 1 superior efficiency to that of the longest stroke L-type cylinder construction which it is practicable or advisable to use.

Connecting-Rod Length.

So far our reasoning has led us to conclude that the modern tendency in engine design is in harmony with natural laws. One detail which there is a tendency to develop is, I think, in opposition to a natural law governing efficiency. I refer to the ratio of connecting-rod length to stroke. While there are the mechanical considerations of vibration and stress which put a premium upon connecting-rod length, the time factor as affecting combustion chamber efficiency puts a definite penalty on connecting-rod length. It is commercially impossible to make a rapidly working piston absolutely gas-tight. The temperature and pressure in the combustion chamber are necessarily higher at the beginning than at the end of the working stroke and the ratio of wall area to volume is greater at the beginning than at the end of the working stroke. Therefore, because of these three considerations, mechanical leakage, temperature difference and wall-area-to-volume difference, the time factor is most detrimental during the later portion of the compression and the earlier portion of the working stroke. Due to its angularity, the shorter the connecting-rod the less the time proportion of the compression and working strokes, coincident with high pressures, high temperatures and high wall-to-volume ratios; therefore, the shorter the connecting-rod the higher the combustion chamber efficiency at any given number of revolutions per minute.

Of course, high side pressure between the cylinder wall and piston is urged against short connecting-rods with their high angularity. However, with lubrication varied (as it properly should be) in proportion to the pressure delivered by the expanding charge upon the piston head, this becomes a negligible factor.

The questions of vibration and stress are, I believe, the two factors which limit the advisable shortening of the connecting-rod. These would disappear entirely if it were possible to construct pistons and connecting-rod upper-ends of zero weight. I have called your attention to this phase of motor design to emphasize the extreme value of light-weight pistons. It is not improbable that some of the light-weight alloys will be found satisfactory in small diameter pistons, but fail in large diameter pistons.

Let us assume, for the purpose of further discussion, that a cylinder of 3 inch bore and 4½ inch stroke, with inverted or overhead valves, will give the highest average efficiency and still meet satisfactorily the requirement of continuous prformance under full load at speeds at least as high as 2,500 r. p. m., or in other words when subjected to maximum temperature and pressures at least as often as 1,250 times per minute.

Number of Cylinders.

These cylinder dimensions give a displacement of approximately 32 cubic inches and can safely be relied upon to give, in the hands of the ordinary user, at least 3.2 h. p. at 1,000 r. p. m. (500 cycles per minute), and to approximate proportional power delivery throughout a wide range of higher and lower speed.

If two of these cylinders be combined in a two-cylinder engine, we have double the piston displacement per revolution with less than double the total engine friction per cylinder, and again, if the num-

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ber of cylinders be doubled, we again double the piston displacement but do not quite double the total engine friction per cylinder. In fact, increasing the power by multiplying the cylinders has a tendency to increase the efficiency of an engine so long as the same power per impulse is required.

The only problem which tends to decrease efficiency, as the number of cylinders is increased, is the problem of uniform and adequate charging of the cylinders.

I assume that no one will question the axiomatic truth that all other things being equal, the greater the number of impulses per revolution of the crankshaft, the greater will be the flexibility of the motor. This increase in flexibility due to increased cylinder numbers is of maximum value in automobile service, because it is an increase which is added entirely at the lower end of the speed range.

In view of these two obvious truths it becomes at once apparent that the problem of increasing the power and flexibility of an automobile on top gear is solved with the least reduction in efficiency by increasing the number instead of the size of the cylinders. There are other advantages besides efficiency in meeting the demand for greater top gear capacity by increased number rather than increased size of cylinders. One of them is the law already stated that a structural element is proportionately stronger as its size decreases, with its obvious corollary that the smaller moving parts are capable of operating more continuously at high speeds. Another is that the greater number of impulses tend to produce an engine whose operation is more satisfactory at lower speed. To sum up, the frequent-impulse engine is more pleasing in its operation throughout its entire speed range. Its speed range is wider, its durability should be greater, and its efficiency should be higher for a given degree of road ability.

Having started to reason along this line, one might be tempted to jump to the conclusion that there is no limit to the number of cylinders which are advisable. A moment's consideration will show the fallacy of such a conclusion. The end to be secured is to make the car as a whole more desirable from the user's standpoint. As in the achievement of any other worth-while purpose, there is a price which must be paid. The price which must be paid in the achievement of this particular end is an increase in mechanical complication. If we are agreed that the end is desirable and that the means outlined will achieve it, the problem which remains for discussion is the very common-sense one of how low we can make the price.

Fours.

There is obviously no reason for discussing any number of cylinders less than four, as it has been conclusively demonstrated that that number gives the least number of impulses per revolution of crankshaft that will be tolerated by the most economical class of motor car buyers. I believe that the four-cylinder motor will continue to be standard for the lowest price class of automobiles so long as the four-cycle internal combustion engine continues to be the acceptd source of power for this type of vehicle.

As I have already pointed out, two exceedingly important factors in the comfort value of a car, namely, power and flexibility, can be bettered by increasing the number instead of the size of the cylinders, with less sacrifice of fuel efficiency and with an actual gain in durability.

Sixes.

Let us now compare the two first steps beyond the four-cylinder vertical motor in relation to increased comfort value. I refer to the six-cylinder vertical and the eight-cylinder V-type motors.

For purposes of comparison let us assume the same cylinder dimensions, 3 inch bore and 4½ inch stroke. The six-cylinder motor will give an increase of 50 per cent. in power; the number of impulses per revolution will be increased 50 per cent. The cost of this increase will be the two extra cylinders with their pistons, connecting-rods, valves, valve operating mechanism and other minor supplemental parts. Also we must depart from the simple all-in-plane crankshaft of the four-cylinder motor, and to keep the same passenger capacity we must increase the wheelbase of the car something over two cylinder-diameters.

Eights.

The advantages of the eight consist in a 100 per cent. increase in power and a 100 per cent. increase in number of impulses per revolution. The increase in the number of major working parts is, as in the six, substantially in proportion to the number of cylinders added. I say substantially, because we must except two of the major working parts, the crankshaft and camshaft with their interconnecting gear, the number of these parts being the same independently of the number of cylinders.

In the eight V, however, we have this much less price to pay for the greater increase in power and flexibility; the crankshaft remains of the four-cylinder all-in-plane type; the increase in wheelbase need not be more than half of one cylinder-diameter.

I think, therefore, that we must conclude that the eight-cylinder V-type motor makes possible a decidedly greater increase in the comfort value of the car, as effected by motor performance, than the six-cylinder vertical, at a cost in dollars and cents and in car weight at least as low.

Twelves.

As a corollary to this, I think we must conclude that any lengthening of the wheelbase of the car, for increased engine space, and the introduction of a three-place crankshaft, can be justified only in case we wish to secure a 200 per cent. increase in number of impulses per revolution and a 200 per cent. increase in piston displacement over a four of equal cylinder dimensions; or in other words, if we wish to increase the comfort value of the car as effected by engine performance up to the point where the twelve-cylinder V-type motor is advisable.

V Fours.

I have been asked why, if a V eight or a V twelve is a logical motor type, why not a V four? In answer I would call attention to the fact that in V motors, if the impulses are to be evenly spaced and if advantage is to be taken of the possibility of working two pistons on each crank-throw, the angle between the V is the angle of crankshaft rotation between impulses, and the V four, having half the number of cylinders and consequently half the number of impulses per revolution, would require an angle within the V twice that of the eight, that is, twice 90 degrees, or 180 degrees. This would ob-

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viously give a form of engine quite impossible of installation within tolerable hood dimensions.

Vibration.

In connection with V motors in general, some interesting facts in major vibratory tendencies appear. Taking the V four, for example, if all cylinders would work properly on a single crank-throw, as compared with the vertical four of the same cylinder dimensions, all major vertical vibratory tendencies would disappear and in their place would be found a horizontal vibratory tendency just twice as great as the vertical vibratory tendency of the vertical four.

In the V eight as compared with the vertical four of the same cylinder dimensions, the vertical vibratory tendency disappears and in its stead there is a horizontal vibratory tendency of the same general characteristic, 1 3/7 times as great as the vertical vibratory tendency of the vertical four.

In this connection it has been interesting to observe that a properly constructed chassis seems much better able to absorb this horizontal vibratory tendency than the vertical vibratory tendency of the vertical four.

The V twelve seems to have the same major vibratory tendencies and characteristics as the vertical six; that is, instead of a tendency to reciprocate the entire motor mass with four reversals per revolution of the crankshaft, as in the vertical four and V eight, there is a tendency to set up periodic vibrations within the motor mass, the amplitude of these vibrations being in proportion to the work the engine is doing.

This six vertical and twelve V vibrations seems to be a function of overcoming it, by increased crankshaft and crankcase rigidity, is, some years ago by some of the foreign engine builders by use of a friction damping method. What we might term the American method of overcoming it, by increased crankshaft and crankcase rigidity, is, I think, much more scientific and workmanlike.

Overhead-Valve Construction.

I have referred previously to the fundamental advantages of the inverted or overhead-valve type of construction and made the statement that the problems of valve operation have been solved satisfactorily. In proof of the thermal advantages of this type, I would like to call your attention to the fact that in automobile engines this is the only cylinder type which has survived in the direct or air-cooled engine; and I believe this survival has been due almost entirely to, first, the inherent thermal superiority of this cylinder form, and, second, the brilliantly simple manner in which the problem of valve operation has been met, a method so simple that it has apparently escaped the attention and understanding of engine designers in general.

The overhead rocker type of valve-operating mechanism has been criticized as being noisy, because of the greater mass of the moving parts involved. With valve rockers pivoted at their centers, this is an obvious and inherent defect. It is the Franklin company's practice to locate the rocker pivot twice as far from the center line of the valve stem as from the center line of the push-rod. This means that for the same valving characteristics, the cam-rider, the push-rod and the push-rod end of the rocker have just half the movement, and consequently half the maximum velocity of the valve, and in turn just one-fourth the kinetic value in proportion to their weight, with the result that the kinetic value of all of the moving masses of the valve-operating mechanism is nearly if not quite as low as in the average practice in L or T type of engine designs.

The selection of this best commercially possible thermal form of cylinder and valve arrangement, in connection with the really splendid bit of engineering skill, has secured commercial quietness of valve operation in the air-cooled type of engine mentioned, in which owing to the lack of water-jackets quietness is most difficult to achieve.

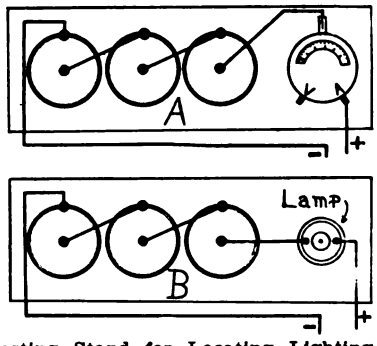
I believe that by taking one more step we can make this indirect valve-operating mechanism commercially superior to any other known type. By making the position of the offset rocker-pivot adjustable, the adjustment parts thus becoming stationary, in connection with the offset rocker and lightened moving parts there will be secured kinetic values at least as low as those of the best direct-action types, in proportion to the effective valving. In addition we attain a convenience of adjustment for the user that has not been approximately heretofore in any constructions with which I am familiar.

Conclusion.

Like the mechanism which we have been considering, a paper of this kind must be a compromise. From the standpoint of your patience, it is without doubt already too long, and from the standpoint of anything like a thorough discussion of the problems under consideration it is much too short. I have only attempted to touch upon the most important and fundamental problems of engine design and their relation to so-called pleasure car service.

Electric Testing Stand.

Grounds or short circuits in the lighting and starting system, and locating a wire of a group run through a conduit, requires a knowledge of the system and the use of certain equipment. Any owner can make a testing outfit which will serve all practical purposes, and which will form a valuable addition to the garage equipment.



Home-Made Testing Stand for Locating Lighting, Starting and Ignition Troubles.

Take a board about 12 inches long and secure three dry cells wired in series; that is, connect a zinc terminal of one to the carbon of the next and so on, leaving one carbon and one zinc post free. Take two 10-foot sections of lamp cord and attach one to the zinc post as shown at A. Attach a volt-ammeter to the board as shown and wire it to the carbon post of the right-hand cell. The other section of lamp cord is attached to the ammeter side of the instrument when testing for amperage, or to the

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volt post when determining voltage. The sketch at B shows a similar arrangement with a 3-volt lamp.

To employ the tester for locating a broken wire in a circuit, touch a loop of the lamp cord to each end of the suspected wire. If the lamp lights, the circuit is unbroken. If the circuit or wire be broken the lamp will not burn. To locate short circuits or grounds, displace one end of the wire and attach it to one loop. Touch the other end of the other loop or lamp cord to the metal of the chassis or parts near which the wire runs. The lamp will not light if the wire be in good condition. If it does, it indicates a ground.

The tester makes it a simple matter to locate a wire of a number in a conduit. Attach one end of any wire to a loop and use the other loop by touching it to the other ends of the group until the lamp lights, which will indicate the correct wire as the circuit is closed. It should be mentioned that the insulation should be removed from the free ends of the lamp cord. The testing stand can be utilized in many ways, but the ammeter side should not be employed when testing storage batteries.



CONDUCTED BY M. KEITH DUNHAM, OXY-ACETYLENE ENGINEER.

Readers are requested to state their questions clearly and fully, but as concisely as possible. It is hoped the information given will be of general interest as well as of value to each inquirer.

Welding Small Pieces.

From Walter R. Murff, Mississippi.—I have an Economy Junior welding plant, made by the Economy Welding Machine Co., of Kansas City, Mo. To successfully weld cast iron or steel 3/8 inch thick, and the piece weighing 5 pounds, I have to bring the metal to a red heat with the other heat, and hold at this heat until the weld is finished. I want to know if this method is right. Is the Economy Junior machine too small to make a successful welding outfit?

Answer.—Using charcoal or other methods of superheating a weld can only result in a better weld than if no other heat is used except the welding flame. At times, of course, it may be wholly impossible to heat with other methods and if the limit of your torch is three-eighths steel, you are certainly working under a big handicap.

For a small repair shop, the welding torch should be capable of handling one inch steel, without superheating. Your trouble then is undoubtedly the size of your welding apparatus. If you were using tank or dissolved acetylene, it would merely mean the purchase by you of larger tips for your welding torch, as both the regulators would be capable of delivering the necessary volume of gas.

I believe the plant you are using generates both gases: An acetylene generator of the carbide to water type, to operate safely and deliver reasonably pure gas, must not be called upon to deliver more than one foot of gas hourly for each pound of carbide capacity,—that is a generator with a capacity of 20 pounds of carbide should not generate more than 20 feet per hour. To weld three-eighths inch steel cold requires an acetylene consumption double this number of feet, so that you can readily see that if your generator is a small one, you are necessarily limited as to the size of your flame.

Would suggest you write the manufacturers and find out on what basis you could trade in your present equipment for one capable of handling your work.

Cutting Steel Bars.

From J. L. Schrieber, Mississippi.—I have some steel about 1/6 to 1/8 inch thick. I cannot cut it with a cold chisel. It is too hard. Can I cut it with an oxy-acetylene torch? Or will it draw the temper out? I want to cut it into strips about 3/4 inch wide. Will you please tell me what kind of an outfit I should get.

Answer.—Your proposition presents some difficulties but if the right outfit is purchased and you handle it intelligently, it will do this work satisfactorily.

Cutting with oxygen requires a flame, as well as a stream of oxygen. The flame merely heats the metal hot enough to permit the oxygen to attack the metal—to oxidize it—and thereafter the iron or steel is the fuel which is burnt up by the oxygen. The heat of this combustion in your instance must be confined to a very narrow limit; therefore the flame must be very small, the oxygen stream very small and so directed that it will not spread. Because of the speed of the process, the temper of the metal should not be drawn more than 1/32 of an inch and the width of the scarf or cut be not more than this distance also. Acetylene is not necessary in this instance—in fact, a gas of less heating power, such as hydrogen or coal gas, is more desirable.

In practice, you may find it necessary to clamp two or more of these plates together when cutting, in order to prevent to some extent combustion into the sides of the plates rather than through them or to clamp a copper plate to the steel plate you are cutting, so that the copper plate will absorb some of the heat. Write to any or all of the advertisers, outlining your requirements and make your purchase on a guarantee basis, with these facts in mind.

Welding a Crankshaft.

From Garden City Garage, Florida.—We wish to ask your expert advice as to how to go at welding a four-cylinder automobile crankshaft, so that it can be guaranteed to hold and run true. An early reply will please us very much.

Answer.—First prepare the break by grinding from both sides on an angle of about 45 degrees to a chisel edge—not to a point, as the latter way will allow the molten metal from the welding rod to attach itself to cold metal and it will be extremely difficult to effect a good weld. If the break is flush with one of the webs (a common break), simply grind the round portion of the shaft, leaving the web as it is.

If you have no V blocks, put the broken shaft in the lathe and start welding; if the break is in such a position that it is possible to do so, you can do the entire job in the lathe. If, however, it is necessary to get the shaft on end for some portion of the weld, take it out of the lathe when the welding has progressed far enough to hold the pieces firmly together and complete the weld on the welding table,

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or better still in a forge or charcoal fire, where you can keep the metal adjacent to the weld at a red heat by the fire, while making the weld with the torch. After the weld is completed, reheat in the fire slowly to a light red heat and when the shaft is cool, put it into the lathe to straighten or true it up.

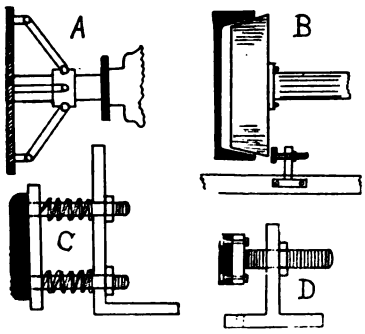
No matter how careful you have been in getting the shaft in alignment before welding, it is always necessary to straighten after welding, since the heat has to a certain extent, distorted the shaft in the vicinity of the weld. This straightening is rarely a long job, however, and you should look upon the shaft merely as one which is slightly bent or twisted and treat it accordingly.

The most important part comes here—the skill and judgment of the operator. If the shaft is one of a high carbon content, even a skilful operator will have his hands full in making a successful weld and an unskilful one would not get 50 per cent. strength. If it is comparatively low in carbon, the job is not so difficult. The welding rod should be as near as practical the same material as the shaft, the adjustment of the flame (as described in the July issue) most carefully made and the entire welding carefully carried out.

Steel welding, while apparently the most simple with the oxy-acetylene torch, is really the most difficult and unless you have welded this metal to a considerable extent, by all means do not start on a crankshaft, where in the event of your being unsuccessful in making a strong weld, the damage would be very high. Instead, practice first on mild steel plates, starting in on about ⅛ inch and gradually increasing till you are welding ½ in. Test each plate by bending back and forth in a vise until you know how to weld—and then tackle the crankshaft.

Clutch Stops or Brakes.

The failure to shift gears is not always due to the lack of skill of the operator, as it is not possible to change from one speed to another with some types of cars without a clashing noise. This is due to the clutch shaft spinning, imparting energy to the constant mesh gears. Many times the male portion of the clutch will continue to spin after it is fully disengaged, a condition due to the periphery of the clutch contacting with the flywheel member or female section. A worn bearing is usually the cause. This may be determined by starting the motor, engaging and disengaging the clutch, and noting if it continues to spin.



Clutch Stops.

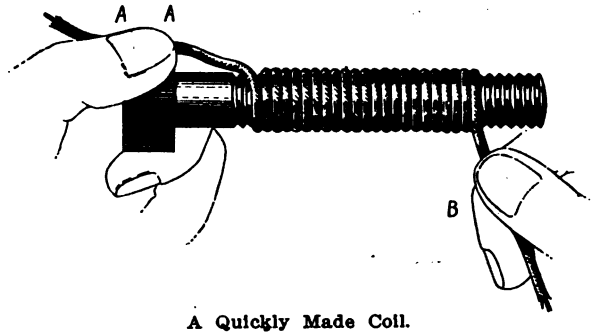
Clutch stops or brakes are fitted to a number of modern cars and are, as a rule, made adjustable. It is a simple matter to design and fit one of these devices to the old car, and the sketches shown will suggest four methods. That at B is adaptable to a cone type of clutch and consists of a T piece of metal bolted to the cross frame member or other convenient place. The stop is constructed of a bolt screwed through the T support and locked by a nut. The stop proper is made by securing a piece of sole leather to the bolt.

The design illustrated at A can be used with the dry disc or plate type of clutch. Secured to the gearset housing by the screws retaining the felt washer used to prevent leakage of the lubricant, is a disc of leather which can be cut so that it can be slipped over the clutch shaft. When the clutch is fully disengaged, the collar contacts with the pad, slowing down the clutch.

The illustration at C shows a stop of the adjustable type with springs for cushioning the contact. The stop is equipped with a leather pad which, like the design at D, is countersunk so that the bolts will be well below the surface. The drawing at D gives in detail the stop shown installed at B. The construction and installation will vary according to the design of car, but a little study will enable one to make and fit a satisfactory clutch brake at a slight expense.

Making a Coil.

From E. G. B., New York.—The illustration shown is a simple method employed in making a coil, either for the battery wires, or for coil connections. Holding the wire as at A with the thumb, and pressing on the bolt head firmly, holds the wire in place while winding it with the other hand, as shown at B. A bolt or round rod can be used to good advantage in forming a coil of this kind.



A Quickly Made Coil.

A Stone Bruise.

When the tire has hit a stone with considerable force, especially if the tire is not fully inflated, the inner surface of the tire will show injury to the fabric when the rubber on the tread has no mark of the injury. Such an injury should be repaired by putting a fabric patch over the injured place, and then inserting an inner protector all around the casing.

Vibrator Screws.

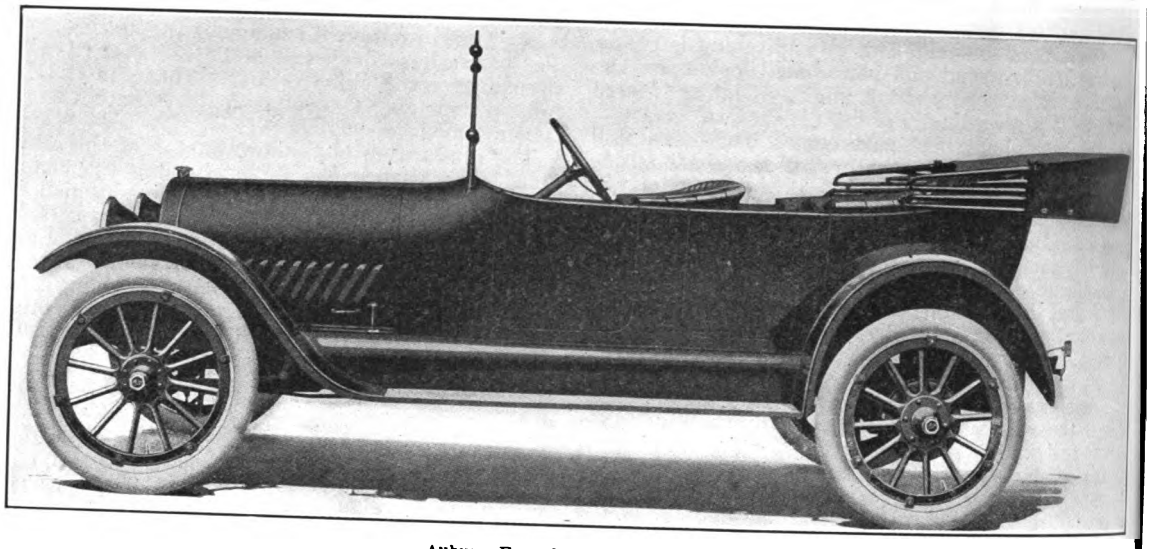
If the screws that hold the small brass brackets to the vibrator box become worn so that they do not hold, do not use longer screws. Longer screws may injure the windings of the coil and spoil the vibrator. Better put a metal band clear around the box and attach to dash with small bolts.

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MUCH FOR THE MONEY.

An Unusual Value for the New Auburn Touring Car.

The Auburn automobile, made by the Auburn Automobile Company, Auburn, Ind., is one of the surprises of even this year of new models and lower prices. Of course, no illustrations do it justice, for an inferior car will make as clean and attractive picture as the best that money and talent can supply. The beauty of an Auburn lies as much in the consistency of its performance as in the lines and finish that delight the eye of an artist. The body is a masterpiece of the motor car builders' art and there is an impressive artistry and refinement in every line.



Auburn Four-Cylinder 38 Horsepower.

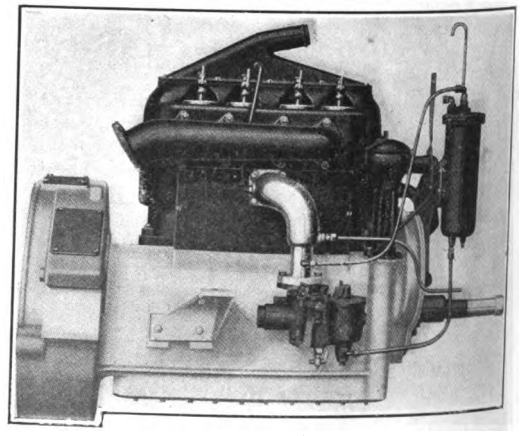
In the four-cylinder 38 horsepower touring car model, illustrated herewith, the chassis has a three-point unit power plant that includes motor, clutch and transmission. The motor is T-head, cast en bloc, water-cooled. The cylinders have a bore of 3⅞ and a stroke of 5 inches, a stroke bore ratio of 1.29 with an S. A. E. formula horsepower rating of 24 and on brake test 38.

The valves are unusually large, giving an open port of 2 inches. All valves are interchangeable and provided with cast iron heads electrically welded on nickel steel stems and operated by adjustable tappets which are case hardened and accurately ground to size.

To insure perfect carburetion the intake manifold passes through the cylinder block which completely jackets it with hot water. The carburetor is located on right side of motor and is automatic. The motor is provided with a centrifugal water pump located in front of the gear case.

The motor, while unusually short for its displacement, is provided with a three-bearing crank shaft, the cam shaft with three large bearings. The cylinders, pistons and piston rings are cast from a special grade of iron and are accurately ground to size. Each piston is fitted with three eccentric rings. They are ground on both sides, assuring a perfect fit in the piston as well as at the wall of the cylinder. The piston pins are made of chrome nickel steel hardened and ground. The connecting rods and crank shaft are of dropped forged carbon steel. The lubrication of this motor is by the patented splash system. The timing gears are spiral cut. Both the pump shaft and crank shaft gears are drop forged. The electric current for lighting, starting and ignition is created by generator and stored in storage battery. The starting motor is installed back of flywheel housing so that its pinion meshes with a hardened ring gear on rim of flywheel.

The frame is of the best steel channel section; all thoroughly braced and hot riveted. The springs are floating on rear axle pivoted to frame at center and linked in front, allowing free play in the spring action. The front axle is drop forged "I" beam section, heat treated, with integral yokes, drop forged steering spindles. The drive is by shaft through universal joint to floating rear axle. The steering gear is worm and gear, non-reversible, with the steering column at left side. The gear shift and emergency brake lever are at the center. The service brake pedal actuates contracting bands on the external face of, and the emergency brake shoes expand within the drums on the rear wheels. The



Intake Side 4-38 Motor.

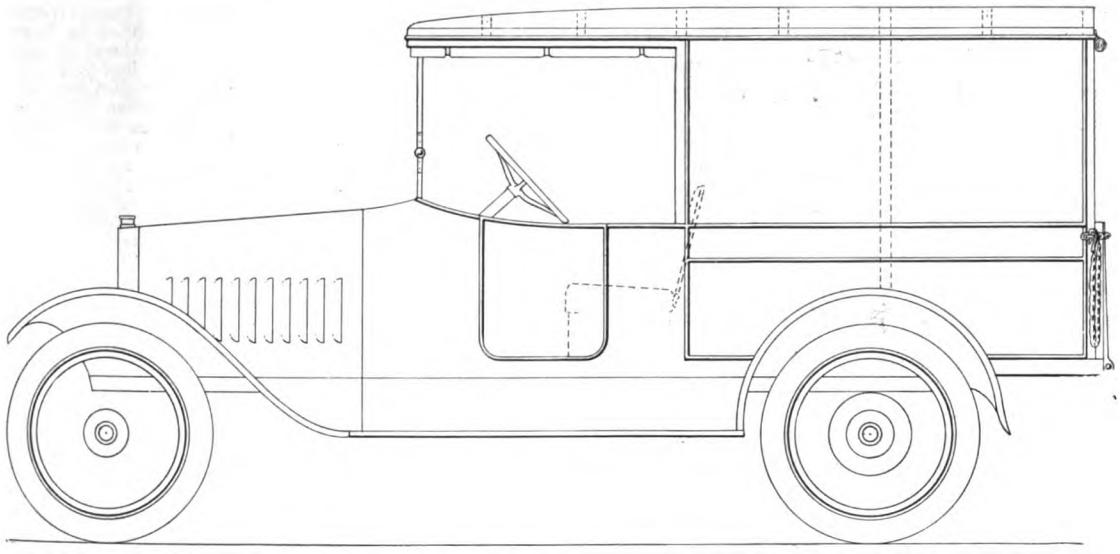
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wheel base is 114 inches; tread, 56 inches; clearance, 10½ inches.

The touring car seats comfortably five passengers. Four full "U" doors all with invisible hinges. Latch handles flush with inside of door. Tonneau equipped with collapsible robe and foot rails. Floor carpeted. Driving compartment covered with linoleum, aluminum trimmed. Pockets located in rear doors. Roomy roadster that will accommodate three average size persons. The rear deck is sloping with door on right side fitted with lock. In the rear of the deck is provided with additional storage space and wide door to permit easy access. The price is $985.

Body Design for a Saxon Chassis.

From E. G. B., New York.—The purpose of this model is for parcel and delivery service. It insures expeditious handling of light merchandise at a low cost. Being equipped with pneumatic tires, the safe delivery of its contents is assured. In this type of car two considerations are of prime importance; the driver's seat must be convenient of access, and the contents of the fore part of the body must be within easy reach of the driver's seat.



Commercial Body and Chassis.

The design shown in the illustration is mounted on a Saxon Six chassis, which has a wheel base of 112 inches, and a tread of 56 inches. The wheels are of artillery type, 32 inches by 3½ inch tires. Users of delivery service admit the advantages of motor propulsion. They are cheaper to operate, cover much territory, take up less room than horses and are of expense only when working.

The dimensions of the Saxon Six are as follows: Length, back of driver's seat, 5 feet; width, 4 feet inside; height, 4 feet 6 inches inside; tail board, 1 foot 6 inches. The body has four corner posts 4 feet by 2½ inches by 1¾ inches. Two center posts 4 feet by 2½ inches by 1¾ inches. Seven roof bows ¾ inch by 1¼ inches. Two side sills 5 feet 4 inches. One center sill 5 feet 4 inches, and three cross sills 3 feet 10 inches. The car has a rear drop curtain, and a side curtain for protection for the driver. The seat has a lazy back.

Steering Gear Lost Motion.

In most cars when the steering gear becomes worn and loose it can be adjusted as follows: Jack up the car front so that the wheels can be turned easily, until you feel looseness in the steering gear. Now loosen the three clamping bolts, one of which is at the ring end of the drop arm, the second on the part of the housing which incloses the eccentric bushing carrying the sector, and the third just below the slotted nut on the steering post. Having reached the position in which you can feel the looseness, the slotted nut should be tightened, that is to say turned down, until the play disappears. Then the wheels should be turned as far as possible to one side and the eccentric bushing turned; this brings the sector into closer engagement with the worm. Now the clamping bolts are tightened again. When the effect of this adjustment becomes lost and the small gear or rather sector wears out, the drop arm is removed after the clamping bolt has been taken out, and the steering wheel is given a turn and a half, thereby bringing a different portion of the sector in engagement with the worm. Then the drop arm is replaced, taking care that everything is tightened up properly.

Caught a Guinea Hen.

Mr. and Mrs. Elwyn W. Lovejoy, of Lowell, Mass., met with a curious experience recently. They had been visiting friends in a nearby country town, and were returning about 10 o'clock at night. Without warning something crashed against the wind shield of their car, breaking it and striking the back of the tonneau, just missing the occupants. A fluttering indicated a bird of some sort, which was secured by throwing a robe over it. On reaching home they found a guinea hen. She had probably been attracted by the headlights of the car.

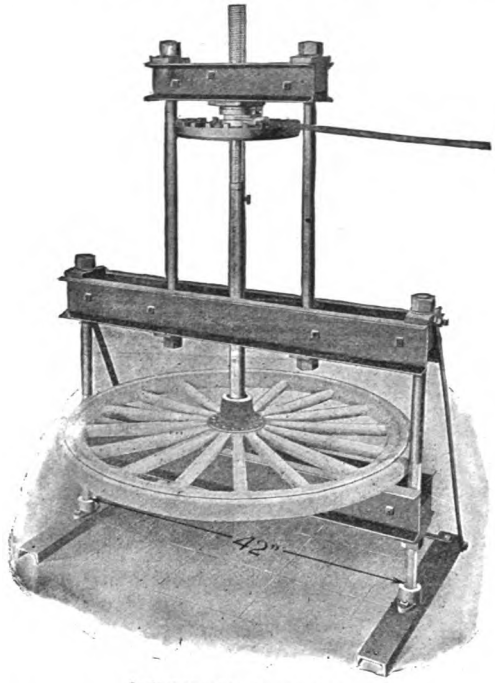
Spots on the body of the car or fenders due to spatters of tar from roadways that have been tar-surfaced, may be removed by washing with soap suds containing a small amount of kerosene oil.

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NEW AND INTERESTING THINGS IN MOTORDOM

The Universal Auto Press.

Illustrated herewith will be found a press that will take in every piece of work any garage is called upon to do.



Indispensable in the Garage.

It is quick in action, and its general construction will easily be seen by the illustration. It takes work 42 inches wide and thus has an unusual large capacity. It is useful for strengthening bent axles, for pressing a crankshaft out of a flywheel, and for many other jobs that no other machine will handle. It is made by the United Engine & Mfg. Co., Hanover, Pa.

A Lock for Ford Switch.

A lock that secures the switch and coil-box of a Ford is manufactured by the Stewart Specialty Co., 79 East Chestnut street, Columbus, O. It consists of a hasp-like hinged bar that fastens at the top of the box and, when locked, passes down over the switch and slips over a steel loop at the bottom; a padlock is hooked into the loop and snapped shut, locking up the whole box. The bar is turned up on its hinge when the car is in use.

A Silencer for Ford Cars.

A new and useful accessory for Ford cars has been brought out by the J. W. Saaborn Mfg. Co., of Hampstead, N. H. The manufacturers state that this device absolutely stops all rattle in the spindle arm on Ford cars. It is put in from the front with nippers and when once inserted will stay indefinitely. These silencers cost only 50 cents per pair, and any Ford owner who will try them will be quickly convinced of their merit. Agents are wanted throughout the United States and patents on the device are pending. Correspondence is invited not only from car owners but from supply dealers throughout the country.

Coil Current Adjuster.

A method of adjusting and equalizing the current flow through the coils of a motor ignition system is supplied by the Roberts Instrument Co., 56 Shelby street, Detroit, in its spark coil current indicator, which is simply a specially constructed and calibrated ammeter. Two types are made, one for pocket use and the other for switchboard mounting. The instrument is shunted into the coil circuits one at a time and the coils adjusted until the current consumption is equalized and is as low as is commensurate with the best results. The capacity is 3 amperes.

Reduced Prices for Dort Cars.

The new Dort car now sells for $650 with a complete outfit including electric lighting and starting, one-man top and other essentials. The first car of the present type, which was exhibited at the New York show last January, was listed regularly without the electrical system, but with it as an extra the price was $743. The large volume of business done during the intervening months, coupled with the resulting production economies, however, has justified the substantial reduction. The car in general remains unchanged, barring detail improvements. It is of conventional, light construction, having 105-inch wheelbase and 30x3½-inch Goodyear tires on demountable rims, 50-inch cantilever springs and three-quarter-floating rear axle. The body is a comfortable touring type and it carries speedometer, electric horn and gasoline gauge in addition to the other equipment mentioned. A roadster model, having a smaller motor also is to be produced, which will sell for $540.

A Good Book for Ford Owners.

The Norman W. Hensey Publishing Company, 132 Nassau Street, New York City, has recently published a book entitled "The Model T Ford Car, Its Construction, Operation and Repair." This work is by Victor W. Page. It is cloth bound and contains 300 (5 by 7) pages, and includes over one hundred specially made diagrams and half-tone illustrations, all in correct proportions, and also two large folding plates. This is the most complete and practical instruction book ever published on the Ford car. All parts of the Ford car are described and illustrated in a comprehensive manner and nothing is left for the reader to guess at. The construction is fully treated and the operating principles are made clear. Complete instructions for driving and repairing are given in a non-technical yet thorough manner. The price of the book is $1 and it will be sent by addressing the publishers or the Motor Vehicle Pub. Co., 71 Murray Street, New York.

A New Line of Automobile Accessories.

The Kennedy Mfg. Co., 14 East Jackson Blvd., Chicago, Ill., are making a line of new goods and devices for automobiles, which are unusually attractive. They are made of steel and the finish is so perfect that one might think they were leather. Their bags are no heavier



Standard Kit With Tray.

than leather bags and are built to stand the wear and tear of the hardest use. They make suit cases, trunks and tool kits, as well as other useful articles, which are waterproof and watertight. Anyone interested should address the firm as above.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

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A New Ford Car Device.

The Badger Automatic Safety Steersman for Ford cars is an insurance against accident, caused by a balky steering wheel. It will keep the car in the road and release the driver from the fatigue of steering. It is sold on a money-back guarantee and is made by the Safety Appliance Co., Baraboo, Wis.

A Garage for $69.50.

The Edwards Mfg. Co., 423-473 Eggleston Ave., Cincinnati, O., make a steel garage 10 x 12 feet, ready to use, which they sell for the unusually low price above mentioned. It is fireproof, portable and quickly set up. A postal card will bring an illustrated catalog containing full information.

A New Garage Air Compressor.

The Brunner Manufacturing Co., Utica, N. Y., are making an unusually good air compressor for garage use. Anything of this sort is indispensable in



Brunner Air Compressor.

a first-class garage, and those interested should send for complete catalog and the name of the nearest agency of the firm.

An Interesting Story.

WHAT'S HE TO ME? By A. A. Hill, Howard O. Bullard, Publisher, 48 New Chambers Street, N. Y. Price, $1.00. This story deals with newspaper and business life, one of the important characters being an editor and publisher, and possibly it may be somewhat auto-biographical. The Brooklyn Eagle says: "It will be read for its spirit as much as for the story itself." The Democratic (N. Y.) Register says: "It is worth reading if only to get acquainted with "Don," "Helen," "Vera," "Rolka," "Mrs. Rolka," and "Uncle Ben," all lovable characters, which drive away all sense of drowsiness on the part of the reader, who does not want to go to sleep while there is a page unread. We thank Mr. Hill for being the means of keeping us awake till the last page was turned over and digested."

An Ideal Headlight.

H. J. Jaeger & Co., Hoboken, N. J., make an automobile headlight which gives an unusually concentrated and uniform light. It is patented and all persons are warned against its manufacture or use, except coming through the patentee. This firm also makes an automobile lamp, which they claim consumes only one-half the amount of electric current that is used in the Tungsten lamps. It has a close focal adjustment and the bulb will not blacken. Dealers or others interested should send for a circular to the address given above, and receive full particulars.

A Ventilated Engine Hood.

There is nothing more conducive to comfort and a cool engine than a ventilated engine hood. Almost every car owner knows this, and yet very few indeed know where to get them. R. G. Ames & Co., 1339 Michigan Avenue, Chicago, make a machine which is guaranteed to ventilate the engine hood in 15 minutes and do it as neatly as if done by the manufacturer before it was painted. It will thus be seen that the cost of the work need not be heavy and yet it will be extremely profitable for the one owning the machine to do it. Garagemen make as high as from $25 to $50 a day ventilating engine hoods, and those who are interested are advised to address the firm as above given for full information and prices.

Tire Lock for Overland Cars.

The New Era Spring & Specialty Co., of Detroit, Mich., are making a lock for tires on the Overland car, which takes the place of the upper strap that holds them. They can be attached easily and quickly and insure tire safety from theft. The price for either the single holder or double holder is low, and there ought to be a wide sale for them.

A Convenient Turntable.

The Rochester Mfg. Co., of Rochester, N. Y., are making a steel turntable with full ball bearings, which may be installed in a few minutes. It is easily operated, and absolutely guaranteed. By addressing the firm as above full particulars may be learned, including the price.

Wheel Rims.

"The trend of automobile rim design is toward simplicity and lightness," says E. R. Hall, of the Goodyear Tire and Rubber Co., Engineering Department.

"This development toward lightness will be hailed with delight by many automobile manufacturers, tending, as it does, to reduce car weight and tire expense. The rims now being placed before the dealers for this year's selling harmonize with the principles sought by many car makers.

"It is the consensus of opinion among dealers and manufacturers that the transition from the cumbersome to the simplified type, will soon be effected. Our quick detachable rim shows this trend to a high degree. The side ring and the locking flange are combined and can be snapped off the wheel in an instant—and off slips the tire. After the tire is replaced the side flange snaps into place without effort. Following as it does a period of economy tests to determine tire expense, this simplified type comes at a most opportune time. This rim design also gives to rim sales that air of newness that is so essential to a successful selling season.

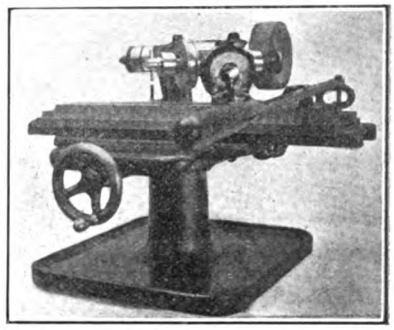
"With our detachable demountable rim you can not only slip a tire on and off quickly, but you can remove the tire and its rim from the mounting, and replace it with an extra tire on an extra rim. The rim bases of both types are solid—weatherproof and waterproof, eliminating the split that punctures tubes and destroys the trueness of the circumference. Our fastener is designed to wedge the demountable rim on the wheel so tightly that no squeaking can result from the play of the rim on the felloe."

Repair Parts for Ford Cars.

The Grossman Auto Parts Co., of White Plains, N. Y., are selling repair parts for Ford cars, which are guaranteed at greatly reduced prices. They can furnish practically everything that may be required, as well as gears, springs and piston rings for over forty different makes of cars. A complete list of the parts they manufacture will be sent, with prices, to any one who will write for it.

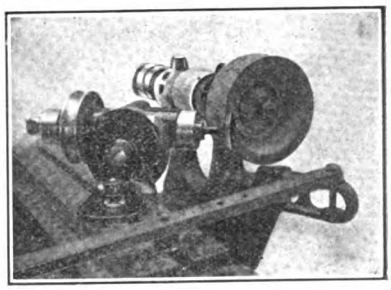
A New Valve Grinder Attachment.

F. E. Wells & Son Co., Greenfield, Mass., have recently brought out a new attachment for their No. 160 or No. 162



F. E Wells & Son Co's Valve Grinder.

"Wells" grinder to be used for re-grinding the valves for Ford engines, although this attachment is also suitable for use in grinding other gasoline engine valves. The illustrations show the grinder set up for grinding the faces of



Set for Grinding Ford Valves.

Ford valves at 45 degree angle. The valve stem is held in a collet and different size collets can be used and supplied for holding various diameters of valve stems.

Magneto Repairs.

The General Magneto Repair Co. announces its removal to 258-260 Halsey street, Newark, N. J., where larger and better accommodations have been secured. They have a full line of special tools, machinery, jigs and repair parts for all lines of magnetos, lighting and starting systems, coils, etc., and are in a position to give better results than you have been receiving in the past and at less cost.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Parts and Accessories.

Illustrated herewith will be found three devices for the automobile among the hundreds if not thousands sold by Stevens & Co., manufacturers of auto and cycle specialties, 375 Broadway, New York. Fig. 1 is a reminder to the driver



Fig. 1.

to resist the frequent temptation to take a chance in a tight place; though, as both sides are alike, it also flashes this hint to the pedestrian. Will fit all radiator caps — also the Ford. Fig. 2 is the Stevens Reserve Valve. Its purpose is to retain one gallon of gasoline in the tank as an emergency supply so that it will be impossible to run dry without warning. It provides convenient shutoff for the gasoline supply to the carburetor while making repairs or in case of fire or accidental leak. The valve is arranged to screw into the tank of any Ford between the tank and the sediment bulb.

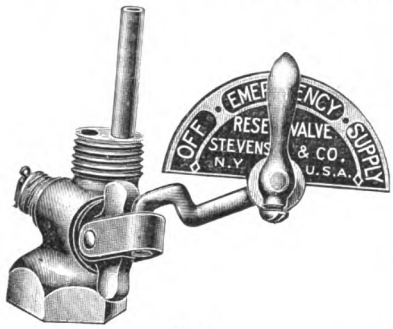


Fig. 2.

Fig. 3 is a Ford Cylinder Tap and Drill Set, for removing broken cylinder

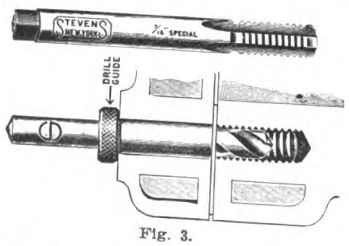


Fig. 3.

head and water connection bolts in Ford cylinders. Ford cylinder head bolts often shear off in an attempt to draw them up too tight and every repairman is familiar with the difficulty of removing the threaded portion that remains in the casting. The operation is simple. A special drill bushing is furnished to guide the drill through the center of the broken bolt so that only a small section of the threads remain. The special tap is then used to clean out the hole leaving it free and ready for a new bolt,—the same size as the original.

Better send for their complete catalogue which illustrates and describes hundreds of unique and valuable devices to make motoring more pleasant and economical.

Carbon Prevented.

A new mineral oil product, manufactured by the Noncarbon Co., 1765 Broadway, New York, has been placed on the market. It is designed to bring about a more complete combustion of the fuel charge in the motor and at the same time prevent the formation of carbon in the cylinders, piston, spark plugs and valve seats. The solution is composed of petroleum products of a solvent and cleansing nature. It is mixed with the gasoline in the proportion of ½ pint to 4 gallons of gasoline and acts with each combustion of the fuel charge. The effect is to cause the carbon to remain in a fine sooty state and it will be blown out with each exhaust of the piston. The manufacturers claim it will not only keep the cylinders free from carbon but will clean them of any deposits that have already been formed.

Used Car Service Coupons.

A marked innovation in the selling of second-hand cars has been inaugurated by Earle C. Anthony, Inc., of Los Angeles, Cal. Henceforth every second-hand car sold by the firm will carry with it a coupon book, good for a certain number of hours of free service labor on the car. The books are identical with those that the concern has been issuing with new Packard and Reo cars sold by it for the past three months, and the coupons are honored not only at the Anthony shop at which the car is purchased, but at every one of the 177 Anthony service stations.

Improvement for the Ford Car.

The Davis-Boyer Co., Detroit, Mich., have anticipated a growing demand for a body equipment for the Ford car chassis. It converts it into a classy roadster and makes it an unusually attractive car. It is not a cheap outfit, but is built substantially and well finished. It will give the best of riding qualities and ample room. It includes not only the body, top and shield but the radiator, starting crank, hood, and in fact everything used above the chassis. It is understood that the price for this outfit is low, considering its high qualities. It really converts the Ford car into something roomy, convenient and in every way desirable.

Ford Car Specialties.

The Peerless Motor Specialty Co., Inc., 136-146 West 52nd Street, New York, are making many exclusive specialties for Ford cars, which they guarantee not only as to quality but price. Among the parts they supply is a coil ignition system, which they claim will give complete freedom from all ignition troubles, an automatic oiling system, shock absorbers, silencers, etc. For prices and their special proposition, please address the firm as above.

Lighting and Ignition Batteries.

Those who desire batteries of any kind for lighting or ignition should address the General Lead Batteries Co., Chapel Street and Lister Avenue, Newark, N. J. Their TWL type battery is especially recommended for automobile ignition, although where extremely light weight is required the LR types are also offered. Their batteries are designed especially for long life and great efficiency. Thick plates and thick separators are employed to give the highest quality. Six volt sizes are standard but any volt size can be supplied that is desired.

A Brush Carbon Remover.

The Temco Manufacturing Co., of 740 West Van Buren Street, Chicago, make a steel wire brush for removing carbon. It is claimed that it does the work almost instantly and has the appearance of



Temco Carbon Brush.

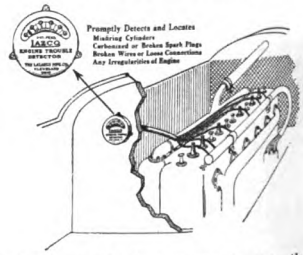
being in every way desirable for the car owner as well as the garage people. There is an alligator wrench on the handle that will fit any small nut and screwdriver tip for adjusting the points of spark plugs.

An Attractive Display.

The Cox Brass Mfg. Co. of Albany, N. Y., is furnishing its dealers with a more than ordinarily valuable display device, which is strictly in line with modern salesmanship tendencies, in that it not only shows a full size working model of the well known C-C Shock Absorber itself, but displays it as actually attached to the automobile spring. This feature gives it distinct attention value and the display is so arranged that it cannot help to create more than passing interest. This display is only one of the many dealer helps provided by this accessory manufacturer.

A Trouble Detector.

The Lazarus Mfg. Co., of 746 Euclid Avenue, Cleveland, O., are making a device, illustrated herewith, which it is claimed will promply detect and locate misfiring cylinders, carbonized or broken



spark plugs, broken wires or any other irregularities of the engine quickly and surely. The device is not expensive, and the firm will be glad to send particulars to any one writing for them.

Service Gear and Machine Company.

The Service Gear and Machine Company of Reading, Pa., was recently incorporated for $20,000. The company at present is busy manufacturing parts for service stations and parts for jobbers, and makes a specialty of manufacturing transmission gears, bevel gears, axle shafts, piston pins, etc., and maintains a large stock of the above parts for immediate shipment of various makes of cars.

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New Specialties for Ford Cars.

The Auto Parts Company, Providence, R. I., maker of the Apco line of specialties, which are sold with the guarantee of "Satisfaction or Your Money Back," announces a new specialty for preventing the annoying rattles of the doors on the Ford car. The Apco door anti-rattler consists of a strip of imported spring steel bent at such an



Anti-Rattler.

angle that movement of the door is prevented when closed. The device is attached by using one of the wood screws retaining the body part of the hinge assembly, and the spring can be fitted in less than 30 seconds. It is attached to the bottom of the hinge on the 1915 and 1914 cars and at the top on the 1913 models. It retails for 20 cents and comes black enameled.

A new pedal is now being supplied for the Apco muffler cut-out. It differs from the former in that it is attached to the



Muffler Cut-Out Pedal.

floor board by locking nuts instead of screws, a construction that requires a much smaller hole than the old pedal and one that is very easily installed. The pedal proper is detachable and is secured by a pin.

Perfection Car Heater.

A car heater, which radiates exhaust heat, has been announced by the Perfection-Spring Service Co., Cleveland. By utilizing energy which otherwise is wasted, the heater operates entirely without maintenance cost. A small valve on the exhaust pipe of the car deflects about one-eighth of the hot burnt gases through a flexible steel hose to the heater and then expels it into the open air under the car. The air in the car, circulating around the hot copper tubes of the heater is warmed to a temperature which is entirely comfortable. The Perfection Company declares that in the operation of the heater there is no noise, no odor, no loss of engine power, or back pressure on the motor. The degree of heat is regulated by a simple movement of the driver's foot. The Perfection heater has been successfully used for more than four years. Actual use has shown that even at slow city driving speeds it will heat a seven-passenger touring car with the ordinary loose-fitting side curtains to an agreeable temperature in the coldest weather. The Perfection heater is made in two types, the first of which consists of a series of seamless copper tubes securely assembled into a manifold at each end.

Punctureless Tires.

It is claimed that punctures, rim cuts, blow-outs and all other tire mishaps are avoided by using the French Fibre Model Pacific Tire Treads. These treads are an all-in-one-piece fabric and rubber envelope which covers old casings completely, enveloping them from bead to bead, thereby giving protection at every possible point of contact. The materials from which this tread is compounded are thoroughly tested before entering into Pacific tread construction, and once on an old casing they actually become an integral part of the tire itself, as they will not slip, slide, creep nor sag. Furthermore, the diamond hard steel studs with which this tread is reinforced, in addition to giving a maximum amount of guaranteed mileage, also offer a positive non-skid protection. These treads are made in all sizes, and are adjustable on all kinds of tires, suitable for service on all kinds of rims. Liberal discounts to motorists who are the first to use introductory equipment on their own cars in any given locality. Address V. K. Sturges Co., 26th and Union streets, Oakland, Cal.

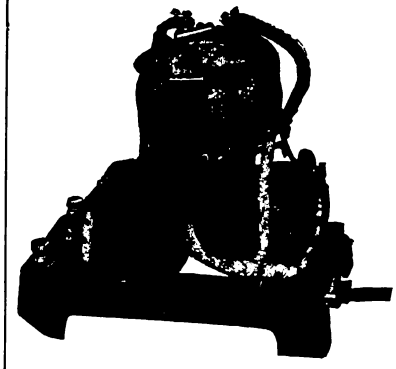
Astonishes the Motorist.

In these blase days of motoring, it requires something out of the ordinary to arouse interest in the automobile world. But one of the standard demonstrating stunts of the new spiral gear M. & S. differential is sufficiently uncanny to make the average automobile man wonder how on earth it is done. A Ford car equipped with the M. & S. special type for Fords, is used by the demonstrator. One of the rear wheels is jacked up so that the wheel is entirely off the ground. A two by four is then placed in front of the other three wheels, the engine is started and the driver engages his gear. Imagine the onlookers' surprise, when, instead of seeing the jacked up wheel spin as the power is applied, he sees instead the car move forward over the obstructions and the fourth wheel pulled off the jack. The principle which makes this possible is the arrangement of the spiral gear in the M. & S. differential, whereby power is delivered to the wheel having the greatest traction. A corresponding situation in actual driving occurs in mud, deep sand or on slippery pavements. With the old style bevel gear differential, of course, the wheel that loses traction simply spins—wasting power and wearing out tires. Owing to the number of Ford cars in use, the M. & S. Gear Co. of Detroit has arranged to supply M. & S. differential replacements for the Ford car first. The Ford special type M. & S. is made in the Brown-Lipe-Chapin factory, Syracuse, N. Y.

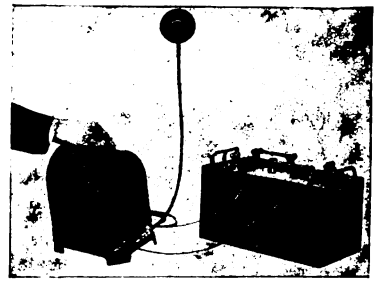
Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

For Battery Charging.

A new and inexpensive mercury arc rectifier is just being marketed by the General Electric Co., of Schenectady, N. Y., for charging small storage batteries, such as are used for starting, lighting and ignition current in gasoline automobiles and motor boats; for operating electric bells; for electro-plating, and for numerous other uses where not over 5 amperes, 15 volts direct current is required and only alternating current is available. It is designed for charging one 3-cell, one 6-cell or two 3-cell batteries as required, and is automatic. In fact, the rectifier may be connected to a single-cell battery and will charge it at the rate of approximately 6 amperes from 110-volt, a-c. supply. This type of rectifier can be furnished for 60, 50, 40, 30 or 25 cycles, 110-volt circuits. The rectifier is completely self-contained and requires no mechanical ability either to install or operate it. It is so designed that it will maintain a fairly constant



Mercury Arc Rectifier for Charging Small Batteries with Cover Removed.



Method of Starting the Mercury Arc Rectifier for Charging Small Batteries.

current as the voltage of the battery rises. The cost of charging either a 12-volt (6-cell), or two 6-volt (two 3-cell) batteries, for a 10-hour charge, is about 13 cents; or the same for a single 6-volt battery. This cost is based on a rate of 10 cents per k. w. hour for current. Where the rate is less, the charging cost will naturally be proportionately lower.

Disco to Increase Output.

The Disco Electric Starter Co. has taken necessary steps for increasing its output. Additional machinery is to be installed and the working force increased.

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A Metallic Cable Tire.

Charles E. Miller, Anderson, Ind., is about to place on the market a metallic cable tire which is made on a good deal the same plan as a cotton cord tire, but instead of using cotton cords they use metallic cables, each strand of which is composed of twenty wires, and has a breaking strength of about three hundred pounds, and as they put two layers of these cables into their tires, they get sixteen cables to the inch, making a total of 4,800 pounds tensile strength per inch. These metallic cables extend from one bead to the other, being anchored around the wire in the bead which extends clear around the tire. The tire is built up in the following manner: First on the inside of the tire, where the tube lays, they place a piece of regular tire fabric, over this is placed a sheet of cushion gum, then a layer of metallic cables diagonally across the tire, then another sheet of cushion gum, and on top of this another layer of metallic cables, diagonally across in the opposite direction from the other layer of cables, over this is placed a layer of cushion gum, then a layer of breaker strip extending from bead to bead, then another layer of cushion gum, and another breaker strip extending just over the tread of the tire and on top of this they



Section of the New Tire.

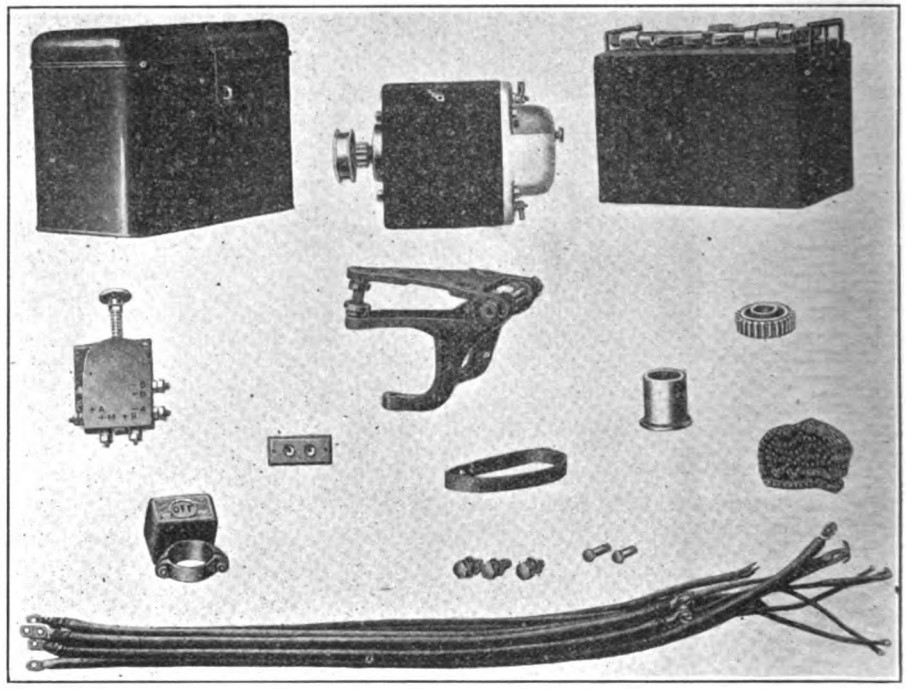
place the tread, which is about one-half inch thick. This makes the tire blow-out proof and almost puncture proof. This tire is very resilient and requires little power to propel it. In traveling at high speed this tire generates less heat than is generated in the ordinary fabric tire. The first cost of the tire will be a little expensive, but in the end it is claimed that you can ride much cheaper on this tire than any yet produced.

For Garage Doors.

A stay designed to hold garage doors open against wind or other forces tending to close them is supplied by the Stanley Works, New Britain, Conn. The stay consists of a jointed angle-steel bar with brackets at each end. One bracket is screwed to the door and the other to the frame, both at the top. When the door is closed the stay is folded upon itself. When the door is opened the stay opens and when the folding joint is straightened out it locks in position, holding the door so it cannot swing either way. To release the door a chain is pulled, throwing the joint off center.

The Dixie 12 Cylinder Magneto.

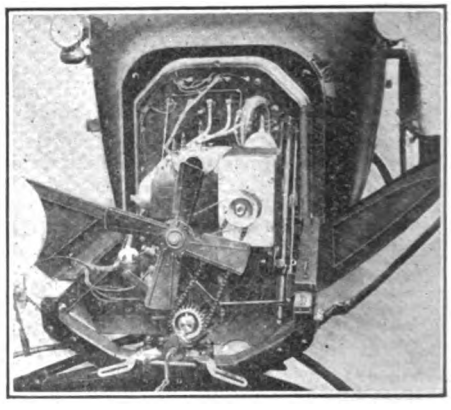
Designers of 12 cylinder engines desire to apply the advantages of magneto ignition to their engines and the advent of the Dixie 12 cylinder magneto makes this possible. The construction of the Dixie 12 follows closely that of the Dixie 4 as used on the Overland. There is no rotating wire wound armature and the usual high tension collector spool with its attendant brushes, so complication is eliminated. The distributor



Splitdorf Apelco Ford Starting and Lighting Parts.

as shown in the illustration is no larger in diameter than the usual 4 cylinder distributor. It has, however, two rows of contacts. Traveling around and wiping over each row of contacts is a separate brush and connected to each one of these brushes is an auxiliary brush so arranged that the high tension current is connected first to one traveling brush and then to the other. At no time are both brushes alive and consequently the separation of the various contacts in the distributor is maintained at such a point that jumping and missfiring is prevented. The two rotating brushes in the distributor carry the same polarity of current and therefore there is no tendency for a breakdown to occur between them. Particular attention is called to the breaker used in the Dixie 12. These contacts operate at 12 cylinder engine speeds in excess of 300 times per second, the vibrations of the breaker arm exceeding in speed the vibration of the middle C string in a piano, in fact, the magneto when running at maximum speed gives a clear musical note. The breaker arms are of special construction carefully balanced and the hammer blow on the platinum points is eliminated by an ingenious arrangement of the various parts. The breaker arm bearing and actuating cam are self-lubricating, the latter having four lobes or bumps, the magneto producing four sparks per revolution. The magneto is geared to the engine 1½ times engine speed and practically any degree of advance and retard is accomplished, the intensity of the spark being the same at either advance or retard for any given engine speed. This feature is unique in the Dixie magneto and is particularly desirable in connection with high speed multi-cylinder engines where excessive spark range is required. In mounting dimensions the Dixie 12 conforms to the S. A. E. standard and in fact is not as large as the conventional four cylinder magneto. Provision is made for cutting out the ignition by means of an ordinary switch connected to a terminal carried on the lid of the breaker box. The accompanying cuts show the external appearance of the machine.

Owing to the fact that the Dixie 12 has no rotating wire wound armature or other parts that would not stand up under excessive speed, the Dixie may be driven at speeds of 5,000 R. P. M. in-

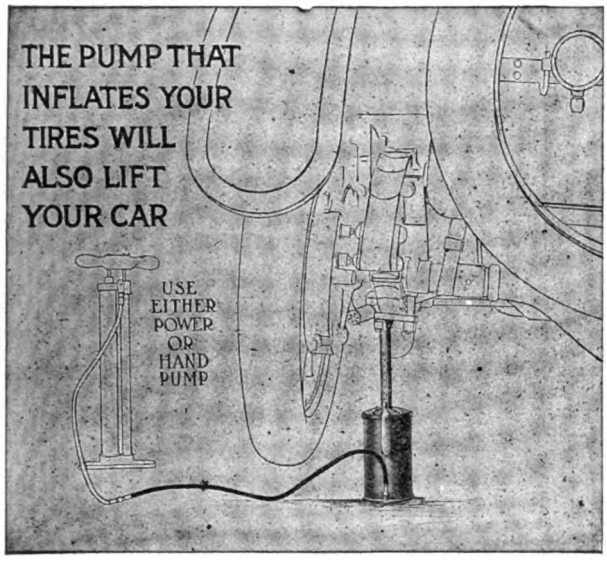


Splitdorf Apelco Ford Starting and Lighting Installation.

definitely, at which speed 20,000 sparks per minute are produced and these are in perfect synchronism and of the same intensity at any given engine speed with the magneto full advance or retard over a spark range, usually of 40 to 60 degrees. It is thought this is a new high record for synchronous spark production which has never been equalled even by battery timers in which of course the spark is variable depending upon the condition of the battery. This magneto is made by the well-known Splitdorf Electrical Co., Newark, N. J.

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NATIONAL PNEUMATIC JACK



"JUST WHAT I HAVE BEEN LOOKING FOR"

—Is what people are writing us every day

HERE IS A JACK THAT WILL LIFT THE LARGEST CAR WITH NO WORK, NO DIRTY CLOTHES, NO "GETTING DOWN ON ALL FOURS" (like the man in illustration below).

THE "NATIONAL PNEUMATIC JACK" IS AS FAR AHEAD OF THE ORDINARY LEVER JACK AS THE SELF STARTER IS OF THE OLD CRANK.



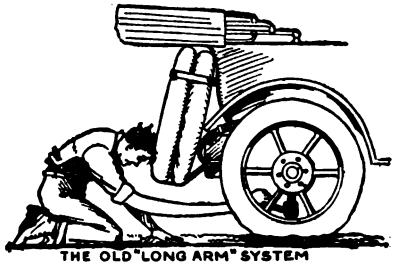
Just slip it under your car, attach either a hand or power pump to the end of hose, and up goes the heaviest car, AND STAYS THERE UNTIL THE AIR IS RELEASED. Has locking device for holding up car in storage. It can't slip. It won't sink in ground on account of its large base. You need not worry about long springs, rear tank, etc., being in the way. Five to ten strokes of ordinary hand pump will lift car. Order one for your old car, or specify that your new car be equipped with it.

Tell the agent he must furnish one with car—and he will.

Ten Days' Free Trial

Will ship one on trial, and if not satisfactory will refund your money. That's fair! Weight only seven pounds. Four inches in diameter, eleven inches high when closed, with six inch lift.

PRICE, by mail prepaid, $6.00

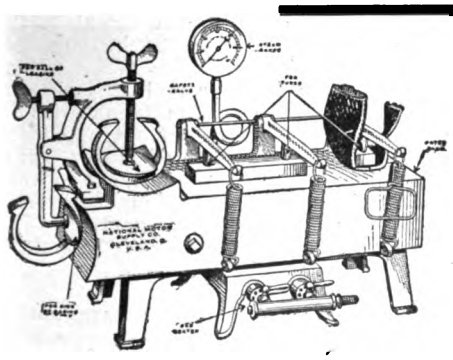


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IS THIS THE WAY YOU WORK?

Garagemen

This is the jack for you. Just stick on air line hose, raising car instantly, with no slipping, skinned knuckles or hard work. Earns its cost in time saved. Nothing to wear out or get out of order.

Get the agency in your town.



GARAGE AND REPAIR MEN, LOOK!

Thousands of garage men all over the world are making big profits with the

NATIONAL GARAGE STEAM VULCANIZER

Vulcanizes three tubes and two casings at a time. Heated by either gas or gasoline. We have made this machine without any change for six years, which shows how satisfactory it is. You might as well have the big profits for vulcanizing in your vicinity. The National is the easiest and cheapest machine to operate on the market.

LIST PRICE, $60.00

Write for full details and discounts. A card will do.

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TRADE HIGHEST QUALITY MARK

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Prest-O-Lite Cooking Outfit.

The Prest-O-Lite Co., Inc., Indianapolis, Ind., has brought out a compact, convenient cooking outfit, which may be operated from the gas tanks made by this company and which turned on full consumes only about three and one-half feet of gas per hour. The heat of the full flame is said to be sufficient to boil a quart of water in three minutes. The burner plate weighs only six pounds and has tubing attached which may be quickly and easily connected to the acetylene tank.

Carbon Burning Outfit.

F. W. Stewart, 1509 Michigan avenue, Chicago, Ill., has brought out a line of carbon burning outfits, which consists of regulator valves with oxygen tank connections, pressure gauges, expansion chambers, air cocks and nozzles. These outfits may be had with special gauges and burning nozzles, according to the work for which they are required.

Rising Prices for Materials.

Some of the materials that go into the manufacture of automobiles or are used for tools employed in manufacturing processes, have shown an upward price tendency, partly on account of the increasing activities of the automobile industry, but more largely because of the European war. One of the materials most seriously affected is high speed tool steel, which is an alloy steel containing tungsten. In the past a great deal of the high-speed tool steel used in this country has come from England, but at present the local demand for such steel is very great, owing to the war, and very little is being exported. Cyanide of potassium, which is used for case hardening, is also getting scarce, as there is only a single source of this chemical in this country. Burlap, of which large quantities have been imported from Calcutta, is also hard to get, owing to the fact that there are few ships available for transportation.

A Sensation Promised.

R. C. Hupp, president of the Monarch Motor Car Co., Detroit, Mich., promises a veritable sensation with the announcement of the 1916 Monarch, though at the present time he divulges none of the details of the new machine. The announcement is to be made about September 1st.

Cigar Lighter for Fords.

Asch & Co., 1779 Broadway, New York City, have brought out a special cigar lighter for installation on Ford cars which operates direct from the magneto. The lighter tip is designed especially for this purpose and is connected with ten feet of silk cord wire which is led between the dash and footboards, connecting one terminal to the binding post on top of the magneto and the other to any one of the screws which hold the cover on the gear case.

New Wood Wheels for Ford Cars.

The Superior Lamp Mfg. Co., of 136 West 52d street, New York City, has brought out a set of demountable clincher wood wheels for Ford cars. The set consists of four best-growth hickory wheels, with demountable rims attached, including one spare rim, with wrench, and holes drilled, ready to attach. The outfit is furnished in either natural wood or black finish, at the same price. The set lists at $16, with a profitable discount to the trade. Sets are crated conveniently for sample orders, and further information will be gladly furnished upon request. Dealers will do well to investigate.

Micro Piston Rings.

Motorists are satisfied with plain piston rings only because the importance of the rings as an economy and efficiency factor is not generally understood. Elimination of the faults in the Micro ring is accomplished by using two assembled members, a main ring with interfitting stepped joint and a plain-jointed auxiliary ring. The main ring has its outer bearing surface uniformly channeled throughout to receive the snugly fitting auxiliary ring, which also is of larger diameter than the piston, and is of practically the same uniform section as the channel. The outer rim of the auxiliary ring thus forms part of the bearing surface, and by placing the joints of the two rings diametrically opposite, the outer ring seals the opening in the inner ring, and the expansion from opposite points tends to equalize the contact pressure at all points of the cylinder wall. In expanding, the two ring parts act with the flexibility of the leaves of a spring to assure good contact and the absorption of a minimized amount of power in frictional drag and wear. Obviously this design conforms well to a perfect cylinder and holds on a badly worn cylinder. Cars formerly equipped with plain rings and having difficulty in making certain hills on second have been known to make the same hill easily on high, after the installation of Micro rings. The improvement by using a pressure tight ring is also particularly noticeable in starting and at slow speeds.



The Umbarger Fuel Saver and Lubricator.

This desirable accessory is manufactured by the Chandler Sales Co., 9 South Clinton street, Chicago, and they state that it enables car owners to get more mileage, more speed and more power per gallon of gasoline, also that it will give you a smoother running, quicker accelerating and more flexible motor. Local agents are wanted and correspondence is invited.

A Powerful Searchlight.

The Manufacturers Distributing Co., of America, 246 West 56th street, New York, are selling what they call the Nite-Lite, which is an essential accessory of the car. It is invaluable for reading signs, watching the edge of the road, or averting collisions at night, and is indispensable for a trouble light. It is easily and quickly attached and the light can be thrown in any desired direction. Full particulars and price may be had by addressing the firm as above.

Spring Cranker for Ford Cars.

The Cleveland Spring Cranker is [illegible] especially for Ford cars—fitting [illegible] without alteration or machine work. It derives its power from a flat chr[illegible] vanadium steel spring 2½ inches [illegible] and 12 feet long. This spring is c[illegible] up just like a clock spring—one [illegible] being fastened securely to its steel c[illegible] the other end being connected to an [illegible] tension of the crankshaft and wound [illegible] by a pawl and ratchet movement. [illegible] trigger on the dash—right where you [illegible] reach it conveniently, connects [illegible] cranker to the engine and releases [illegible] coil spring. The stored up energy s[illegible] the motor several complete revolutio[illegible] the motor starts, and you are ready [illegible] go. The instant the motor begins [illegible] ning under its own power, the sp[illegible] automatically rewinds and when f[illegible] wound up, the winding mechanism a[illegible] matically ceases to operate. This [illegible] winding takes from twenty to thirty s[illegible] onds according to the speed of the m[illegible] tor. If desired, the cranker is then d[illegible] connected from the engine relieving [illegible] motor of all load and the cranker from all wear.

The manufacturers guarantee each starter for one year against wear or defective material, and, if for any reason it becomes inoperative, will replace it free of cost, providing, however, that the starter has not been tampered with or abused. It is made by The Forest City Electric Co., Cleveland, Ohio.

Four Wheel Chain Drive.

Claude Hoadley, of Gasport, Ind., has built a four-wheel-drive gasoline truck on which he holds U. S. Patent No. 1,020,730. The four-wheel-drive feature as incorporated in this truck employs chain-drive to each of the four wheels, all of which are used for steering. Each axle and jackshaft group is mounted on a fifth wheel device, the same as the front axle of a horse-drawn vehicle, the conventional motor truck steering knuckle not being used. When either axle is turned the complete jackshaft and transmission system turns with it. The motor is carried in front and there is an ingenious system of power transmission from it to the front and rear jackshafts employing four universal joints and bevel and spur gearing. The steering of the front fifth wheel is through a rack and pinion.

Arbenz Car at $675.

The Arbenz Car Co., of Chillicothe, O., has placed on the market a new four-cylinder model which is to sell for $675. It is fitted with a 3¼ x 5 block motor with a removable cylinder head and cooled on the thermo-syphon plan. The transmission elements include a cone clutch, three-speed selective gearset and full-floating rear axle. The wheelbase is 108 inches and tires are 30 x 3½. Equipment includes a one-man top, electric horn, Stewart speedometer and electric lighting and starting apparatus.

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Mosler Spit Fire Plugs



$1.25

ALWAYS the one best plug to sell and the one best plug to use—better than ever now because Mosler's big smashing advertisements in the Saturday Evening Post, Collier's, Leslie's, The Literary Digest, The Scientific American, etc., are telling FOUR MILLION Consumers every month about Mosler's

WE GUARANTEE THAT THIS PLUG HAS A GENUINE PLATINUM POINT

THE RED TAG GUARANTEES EVERLASTING IRIDIUM PLATINUM POINTS

Spit-Fire and Vesuvius

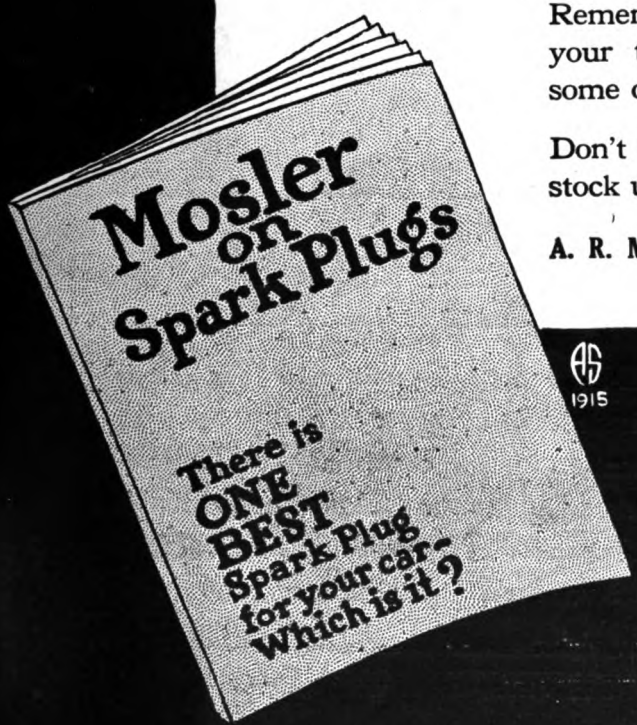
Send for your supply of "Mosler On Spark Plugs," the new free guide which tells at a glance just which kind, size and type of plug is *Right* for each engine. Your customers will want a copy—and you'll find it handy, too.

Just tell us how many to send you.

Remember: "If you don't supply your trade with Mosler Plugs, some other dealer will!"

Don't wait for him to do it—stock up now!

A. R. MOSLER & CO., New York, N. Y.



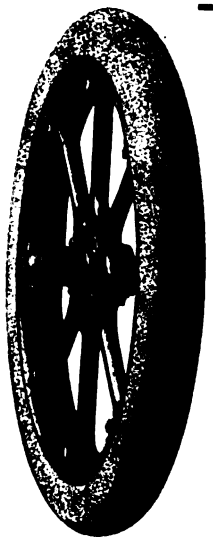
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Mosler Vesuvius $1.00



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A Bad Skid against a Curb

might bend this wheel, but it couldn't break it, and even if bent, it could be easily and quickly straightened.

Think what this security means to you.

The Strongest Wheels Made Are

PARKER-HYDRAULIC Pressed Steel Wheels for Ford Cars

$19.75
SET OF FOUR

enameled black, 30x3½ in. wheels, spare clincher rim, full set of new hub bolts and brace wrench. With wheels enameled red and clincher rims enameled black, $20.50.

And you get this greater strength with half the weight of wooden wheels with demountable rims. This decrease in weight naturally results in a saving in tires.

QUICKER TIRE CHANGES.

These wheels give you the simplest and quickest demountable rims. The only part that comes off is the rim itself. There are no loose parts—nothing to stick—the rim cannot be mounted crooked, and always runs true.

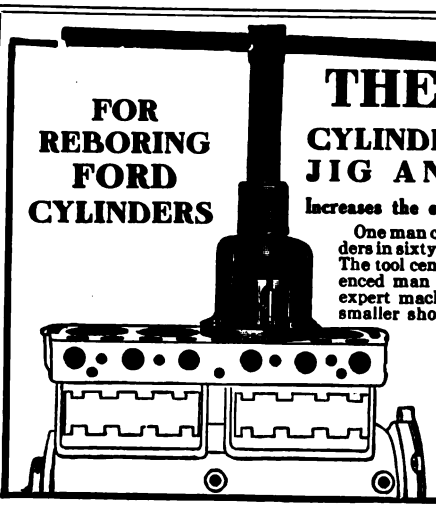
To change a tire simply unscrew each bolt about two turns. This loosens the clips and releases the rim. These wheels have a handsome, baked on, durable finish—are easily cleaned—and **non-rustable.**

So you see this is the ideal wheel from the standpoints of safety, durability, strength, light weight, attractive finish, and quickness of tire change.

Sold by reliable dealers everywhere. If you don't know yours, write us.

These wheels offer a real opportunity to live dealers. Full details sent on request.

THE HYDRAULIC PRESSED STEEL CO.,
3158 East 61st St., CLEVELAND, O., U. S. A.



FOR REBORING FORD CYLINDERS

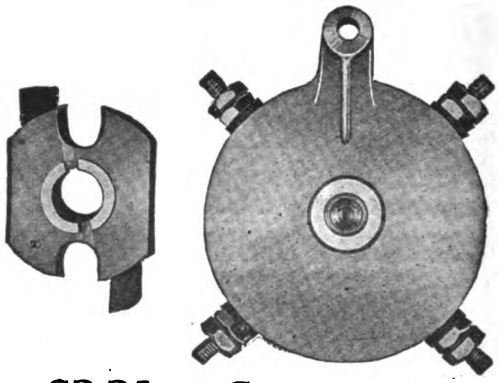
THE DAVIS
CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

AT LAST!
A PERFECT TIMER FOR FORD CARS



Price $2.25 **Guaranteed for Life**

With this Timer you get a wipe contact instead of a rolling contact. This contact is made by a low resistance composition brush which makes a positive wipe contact. Furthermore, there is a felt wiper which travels ahead of the brush, which positively keeps contacts clean at all times.

The Rotor in this Timer is in no way affected by centrifugal force, due to the fact that all revolving parts are contained within the rotating unit.

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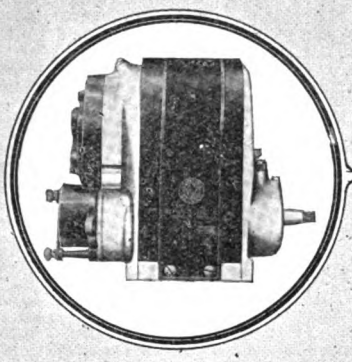
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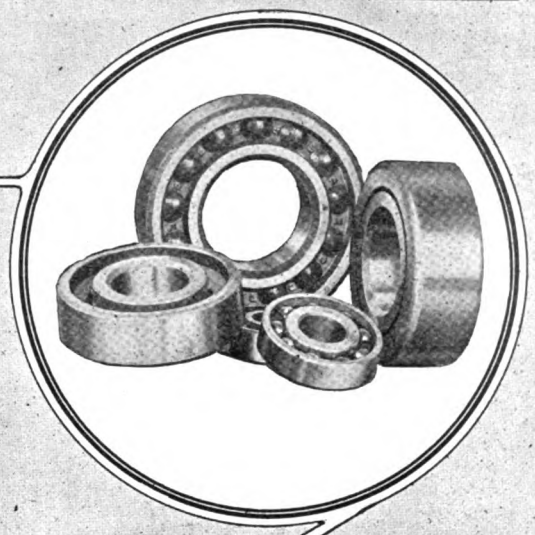
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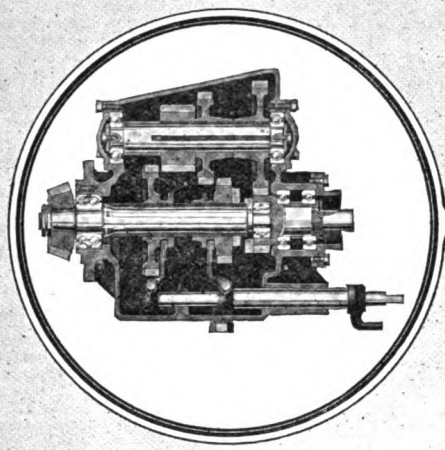
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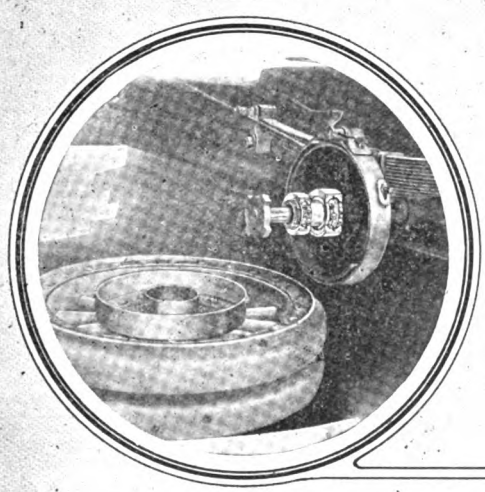


High Speeds
Light Loads





Medium Speeds
Medium Loads



Slow Speeds
Heavy Loads

The pictures tell . . . the story . . .

A large percentage of American made Motor Car Models for 1916 will contain New Departures because of their complete adaptability . . by reason of their inherent goodness . . and because they are absolutely

Guaranteed

Our expert knowledge of Ball Bearing installation is free to every manufacturer of Motor Cars . . . Promptly upon request.

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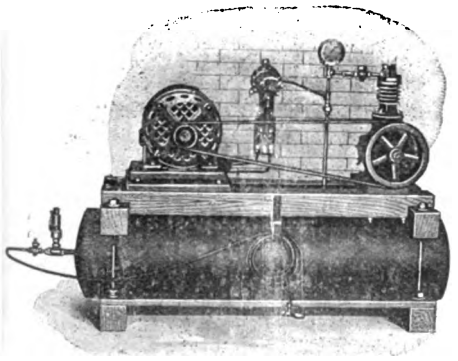
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Gardner Air Compressor.

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The Walden Mfg. Co., of Worcester, Mass., make a combination Wrench Set with 39 assorted steel sockets and wrenches with 10 end openings. The set also includes a cotter extractor, and several other useful tools. It comes in a strong and well finished fibre box and the price of these tools is very low, considering the wide variety of work for which they are adapted.

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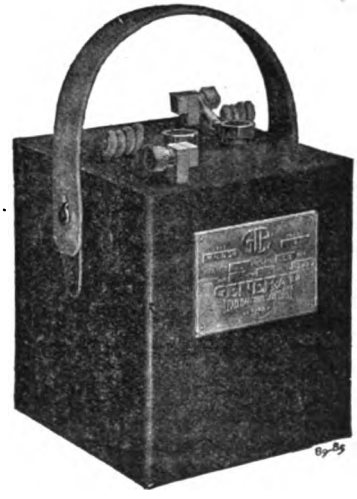
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Rambler, 35 HP, overhead valves.	65.00
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Established 1905

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Demountable Wood Wheels, - - $14.50
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TIRES - - - TIRES

Special sale for July & August

to sell out Double Tread Stitched Tires and introduce Double Tread Stitchless Tires.

A few of my prices on Double Tread Stitched and Stitchless Tires:

STITCHED TIRES

Size	Plain	Non-Skid
30 x 3	$4.00	$4.95
30 x 3½	4.80	6.30
32 x 3½	5.60	7.20
34 x 4	7.20	9.00
36 x 4½	8.00	9.90
37 x 5	8.80	10.80

STITCHLESS TIRES

Size	Plain	Non-Skid
30 x 3	$5.00	$5.50
30 x 3½	6.00	7.00
32 x 3½	7.00	8.00
34 x 4	9.00	10.00
36 x 4½	10.00	11.00
37 x 5	11.00	12.00

I also manufacture New Reclaimed Tires for light cars which I guarantee 3500 miles and sell them at 40% off the Standard price list in the following sizes:

Size	Plain	Non-Skid
30 x 3	$5.40	$6.42
30 x 3½	6.96	8.40
32 x 3½	7.99	9.60
32 x 4	10.95	13.38
33 x 4	11.44	14.08
34 x 4	11.64	14.37

Adjustments make according to the United States price list.

I also carry a full line of tubes, reliners and slightly used tires of all makes.

LEON JAFFESS

Main Office

252 West 55th St., New York City

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5019 Euclid Ave., Cleveland, Ohio

Factory and Salesroom

Fifth and Cross Streets, Harrison, N. J.

Not connected with any other Jaffess.

Terms: 10% deposit, balance C. O. D.

Deposit required from new customers.

Tires

SAVE 75%

ON YOUR

TIRE BILLS

BY USING OUR

DOUBLE TREAD TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS

MAIN STORE

1319A Fifth Avenue, New York

BRANCH AT

282A Halsey Street, Newark, N. J.

EMPIRE TIRES

Slightly Blemished.

CAR OWNERS: Note the low prices below, of the best tires made.

Size	Our Price Plain	Our Price Non-Skid	Dodge Red Guaranteed Tube.
28x3	$5.50	$6.00	$2.10
30x3	6.00	6.50	2.25
30x3½	7.50	8.00	2.50
32x3½	8.00	8.75	2.75
32x4	11.00	12.00	3.50
33x4	11.50	12.75	3.75
34x4	11.75	13.00	4.00
35x4	12.25	13.50	4.25
36x4	12.50	13.75	4.50
34x4½	15.75	17.35	4.75
35x4½	16.25	18.00	5.00
36x4½	16.75	18.50	5.25
37x4½	17.25	19.00	5.50
36x5	19.00	21.00	6.00
37x5	19.50	22.00	6.25

DODGE RED GUARANTEED TUBES are made of the best possible material and equal to any tube produced at any price. Fully guaranteed by us.

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August and September Only

To Insure Full Capacity Production.

At Prices Cheaper than Seconds

Brand New Stock Guaranteed to be the equal of any Standard Make Tire.

Size	Plain	Non-Skid	Red Tube
28x3	$4.95	$5.30	$1.50
30x3	5.60	5.75	1.60
30x3½	7.65	7.90	1.80
32x3½	7.90	8.30	1.85
34x3½	8.25	8.65	1.95
30x4	9.50	9.95	2.35
31x4	10.00	10.50	2.55
32x4	10.70	11.00	2.65
33x4	11.00	11.55	2.75
34x4	11.25	11.75	2.85
35x4	11.75	12.35	3.10
36x4	12.50	13.25	3.20
34x4½	15.75	16.50	3.30
35x4½	16.50	17.30	3.45
36x4½	16.90	17.70	3.65
37x4½	17.50	18.25	3.75
35x5	18.25	19.15	4.00
36x5	18.90	19.80	4.20
37x5	19.50	20.35	4.35

Please specify, in ordering, **whether** Q. D., CLINCHER, or Straight Side Tires are desired.

All C. O. D. Shipments made subject to Examination at your local EXPRESS OFFICE on receipt of 10% deposit.

1% DISCOUNT for Cash Remittance with Order.

DOUBLE TREAD TIRE COMPANY, Inc.
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When buying Double Tread Tires buy the best in the market.

We sell Double Tread Tires from

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We do not charge extra for non-skid

For further information write for catalogue

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Automobile Dealers Take Notice.
We now offer for sale our Henschel Special tires in a sizes and types. Write for our special dealers' proposition
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Tires

TIRES TIRES

NEW TIRES GUARANTEED 3500 MILES
40% off Standard list price
We also carry stock of reclaimed Double Tread tires at following prices.

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Terms C. O. D. 10% deposit.

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NEW YORK CITY
The Home of Double-Tread Tires

Have Your Own Tires RECLAIMED

For $2.50 to $4.50
According to Size

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We Keep a Stock of
RECLAIMED TIRES
PRICE RANGING FROM
$5.50 to $12.50

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Agents Wanted

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AUTO-TIRE REPAIRING
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Use Roll-in-White, it Preserves your Tires, 25c. per pint.
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Tires

OWNERS

CUT YOUR TIRE BILLS
BY USING
Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

We pay express charges on receiving your old tires and return C. O. D. subject to inspection.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

For all other sizes write for prices.

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN
27A East 110th St. NEW YORK CITY
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GET A
PUNCTURE PROOF TIRE
with a guarantee, at a reasonable price.
Some of our prices:

	Plain	Non-Skid	Slightly Used Tubes
30x3½	$6.00	$7.00	$1.75
32x3½	7.00	8.00	2.00
36x4	9.00	10.00	2.00
37x5	11.00	12.00	3.00

You will save money by giving my tires a trial; let me prove it to you by your order at once.
WRITE FOR OUR CATALOGUE
247 West 49th Street New York City

Double Tread Tires

AT 75% SAVING
GUARANTEED

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.00	$8.75
30x3	$5.00	$5.25	36x4	8.00	9.00
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
32x4	7.00	8.00	36x4½	9.00	10.00
33x4	7.50	8.25	37x4½	9.00	10.00
34x4	7.50	8.25	37x5	10.00	11.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.
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Piston Pins
"Manufacturers for the Trade"
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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

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Prompt and reasonable.
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Expert Repairing of All Makes.
Distributors and Service Station for
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At Discount For
PACKARD, REGAL AND CHALMERS "30" and "36"
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Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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FORD PLEASURE BODIES.
Brand new 1915 Ford Cowl Dash Touring and Roadster Bodies complete with Top and Windshield at money-saving prices. London Auto Supply Co., 2548 Wabash Ave., Chicago.

JANDORF AUTO COMPANY
Dealers in New and Used Cars, Bodies, Accessories, Tires, etc. Est. 1899. B'way at 57th St., New York City.

Agents Wanted

LISTEN! Can you sell gasoline at ONE CENT per gallon? If so, sell GASO-TONIC. Gives 40% more gasoline mileage; eliminates carbon. Auto owners grabbing for it. $10 a day easy. Heisey made $25 first day. Act quick, man. Details free. White Mfg. Co., Dept. 118, Cincinnati, O.

AUTOMOBILE AGENTS WANTED—Take notice the Coey Flyer World's Champion Light Car winning 19 cups in 1914. Five-passenger touring car. Price $650, fully equipped. Its designers are men of national reputation. Our new profit sharing plan enables you to make a handsome income. You are not restricted to any one territory. You can sell the Coey Flyer wherever you choose. This car is in great demand. Write for catalogue and the greatest selling plan ever known. A. D. Bell, Suffern, N. Y., Box 111.

Starting & Lighting Systems

Starting, Lighting & Ignition Systems
OF ALL MAKES REPAIRED
Magneto and Coil Armatures Re-wound
IGNITION SPECIALTIES CO.
798 SEVENTH AVE. NEW YORK
Simms Service Station

Used Cars

ONE MAN TOPS—$20, $25
Fit Fords and others. Top enveloped, $1
20th CENTURY COMPANY, 1694 Broadway cor. 53d St., N. Y.

FOR SALE—Automobiles in first-class condition. Renault, 14-20 H.P. Rochet Schneider, 50 H. P. Houpt. Rockwell, 50 H.P. All spare parts for sale by Kuehn & Metz, 1926 Broadway, New York.

Wanted

SPECIALTY WANTED—We manufacture line valve repair tools and have sales force to market in addition good salable tool or accessory. Would consider factory output. Healy Tool & Appliance Company, Buffalo, New York.

A GOOD ALL AROUND MAN to take charge of a garage. Must be good on engines and a strictly sober man. Address Adam Roe, Pickford, Mich.

Automobile Clutch Leathers

CHAS. HAGER & SON
High Grade Mfrs. of
AUTOMOBILE LEATHER EQUIPMENTS
Our Specialty—Domestic and Foreign Oak Tanned Clutch Leathers. We cut them while you wait to either your used leather or paper template from stock 3/16" to 5/16" thick. Other Specialties—Steering Joint Boots, Straps and Magneto Covers.
Prices quoted upon specifications.
1876 Broadway (62d St.), New York City

Gas Engines

REBUILT STATIONARY TYPE NATURAL GAS ENGINES
SPRINGFIELD 10 HP. NEW ERA 15 HP.
FAIRBANKS-MORSE 15 HP.
Stationary Gasoline
CALLAHAN 4 HP. FOSS 16 HP.
FAIRBANKS-MORSE 20 HP.
Portable
OHIO 10 HP. I. H. C. 4 HP. McVICKER 12 HP.
FAIRBANKS-MORSE 4 HP., Type H.
Prices given on application.
THE FOOS GAS ENGINE CO., SPRINGFIELD, OHIO

Help Wanted

WANTED—Salesmen calling on the Ford trade to handle new line of Ford specialties as a side line. Goods guaranteed. Liberal commission. W. S. Graffam, 86 Locust St., Northampton, Mass.

Welding

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WELDING PLANTS--$25 to $250
LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.
Write at once to Manager Dept. B.
BERMO WELDING APPARATUS CO. OMAHA, NEBR.

Cars Wanted

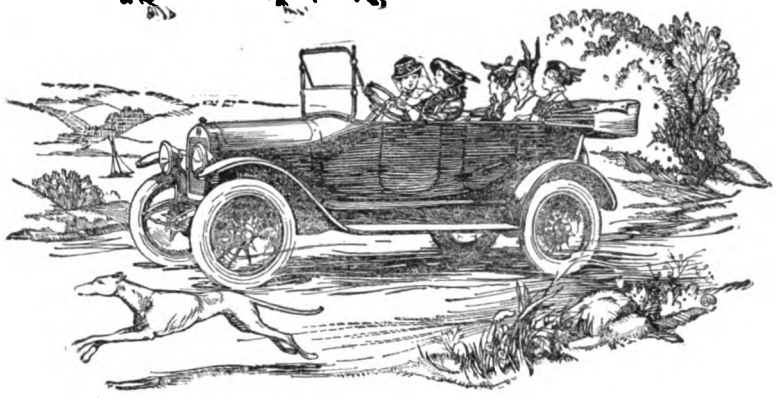
WANTED—Auto in good condition to trade for Two valuable level residence lots in Kansas City, worth $550 to $600. Lots good for loan of $200 to $250. Also have a corner lot in Fruitdale, Mich., a Remington Typewriter, a Winchester High Power Repeating Rifle to trade for a good motorcycle. Address Paramount Company, Moline, Illinois.

A Piston Ring Directory.

The Burd High Compression Ring Co., of Rockford, Ill., have issued an unusually useful directory of the sizes of piston rings, not only for automobiles and motorcycles, but for every style of internal combustion engine. It contains much valuable information, including instructions for installing piston rings, and the book is well nigh indispensable for garage use. It contains 133 pages and is copyrighted. Anyone wishing a copy of the book can probably secure one by sending for it at the address given.

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1916 Princess "30"



$695
F. O. B.
Detroit

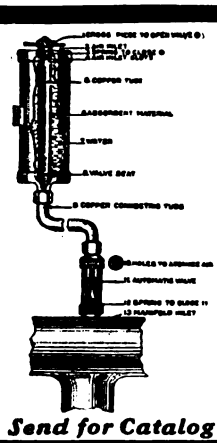
Fully Equipped
Electric Starter
Electric Light

Increased ***demand*** for the ***New Princess "30"*** made it imperative that we increase our production.
We are now settled in our ***New Home. More Space. More Cars. Prompt Deliveries.***

Dealers ═══ Opportunity ═══ Dealers

We have some of the best territory still open. Can make immediate delivery.
Wire or write for dealers' proposition.

PRINCESS MOTOR CAR CO. - 1315 Belview Avenue, Detroit, Michigan



Send for Catalog

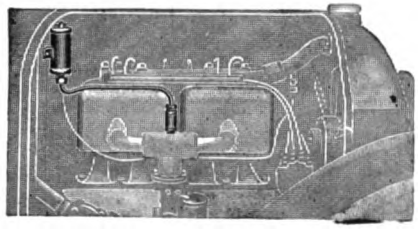
THE TRIPLEX GAS ECONOMIZER AND CARBON REMOVER

In ordinary operation, air is drawn through holes (2) in tank cover, thence over water (7) and absorbent material (6), through milled slots (4) and automatic valve (11). The holes (10) break up or atomize this moist air so that it readily mixes with the gasoline vapor.

To remove carbon, valve (8) is opened by lifting copper tube (5). This allows water to run from tank directly to combustion chambers where it is converted into live steam which cuts and loosens the accumulated carbon deposit.

TRIPLEX GAS ECONOMIZER CO.
223 WEST 49th STREET NEW YORK CITY

SAVES 15 to 45% Gasoline
CLEANS Cylinders, Valves and Plugs
INCREASES H. P. Efficiency, Speed



PAT. APPLIED FOR
FULL AUTOMATIC
ABSOLUTELY GUARANTEED

GROBET "VIBRATOR" FILES



Six inches over all — Length of Cut three inches — Screwdriver end — Quality Guaranteed
Price, 15 cents each post paid — Price, per dozen, $1.50 — Price, per gross, $13.75
LIBERAL DISCOUNT TO DEALERS
MONTGOMERY & CO., Inc., Tools, Supplies and Machinery, 105-107 Fulton Street—62 Ann Street, NEW YORK CITY

The Great Western "Light Six."

The Great Western Automobile Company, of Peru, Indiana, are making a light six-cylinder car upon which a number of claims seem to be of unusual merit. The car combines comfort, convenience and economy and those interested should write to the firm for full particulars.

Magneto With Starting and Oiling System.

The Maxwell Automobile Co. will probably use this season 50,000 of the new Simms high tension magnetos, with the electric starting and oiling system. They decided to install this equipment after making a somewhat extended investigation, and feeling sure of its absolute reliability and satisfaction in every way for car owners. The Simms Magneto Co., will soon have an electric starting and oiling system for the Ford cars on the market. This will give an exceptional opportunity for wide awake dealers and they should write at once for full information, addressing the Simms Magneto Co., East Orange, N. J.

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A Gold Mine for The Sears-Cross

Absolutely Accurate. Mounted in a Special New Bracket right before the Driver's Eyes.

THE Sears-Cross Spedindicator was one of the speed meters which were standard equipment on the 1915 Ford car. The Ford car for 1916 will not be equipped with a speedmeter at the Ford factory.

The Sears-Cross Spedindicator, especially made for Ford cars, will be sold by dealers to Ford owners in a special bracket, mounted on the cowl, as shown in the illustration. This bracket places the Spedindicator right before the driver's eyes, where he can read the speed, the total mileage, and the trip mileage at a glance. This does away with bending over to read the speed or mileage, and taking the eyes off the road.

The Sears-Cross Spedindicator set flush in the new special bracket, enables the driver to glimpse the speed or the mileage.

The Fastest Selling Ford Accessory

There are many accessories for Ford cars, but the Sears-Cross Spedindicator is the absolute leader of them all. It opens up a brand new field of profits to Ford dealers and accessory dealers. The new bracket will make the Sears-Cross Spedindicator sell like "hot popcorn" at a county fair.

Don't overlook the really big, quick profits that we offer you. An agency for the Sears-Cross Spedindicator in the new special Ford bracket, is better than a gold mine.

Write or telegraph for our dealer's proposition.

Sears-Cross Company, Bush Terminal, Brooklyn, New York

Sears-Cross Service

Sears-Cross owners are given unusual service. The Sears-Cross Spedindicator stays in service better than any other speed indicating instrument for automobiles. But in the rare cases where replacement of parts or any other form of service is needed, the half-hundred and more Sears-Cross Branches and Sears-Cross Service Stations located so that all parts of the United States and Canada are covered, give quick, efficient service.

A list of Sears-Cross Branches and Sears-Cross Service Stations with their locations follows.

All branches and service stations carry fine stocks of instruments and parts.

Model F 15 (same as used in 1915 Ford cars as regular equipment) Complete, ready to attach, $12.00.
Model FF 16 (as illustrated, new equipment for 1916 Ford cars, flush bracket and longer shaft) Complete, ready to attach, - - - - - - - - - - - - - 15.00.

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Ford Dealers

Spedindicator

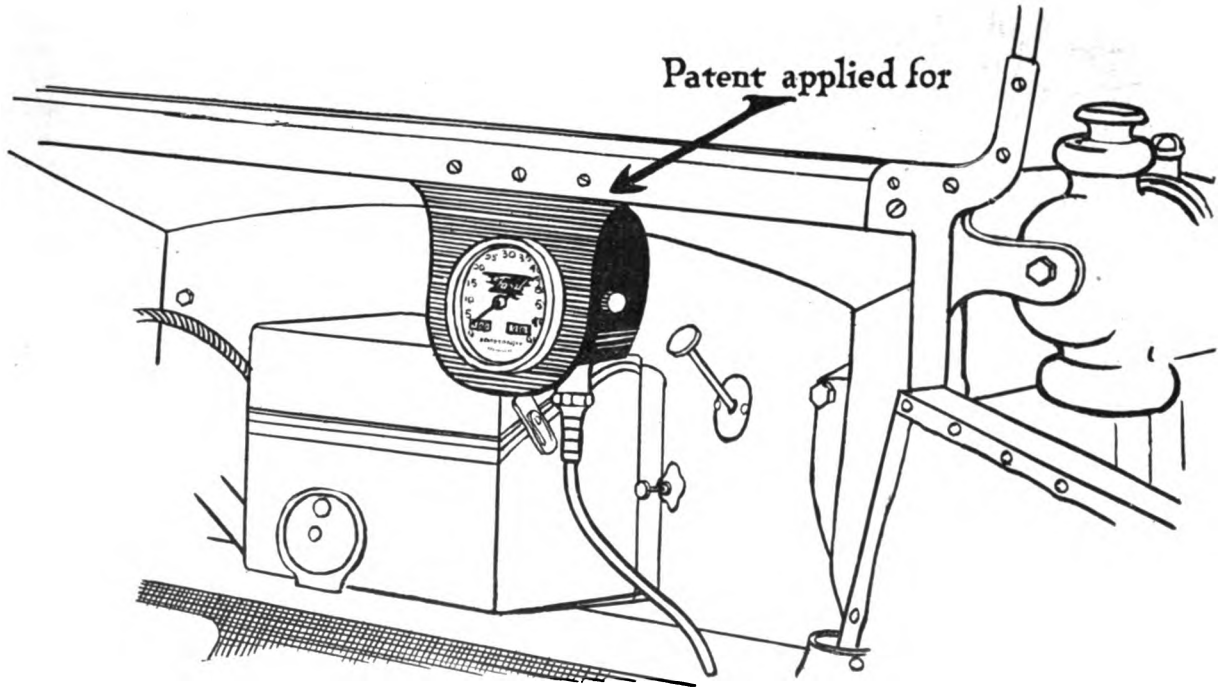
147 Forty-first St., Brooklyn, N. Y.
218 West 65th St., New York, N.Y. SEARS-CROSS BRANCHES: **2303 Indiana Ave., Chicago, Ill.**
650 Woodward Ave., Detroit, Mich.

SEARS-CROSS SERVICE STATIONS

F. P. Mathews, 51 Elm Street Potsdam, N. Y.
J. N. Johnson Co., 915 Nicholett Ave. Minneapolis, Minn.
Motor & Machinists Supply Co. 1519 Grand Ave., Kansas City, Mo.
National Electric Auto & Supply Co. 117 S. Washington St., Peoria, Ill.
Auto Equipment Company 1554-56 Broadway, Denver, Colo.
Herring Motor Company, 11th and Mulberry Sts., Des Moines, Ia.
Omaha Auto Top Company 709-11 S. 15th St., Omaha, Neb.
J. W. Wozencraft 328 W. 7th Street, Cincinnati, O.
Locust Auto Sppply Company 1411 Locust St., Philadelphia, Pa.
Auto Supply Company, 122 West Washington St., Ft. Wayne, Ind.
The Motor Shop, 238 Massachusetts Avenue, Indianapolis, Ind.
Miller Bros. Auto & Supply House 61 to 81 Pierce Street, N. E. Washington, D. C.
Dyke Motor Supply Company 600 Grant B'levard, Pittsburgh, Pa.
Pennsylvania Rubber & Supply Co. Cleveland, O.
The Barclay-Brown Co. 215 East Ave., Rochester, N. Y.
Albany Garage, Howard and William Streets, Albany, N. Y.
James G. Barclay, Inc. 715-717 Main St., Buffalo, N. Y.
John Van Benschoten, 14-24 Catherine St., Poughkeepsie, N. Y.
Mohawk Valley Supply Company Herkimer, N. Y.
Oneonta Sales Company 53-57 Market St., Oneonta, N. Y.
Merriam Motor Car Company Amsterdam, N. Y.
Cortland Auto Supply Company Cortland, N. Y.
City Auto Supply Company 118 Market St., Harrisburg, Pa.
Conrad Bros., 245-7 Wyoming Avenue, Scranton, Pa.
Kitsee Battery Co., 62 N. Main St. Wilkesbarre, Pa.
Becker Auto Co., Grand Rapids, Mich.
Benj. E. Boone & Co. 514 Alder St., Portland, Ore.
The Bailey-Drake Company 604 Mission St., San Francisco, Cal.
The Bailey-Drake Company 145 W. Railroad St., Los Angeles, Cal.
The Bailey-Drake Company Central Bldg., Seattle, Wash.
Milwaukee Tire & Supply Company 457 Milwaukee St., Milwaukee, Wis.
Quickel Auto & Supply Company Albuquerque, N. M.
Capital Electric Company Salt Lake City, Utah
Idaho Electric Supply Co. Boise, Idaho
Idaho Falls Electric Supply Co. Idaho Falls, Idaho
Pocatello Electric Supply Co. Pocatello, Idaho
Citizens Electric Supply Co. Twin Falls, Idaho
Butte Electric Supply Co. Butte, Mont.
Billings Electric Supply Co. Billings, Mont.
Missoula Electric Supply Co. Missoula, Mont.
Great Falls Electric Supply Co. Great Falls, Mont.
Helena Electric Co. Helena, Mont.
Allen Electric Supply Co. Lewistown, Mont.
Ogden Electric Supply Co. Ogden, Utah
Provo Electric Supply Co. Provo, Utah
Price Electric Supply Co. Price, Utah
Salt Lake Electric Supply Co. Salt Lake City, Utah
Brigham Electric Co. Brigham City, Utah
Edward Rudolph Ford Garage, Phoenix, Ariz.
Tri-State Motor Co., El Paso, Texas
Electric Service Company 204 Main St., Dallas, Texas
Ford Sales Co. San Antonio, Texas
McEldowney & Son 106 Broadway, Oklahoma City, Okla.
Ford Garage Tucson, Ariz.

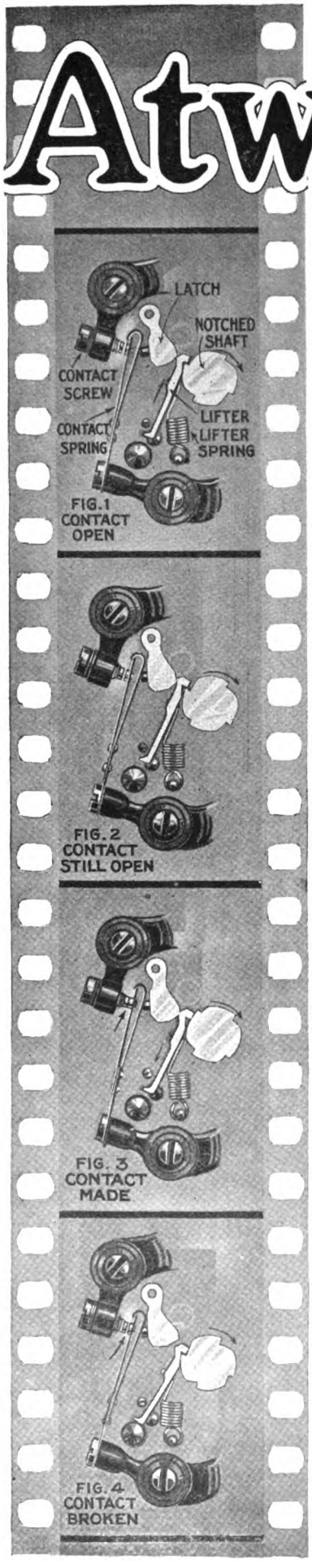
SEARS-CROSS CANADIAN SERVICE STATIONS

Cutten & Foster 179 Queen St., W. Toronto, Ont.
Empire Garage & Supply Co. 90 Duke St., St. Johns, N. B.
Forest Motor Supply Co., 1787 St. Lawrence B'levard, Montreal, Que.
Lions Auto Garage, Ltd. 210 Fort St., Winnipeg, Man.
Saskatchewan Motor Co., Ltd. Regina, Sask.
Bowman Bros., Ltd. Saskatoon, Sask.
Motor Car Supply Co., Ltd. 607 First St., W., Calgary, Alta.
Motor Car Supply Co., Ltd., Corona Hotel Block, Edmonton, Alta.
Electrical Maintenance Co. 737 Pender St., W., Vancouver, B.C.



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Atwater Kent



The lifter as it is pulled forward by the notched shaft does not touch the latch, and the contact points remain open.

The lifter, reaching the point where it rolls off the notched shaft is pulled back by the lifter spring, striking the latch as it returns.

The latch, being struck by the lifter, presses against the contact spring and closes the contact points for a brief instant, immediately opening after the lifter passes.

The latch and lifter, having returned to their original position, are ready for the next spark.

The one Ignition System that works on the "open-circuit" principle--as simple and easy to understand as your door-bell or electric-horn.

Electricity flows through your door-bell circuit only when someone pushes the button and "closes the circuit" to do the work of ringing the bell.

Now, just imagine in place of the bell a coil which produces a hot spark each time it receives an impulse of current, and in place of the push button, the contact-maker of the Atwater Kent System. You will then understand the principle on which the Atwater Kent System works. By means of the contact-maker the ignition circuit is momentarily closed and instantly opened for each spark.

Owing to the fact that it is impossible to stop the motor in any position which will leave the ignition circuit closed, the Atwater Kent System is fundamentally safe, and no accessory safety devices are necessary to protect the battery. The current flows only during the brief instant of each spark and the ignition switch is practically useless except in stopping the car. In other words, it might be left in the "ON" position permanently without the slightest danger of draining the batteries.

The Atwater Kent principle is absolutely unique among ignition devices. Its success is certified by more than nine years of uninterrupted growth. It is in use to-day on upwards of 200,000 cars and is endorsed by more than 30 reputable manufacturers and over 10,000 dealers, garages and repairmen.

The Atwater Kent magneto replacement system can be easily installed in place of the magneto on any standard car. Thousands upon thousands of car owners, realizing the benefits of Atwater Kent Ignition are installing this system on cars previously equipped with magnetos and other types of ignition.

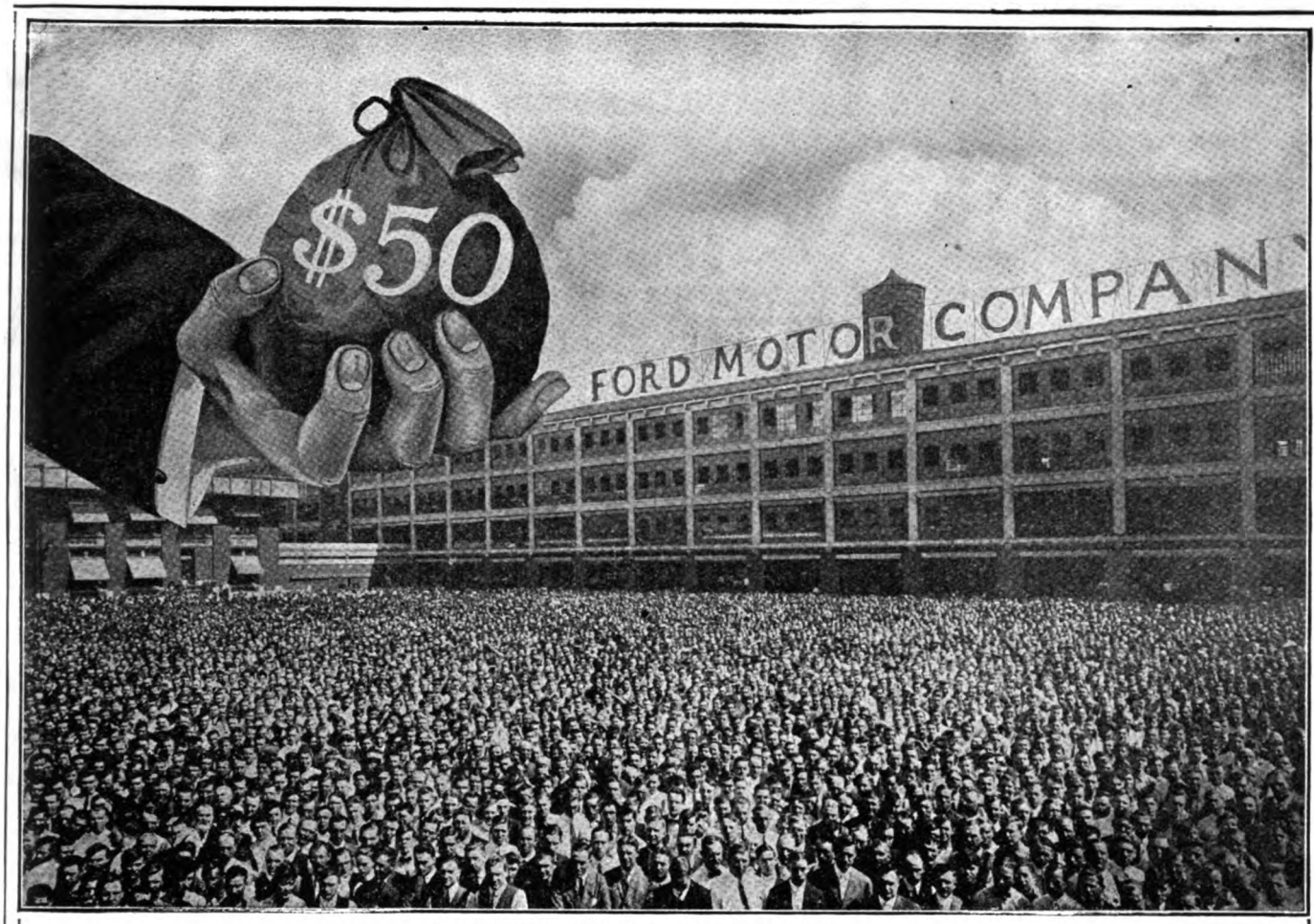
Our special outfit for Fords deserves the investigation of every owner of this remarkable car, and the opportunities which it offers to dealers, garages and repairmen are attracting the attention of the entire trade.

If you are not fully posted regarding this wonderful system by all means get in touch with us without further delay. You owe it to yourself to have our complete data on file.

Atwater Kent Mfg. Works

4933 Stenton Avenue, Philadelphia, U. S. A.

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A corner of the Ford plant and a few Ford employees

Ford Owners Are Getting Money Out of a Clear Sky

Get Them to Apply the Rebate to Install a

SPLITDORF-APELCO
Electric Starting & Lighting System

which embodies a greater sum of starting-lighting essentials and more features of practical value than any other starting and lighting system ever developed for *Ford* cars.

It is simple and easy to install the SPLITDORF-APELCO system—and *Ford* motor repairs can be made without disturbing the installation.

DEALERS' PROPOSITION We have an attractive offering for the handling of SPLITDORF-APELCO Systems. Write for details.

BY INVITATION MEMBER OF

Splitdorf Electrical Co.

ATLANTA	10-12 E. Harris Street	MINNEAPOLIS	34 S. 8th Street
BOSTON	1112 Boylston Street	NEWARK	290 Halsey Street
CHICAGO	64-72 E. 14th Street	NEW YORK	3-5-7 W. 61st Street
CINCINNATI	811 Race Street	PHILADELPHIA	210-212 N. 13th Street
DALLAS	402 S. Ervay Street	PITTSBURGH	5941 Ellsworth Avenue
DETROIT	972 Woodward Avenue	SAN FRANCISCO	1028 Geary Street
KANSAS CITY	1827 Grand Avenue	SEATTLE	1628 Broadway
LOS ANGELES	1215 S. Hope Street	TORONTO	469 Yonge Street
LONDON		BUENOS AIRES	

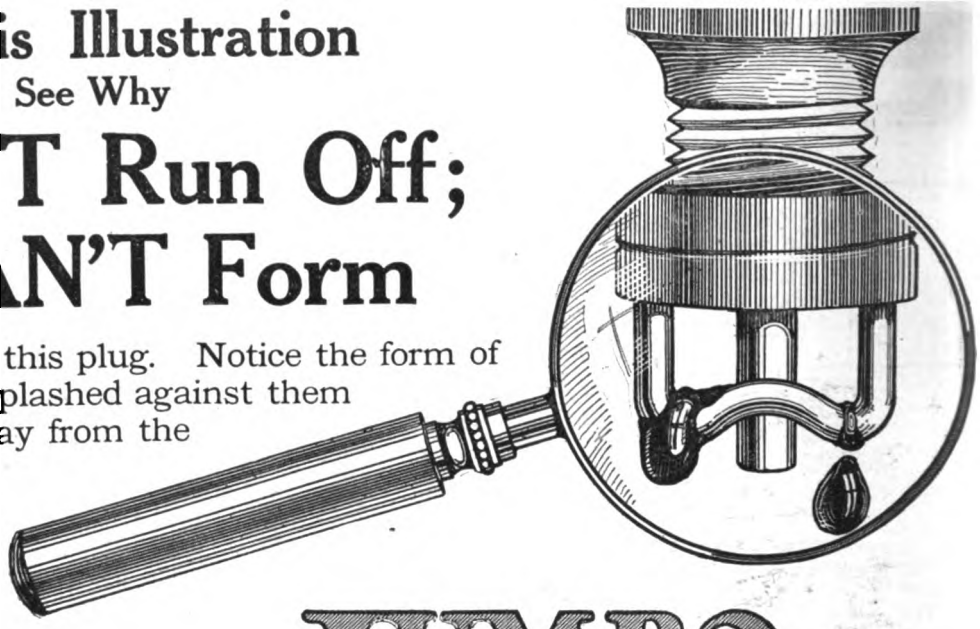
Factories: NEWARK, NEW JERSEY

Pacific Coast Price, $73.00; Canadian Price, $85.00, f. o. b. Toronto

$65

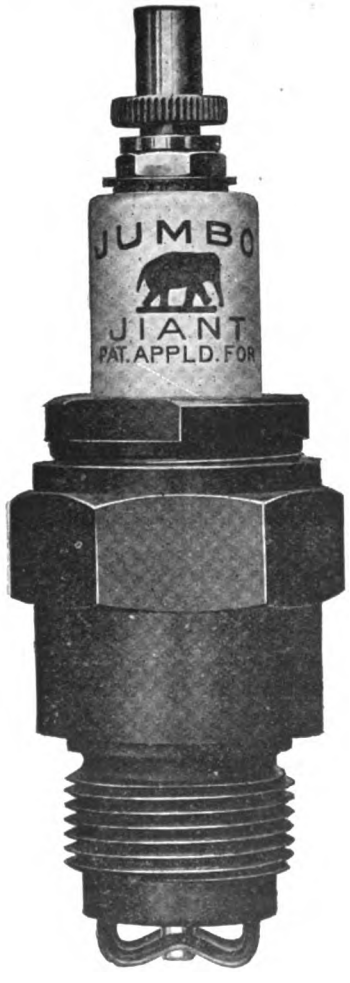
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Study This Illustration
And See Why
Oil MUST Run Off; Soot CAN'T Form



at the sparking point of this plug. Notice the form of the electrodes—any oil splashed against them must run down and away from the sparking point, just as rain runs away from the ridgepole of a house. This is only one of many unusual features that make

JUMBO SPARK PLUGS



the best buy in the spark plug market. The big, massive insulator will not crack with the heat. A liberally proportioned copper-asbestos washer prevents compression leakage, and protects the porcelain insulator from the hammer-like blows of explosion.

No matter what terminals are on the cables in the car, Jumbo Jiant will fit them, because it has a

Universal Terminal

which gives perfect electrical contact with plain, Q-D or slip terminals. This means that the dealer needs to carry in stock only a third as many plugs to meet all requirements.

When you put a set of Jumbo Jiants on your car, your plug troubles are taken care of for fifty-two weeks, for

Every Jumbo Jiant is Guaranteed For a Year

This means precisely what it says—if, at any time within one year of purchase, a Jumbo Jiant develops any defect, or in any way falls down on the job, you can get a new one without further cost. Just send the defective plug back to us, with the guarantee coupon issued at time of purchase, and we will see that you're supplied with a new plug.

Test Jumbo Jiant For Yourself

If you are a dealer, write us on your own letterhead, and we will send you a plug for trial. Test it out under the most severe conditions you can think of. If it doesn't fully prove its absolute superiority over every other plug made in America, we won't expect your future business.

Our discounts will interest you—write for them

Gibson-Hollister Manufacturing Company

3380 Washington Street **Jamaica Plain, Mass.**

69-6

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STEVENS TOOLS — ACCESSORIES

The Stevens label has for fifteen years been recognized by all representative jobbers as indicative of the best value. They will gladly fill your orders for Stevens products because of the guarantee of satisfaction behind them.



THE STEVENS DUPLEX REAMER

A high grade tool of double efficiency for fitting Ford steering arm and body bushings Nos. 2713-14. The spiral cutting edges will not catch in split bushings.

List Price..... ..... $2.00

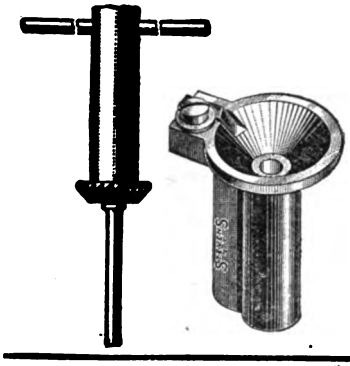


STEVENS SERVICE REAMERS

We are prepared to furnish a complete line of both plain and expanding Reamers in all sizes for automobile bushings.

The following are for Ford:

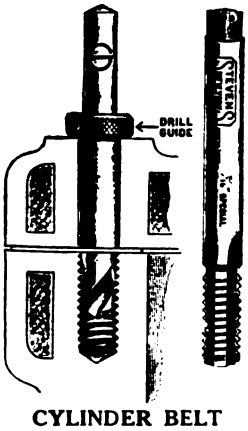
F 2713. Steering Body, $1.50	F 2525. Differential, $2.00
F 2714. Steering Arm, 1.75	F 3314½. Triple Gear, 2.00
F 3022½. Piston Pin, 2.00	F 3545. Steering Post, 2.00



VALVE REFACER AND RESEATER FOR FORD CARS

This outfit does away with the tedious operation of grinding in the valves on Ford cars. It makes a perfectly true valve seat—the secret of good and lasting compression.

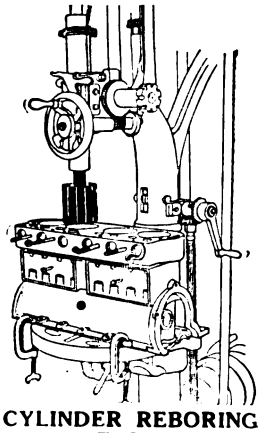
List Price Per Set, $2.00



CYLINDER BELT RETREADING SET

An effective outfit for removing broken cylinder head bolts. The operation is simple and can be performed without taking off the head. Outfit consists of special drill, body tap and bushing.

List Price $1.00



CYLINDER REBORING REAMER

For fitting 1/32 inch oversize Ford Pistons. The blades of this reamer are made of high speed steel and can be reground when necessary. Fitted with No. 4 Morse Taper Shank and can be used in any ordinary drill press with very satisfactory results.

List Price $16.00

SAMPSON FEATHEREDGE INNERTUBE PLUG

FOR PUNCTURES AND SMALL BLOWOUTS

JUST THINK WHAT THIS MEANS!

To make a clean, absolutely permanent inner tube repair in less time and with no greater trouble than changing a spark plug in your motor.

No waiting for cement to dry.

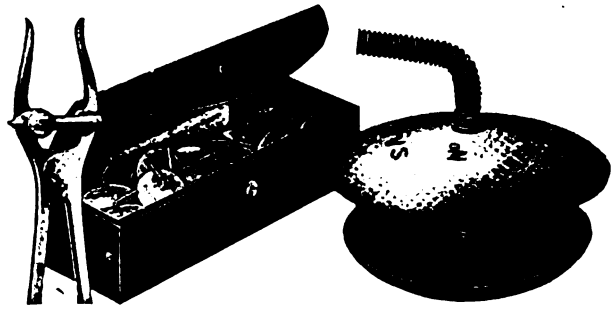
No patches to leak or creep.

Sampson Feather-Edge Plugs are guaranteed to give absolute satisfaction in every way. They have no exposed metal to chafe the tube or shoe.

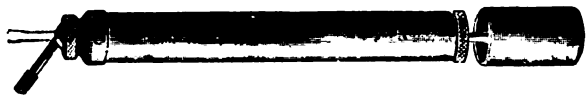
Convince yourself by a trial. Purchase price will be refunded any time if you are not satisfied.

PRICES:

No. 1. Outfit with tool and ½ dozen assorted plugs.....$1.50
No. 2. Outfit with tool and 1 dozen assorted plugs..... 2.50
Motorcycle Kit with tool and ½ dozen assorted plugs..... 1.50



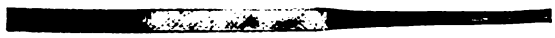
THE PIONEER GREASE GUN



The "Pioneer" is a heavy, well made brass gun with many good features. It has a strong swivel nozzle suitable for oil or grease, and years of experience have shown that it will give more service than any other gun made.

List Price..... ....$1.50

IGNETO COIL FILES



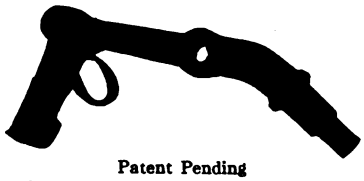
For facing up vibrator points. These files have a dead smooth cut, and are thin enough to insert between contact points without changing the adjustment.

List Price 15c Each. Mounted 1 dozen on display card for the dealer.

STEVENS & CO., Manufacturers and Distributors to Jobbers 375 Broadway, NEW YORK

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Spindle Arm Silencer
For Ford Cars



Patent Pending

Absolutely stops all rattle in arm and stops wear. Put in from front side with nippers. Once there, will stay. Try a pair and see how good they are. **Price 50c per pair, postpaid.**

Agents Wanted.

J. W. SANBORN CO., Hampstead, N. H.

HIGH GRADE
Auxiliary Seats



Attach to side of tonneau or fold into back of front seat.

Hodge & Graves Co.
AMESBURY, MASS.

BUY *BETTER* SPRINGS

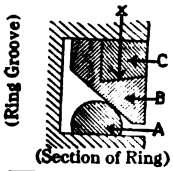


GUARANTEED even at the bolt hole—NO restrictions. Graphited (for 2 years' lubrication) between all leaves. At better price than car factories.
Get complete 1915 list of 250 numbers and address of nearest Supply Jobber carrying stock, or wire us for any stock number listed.
Try *Better* Springs.
NEW ERA SPRING & SPECIALTY COMPANY
864-78 Woodward Ave., Detroit, Mich.
69-73 No. Washington St., Boston, Mass.
Ask for circulars of other low price Ford Specialties

CHAS. FRIEDLANDER & CO.,
58 Warren Street, NEW YORK.
THE HOUSE OF SPECIALTIES FOR FORD CARS
Write for Catalog.
We do not sell to consumers at any price.

CATALOGUE OF
AUTO ACCESSORIES and TOOLS
Sent free to Dealers and Repair shops in the middle West on request written on business stationery.
CAMPBELL IRON ACCESSORIES
811 Cass Avenue St. Louis, Mo.

(Pressure Side)



(Section of Ring)

Pressure Proof Piston Rings stay tight in ring groove.
Made by
Pressure Proof Piston Ring Co.
3368 Washington St., Jamaica Plain, Boston, Mass.
Write for circulars.

"The Most for the Money"
FOUR $985 **Auburn** SIX $1550
Auburn Automobile Company, Auburn, Indiana

"What's He To Me?"
by the Editor of the Automobile Dealer & Repairer
LIVELY, VITAL and THOUGHTFUL
362 pages, illustrated.
Sent post free on receipt of $1 by **H. O. BULLARD, Publisher, 48 New Chambers Street, New York.**

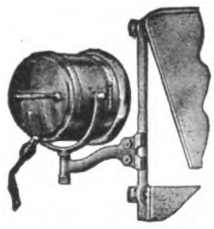
The Scientific Safety Garage Heater
The Only Heater Listed By Underwriters.
Send for book on Scientific Garage Heating.
Built by **THE SCIENTIFIC HEATER CO., 2300 Power Avenue, Cleveland.**

J. H. SAGER COMPANY
Manufacturers of
J. H. S. ABSORBERS, SAGER EQUALIZING SPRINGS, BUMPERS, and Other Automobile Specialties.
Write for Catalogue.
291 South Ave., ROCHESTER, N. Y.

The Perfect Pump With Perfect Attachments
"Guaranteed Not to Spray Oil with the Air"
Engine Driven KELLOGG Tire Pump
Model 101 with complete attachments - - $15
Special Dodge Outfit - $10
Special Ford Outfit - $9.50
Stock carried by leading distributors and dealers everywhere.
KELLOGG MFG. CO., 267 Circle St., Rochester, N. Y.

Samson-Tiger $5
Automobile Hand Horn
cannot stick or balk. Samson-Tiger is the only *shaft-driven* hand horn. Write for our attractive proposition to dealers.
AMERICAN ELECTRIC COMPANY, State and 64th Sts., CHICAGO
Manufacturers of motor, vibrator and hand actuated SAMSON AUTOMOBILE HORNS

HERZ PLUG
The famous "Bougie Mercedes" Spark Plug of Europe
ADOPTED BY U. S. ARMY and NAVY. WHY?
Unbreakable Double Stone—4 sparking points. Platinum-alloy electrode—self-cleaning. Guaranteed a year—usually outlasts the motor. Write for our special proposition to dealers. **HERZ & CO. 245 W. 55th St., New York**



The CELLO Spot Light will throw sufficient light to read type of this size 1000 feet away. Will fasten on any windshield. Price, any finish, $10.00 each Send for further detail.
A. S. CAMPBELL CO.
280 Commercial Street BOSTON, MASS.

"AMERICAN"
ADJUSTABLE VALVE FACING TOOL
MAKE your old Cylinders equal to new by using this Adjustable Valve Refacing Tool. The only adjustable tool for the purpose on the market, it can be adjusted to any size valve in less than half a minute, and by a few turns will give a perfect facing of the valve.
Write today for descriptive circular and price.
AMERICAN VALVE TOOL CO., 589 Hudson St., New York

MOSCO
A GUIDE TO QUALITY IN
AUTO FITTINGS
MOTOR SPECIALTIES CO., Mfrs., Waltham, Mass.

Quickly Saves Its Cost
For Cutting Headlights
"RED DEVIL" Circular Glass Cutter No. 033
"It's all in the wheel"



Enameled wood handle and base, "slip proof" bottom; steel rod and head. Pays for itself on the first headlight you cut. Hand honed, tested steel wheel. **Mailed for 50c.**
Write for free booklet.
SMITH & HEMENWAY CO., Inc.
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GREASE CUPS REPLACED FREE!
Equip your car with **KLICKET RATCHET GREASE CUPS** and you get a new one free whenever you lose a cap off or break anything. They save their cost in grease alone. Send 25¢ for sample to fit any car. Sold by all dealers. Identified by the name
KLICKET
American Stamping Co., 606 Burchard St., Battle Creek, Mich.

GENEMOTOR
For Starting and Lighting FORD Cars
Built By The
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A. J. PICARD & CO.
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DON'T BORROW TROUBLE
Swat the trouble in operating your **Ford Car** by applying
PEDERSEN UNITED TERMINALS
and wear the smile that don't wear off. Drop postal for booklet describing these and full line of Pedersen Ford specialties.
PEDERSEN LUBRICATOR CO., 601 First Ave., N. Y. City

"PURAIR" TIRE PUMP
Saves Its Cost in a Very Short Time
EVERY PUMP GUARANTEED
Write for Prices and Full Description
HERT MANUFACTURING CO., INDIANAPOLIS, IND.

Automobile Supply Catalog.

The Service Motor Supply Co., Washington Blvd. and Desplaines St., Chicago, Ill., announces the advance edition of their 1915 catalog. It has practically everything new and good in the line and a copy will be sent to any dealer who will apply for it. A postal card will bring it.

For Mail Order Firms.

The Mail Order Company, of San German, Dept. V32, Porto Rico, are supplying a mailing list of Latin-American buyers which is guaranteed absolutely correct. It includes hundreds of classifications and as mail buying is much more common in those countries than in this, it is a good business policy to get some of the trade. For booklet address the firm as given above.

Offers $100 for Best Name.

The newly organized International Rubber Co., of Denver, Colo., is offering $100 to the person who suggests the best name for their new tire protectors, and their new brand of rubber tires. Car owners only can enter—and can submit as many names as desired which will be finally decided upon by five disinterested judges.

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Miller's No. 14 Three Cavity Sectional

(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

With Gasoline Burner Outfit, extra - $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.



MILLER'S REPAIR MATERIALS

Common Tread Stock, per lb	$0.40
Standard Tread Stock, per lb	.55
High Grade Tread Stock, per lb	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried...Net,	1.50
*Miller's Three in One Repair Stock	.90

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture



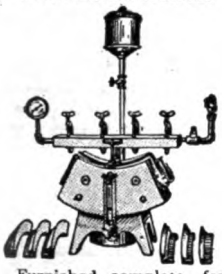
Patented

Other Patents Pending

That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Molds.....$42.00

MILLER'S SECTIONAL VULCANIZER With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $41.50

Miller's High Pressure Air Pump

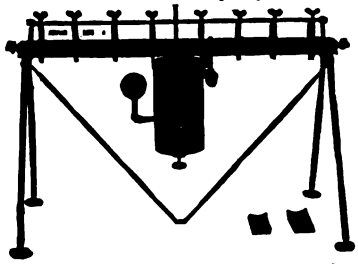
is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. pressure. Write for details.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Inner Tube Vulcanizers

Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

Miller's Rubber Instruction Book.

Price Prepaid, $1.00 Net

Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Cog" Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*

CHAS. E. MILLER

Anderson Rubber Works

ANDERSON, IND., U. S. A.

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To Automobile Owners,

Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

100% POSTAGE GUARANTEED

ALL DUPLICATES CUT OUT

We Have the Largest Addressograph Plant in the World for Public Business

List of Fords, Overlands, and All Makes at Rock Bottom Prices

Card Systems any Make, any State or Section Thereof

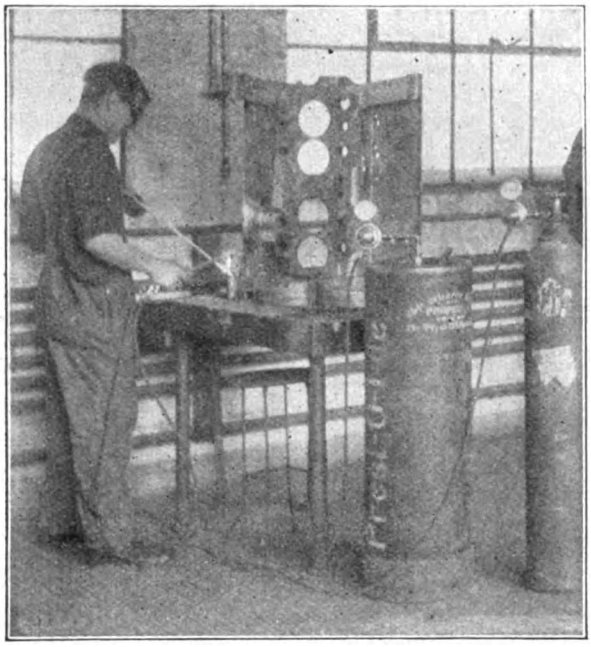
PROMPT SERVICE

New Jersey and New York State Automobile Registrations for $10.00 per Year

AUTO LIST & ADDRESSING CO.

1735 BROADWAY Telephone, 6600 Columbus **NEW YORK CITY**

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Showing the Variety of Work Handled and Simplicity of Apparatus

Positive Profits—Easily Made by Oxy-Acetylene Welding

Garage owners everywhere are finding this process a ready money-maker.

Parts that seem hopelessly damaged are made good as new—easily, quickly and at small cost. Repairs possible by no other method become simple every-day routine work.

Naturally, this kind of service and the pronounced savings please garage patrons. It brings new customers to your shop. At the most moderate charges, YOUR profits are too large to overlook.

PREST-O-LITE

Dissolved Acetylene

Simplifies—Cheapens and Improves this Process for All Garage Work

Very small outlay for apparatus is required. Equipment soon pays for itself. We furnish a thoroughly high grade welding outfit for $60. The average user will also need gas cylinders at additional cost and about $10 worth of welding supplies. Truck and special cutting equipment at extra cost. Complete instructions free with every outfit.

Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene (ready-made carbide gas) in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified —makes better welds and is cheaper to use.

START NOW—GET FULL DETAILS.

The demand for Oxy-Acetylene Welding Repair work is large and growing. Get your share of the profits. Send for literature that shows how you can apply Oxy-Acetylene welding in your shop, with profits to you and savings for your customers.



The Prest-O-Lite Co., Inc.,

The World's Largest Makers of Dissolved Acetylene

820 Speedway, Indianapolis, Ind.

53 direct factory branches and charging plants in principal industrial centers.

Are You Losing This Chance?

The Garage man who can repair and adjust Electrical Equipment is going to get the cream of the garage business. The ever increasing demand for attention to self-starting and lighting systems will compel you to equip to handle this business.

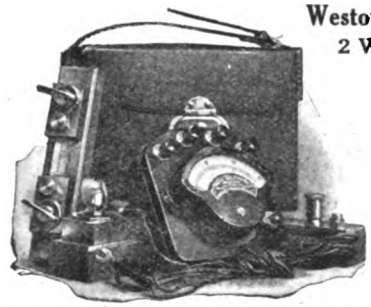
Weston Model 280

GARAGE TESTING INSTRUMENT

Is your one great and urgent necessity, to enable you to quickly locate electrical troubles and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electric equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.



Weston Electrical Instrument Co.

2 Weston Ave., Newark, N. J.

New York, Boston, Philadelphia, Buffalo, Richmond, Denver, Chicago, Detroit, Cleveland, Cincinnati, St. Louis, San Francisco, Montreal, Vancouver, Toronto, Winnipeg, Berlin, Paris, London, Petrograd, Johannesburg, S. Africa

Guaranteed for 10,000 Miles



BRICTSON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Brictson Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding too.

Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

Your Tires Rebuilt The Brictson Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blowouts, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write today for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

The Brictson Mfg. Co.

185 Brictson Bldg.

Brookings, South Dakota

Brictson Pneumatic Tires

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Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri



REFLEX
Spark Plugs

Get most power from your gasoline.



Baffle reflects soot and dirt **away from** the interior and **out through** the spark gap at every explosion.

Reflex plugs are made right, stay clean, withstand heat and last longer than others.

Regular equipment on 16 leading automobiles and motorcycles.

Returnable and money back if not satisfactory after 30 days' trial.

The Reflex Ignition Co.
211 High Ave., Cleveland, Ohio

TIRE PROTECTION



A complete protection of chrome leather constructed with patented INSULATING and LUBRICATING strip between rivet roots and rubber casing. Prevents heat and chafing.

Prevent skidding on wet and muddy roads.

ARMOR TREADS

Prolong the Life of Your Tires

They may be successfully used upon old casings provided the fabric is in good condition, even though the rubber be worn off.

They fit like a glove and add sturdiness to the appearance of the car.

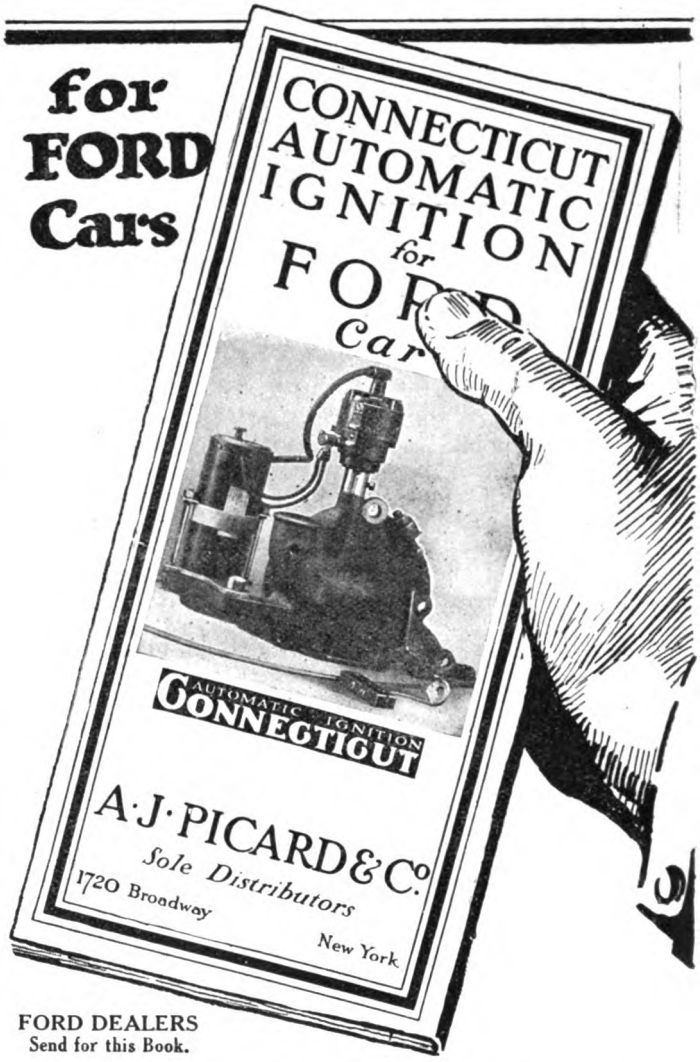
Made in all sizes for all makes of cars.

Write for Prices and Full Particulars.

ARMOR TREAD COMPANY
HARTFORD, CONN.

Announcing the AUTOMATIC · IGNITION CONNECTICUT SYSTEM

for FORD Cars



FORD DEALERS
Send for this Book.

It is a magneto mechanism less the current generating unit, but works in just the opposite way—delivering a spark tempered exactly to the motor's requirements—its hottest spark at slowest speeds—giving an increased range of high gear efficiency—hill climbing ability and power for sustained speed never before considered possible in a Ford motor.

Its ideal adaption is in conjunction with a storage battery charged by a generator.

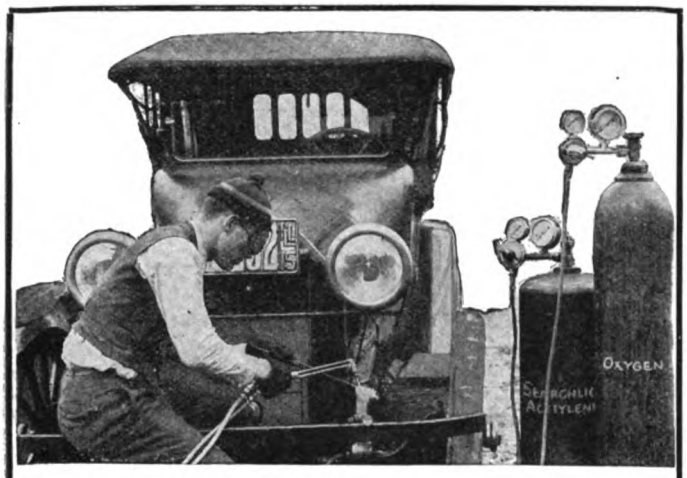
It is simplicity itself and what is better, the most modern and effective system of ignition ever developed.

For information and territory write or wire.

SOLE AGENTS

A.J.Picard & Co~1720-22 Broadway New York

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BIG PROFITS IN THIS WORK!

The automobile in the picture run up to the garage with a broken frame. This up-to-date garage with its Searchlight Welder fixed the frame in forty-eight minutes and charged $18.

Repairs that the other fellow can't handle are the ones that make you the big money.

Don't let this profitable business go past your garage to your competitor. There is no apparatus as profitable in a garage as an acetylene Welder.

And there is no welder as dependable, economical and easy to operate as the

Searchlight Welder

FOR GARAGES

This is the only welder in its class which sells for less than $100.00.

$50 Cylinders Extra

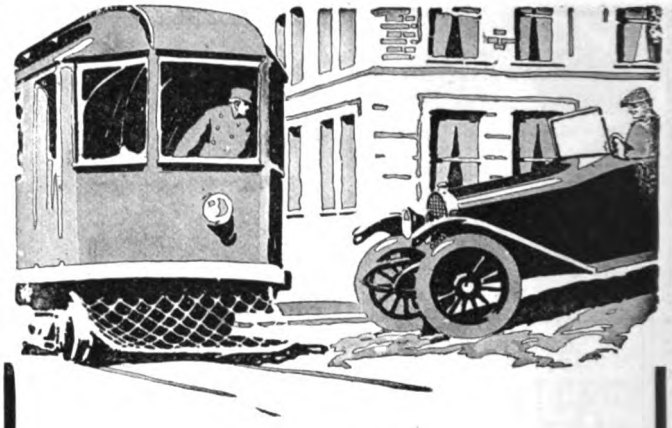
Fifty dollars is the price for the Searchlight Equipment for garages. More money can't buy a better equipment and it isn't wise to buy a welder for less.

Write for information and we will show you the new source of big profit.

The Searchlight Company
Karpen Building, Chicago, Ill.

BRANCHES AND REFILLING STATIONS:

Atlanta, Ga.
Boston, Mass.
Buffalo, N. Y.
Camden, N. J.
Chicago, Ill.
Cleveland, Ohio
Dallas, Texas.
Detroit, Mich.
Kansas City, Mo.
Minneapolis, Minn.
New York City, N. Y.
San Antonio, Texas
Toronto, Ont.
Warren, Ohio



What stopped the automobile in front of your door?

Brake Lining!

There is a constant demand from motor car owners for brake lining, because even the best will not last forever. There is a steady demand for

Thermoid
HYDRAULIC COMPRESSED Brake Lining - 100%

because it is known universally as the brake lining that retains its gripping efficiency until worn paper thin. Thermoid is brake lining clean through—tougher for its purpose than steel itself. It is brought by hydraulic compression to a uniformity and density that give 100% gripping power until it is actually worn out. Even that takes months longer.

You will find it worth your while to look into Thermoid as a motor accessory staple. A line will bring further particulars.

Thermoid Rubber Co. TRENTON, N. J.

Branches:
New York
Chicago
Pittsburgh
Indianapolis
San Francisco
Philadelphia
St. Louis
Detroit
Boston



Our Guarantee—Thermoid will make good or WE will.

Cannot be burned out or affected by oil, heat, water, gasoline or dirt.

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The Main Points

The Au-To Air Compressor is designed especially for automobile garages, electric motor cleaning, water systems, machine shops, foundries and all other purposes requiring not over 6½ or 13 cubic feet of free air per minute at not exceeding 300 lbs. pressure.

The Au-To Air Compressor is built to take care of itself. It is all metal—no leather packing or washers to wear out. It is air-cooled—no freezing, no troublesome tanks, water jackets or pipe connections. The location of the pipes in the crank-case, permitting the fanning process both inside and out, enables the Au-To Air Compressor to develop its remarkable speed and pressure without overheating. Its valves are removable—no secreting of these parts in the base, where pipe connections and foundation joints have to be broken to get at them.

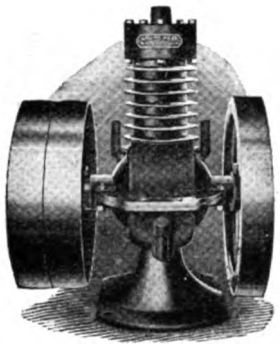
The Au-To Air Compressor is built of the best materials obtainable for the purpose, under the hands of expert machinists. All moving parts are given an ample margin of mass and strength to withstand exceptional strain. Cylinders are made of a special carbon cast iron.



Every Au-To Air Compressor bears this label.

It is your guarantee of efficiency and satisfaction.

Literature on request.



The Au-To Air Compressor

SMALL POWERFUL INEXPENSIVE

The small size and large capacity of the Au-To Air Compressor, combined with its surprisingly low price, have made The Au-To Air Compressor the leader in its line, and have placed it with the leading jobbers in every part of the country.

The Au-To Air Compressor is built to supply 6½ cubic feet of free air per minute at 300 lbs. pressure—occupying a floor space of only 14x18 inches—with all bushings and bearings of finest quality bronze—with crank-shaft and connecting rod of A No. 1 forged steel—with a perfect balance between tight-and-loose pulley and fly-wheel to insure frictionless running and even wear.

Specifications

Power Required—1½ H. P.

Pressure - constant pressure of over 200 pounds without overheating.

Capacity—6½ cubic feet of free air per minute at 400 revolutions.

Crank Shaft, Connecting Rod, Cap } Forged high carbon steel.

Bearings, Bushings } Bronze (Very best grade).

Cylinder—3" bore, single acting.

Piston—4" stroke—3 eccentric rings—2 at one end; 1 at the other end.

Valve—new type—accessible by removal of but five bolts, with no breaking of pipe connections.

Gaskets—best quality asbestos.

Pulleys—tight-and-loose—13" diameter, 2" crown face—weight about 40 lbs.

Fly-Wheel—14" diameter—weight about 40 lbs.—balances pulley and gives absolutely even wear on bearings.

Air Intake—21" above floor (to avoid dust).

Lubrication—splash.

Height—21" over all.

Floor Space Required—14"x18".

Weight—130 lbs.

Speed Recommended—400 revolutions per minute.

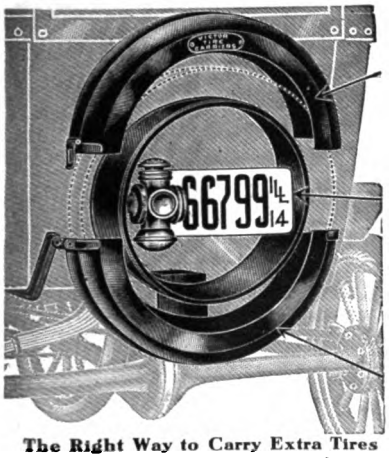
Guaranteed Pressure—300 pounds.

Literature on request.

The Au-To Air Compressor Co., Dept. 62, Wilmington, Ohio, U. S. A.

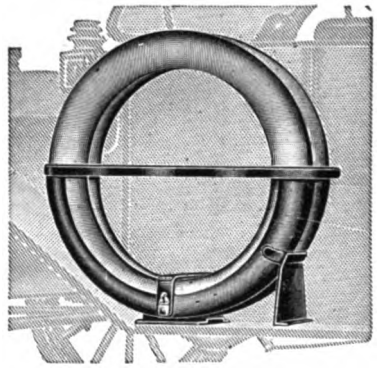
VICTOR, SIMPLEX AND DUPLEX TIRE CARRIERS

HANDSOMELY FINISHED IN BLACK ENAMEL



The Right Way to Carry Extra Tires





Duplex on Running Board of Ford Cars

A handy man with carpenter's brace and bit and a wrench can attach any of these carriers to the car in thirty minutes,

The **VICTOR** is made of sheet steel in three sections, formed to fit, completely enclose and protect the two tires, as shown.

The **DUPLEX** is an abbreviated portion of the lower half section of the **VICTOR** with bars across the top.

The **SIMPLEX** is for one tire only. **DUPLEX** and **SIMPLEX** are made in all sizes.

Made by THE INTERNATIONAL STAMPING CO., 1852 Austin Avenue, Chicago, Illinois

Goodrich
Safety Tread Tires
Best in the Long Run



We manufacture the largest line of auto fabrics including tire covers and specialties for Ford Cars. Dealers and jobbers write now for complete 32 page catalogue.
NATHAN NOVELTY MFG. CO., 84 to 90 Reade St., N.Y. City

LEE Tires
PNEUMATIC NON-SKID PUNCTURE-PROOF
Lee Tire & Rubber Co., Conshohocken, Pa.

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MARATHON

TIRES

Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

SPEED MARATHON ENDURANCE

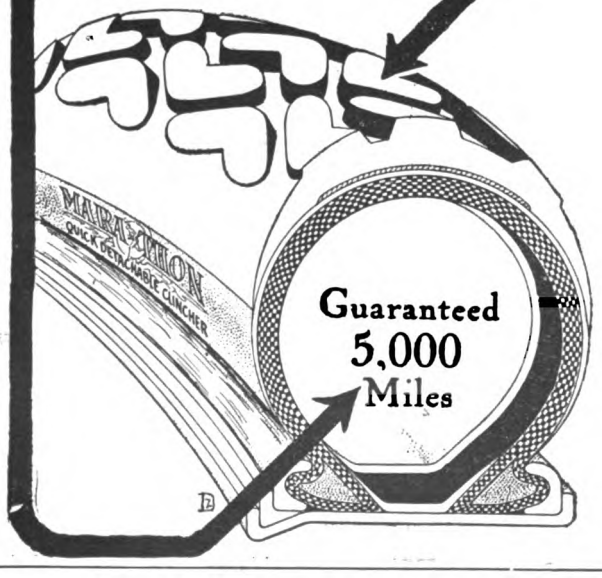
TIRES

Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS,
OHIO



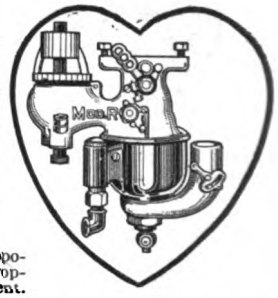
SCHEBLER CARBURETORS

equipped the Stutz Car winner of second place in the

VANDERBILT AND GRAND PRIX RACES

This was the first American car to finish in both races and was of course

SCHEBLER EQUIPPED



Why not have a SCHEBLER yourself?
Ask us about our remarkable exchange proposition on new Model "R." Get our special proposition and particulars for Ford car equipment.

JAMES C. NICHOLS, Inc., Direct Factory Distributor
1673 BROADWAY Tel., Circle 1626 **NEW YORK CITY**



Pat. 1091318. May 19th, '14.
HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

REPAIRMAN

There has been a period in your life that you were unable to tell a valve from a spark plug, a magneto from a carburetor, or a cylinder from a piston; some one had to tell you what these parts were and their function. The troubles arising from these and other parts of a car, you have mastered, but you are still at sea if you do not understand and are not prepared to rebore and fit oversize pistons, for this is the most important repair that can be given a worn engine.

The HEISER IMPROVED CYLINDER REBORING TOOL for Ford Engines, makes a good shop out of a poor one and a better shop out a good one, but best of all, it gives the owner service. The end of this season will see one million Fords on the highways; this means many million dollars will be spent on reboring and fitting oversize pistons.

The early bird catches the worm. We furnish oversize pistons to fit the rebored cylinder, $1.50 each, Complete.

Write for further particulars about this wonderful tool.

HEISER SPECIAL TOOL CO., (Dept. A) **KINGSTON, MO.**

$5.00  **$5.00**

Agents Wanted

CLEAN OUT THE CARBON WITH STEAM

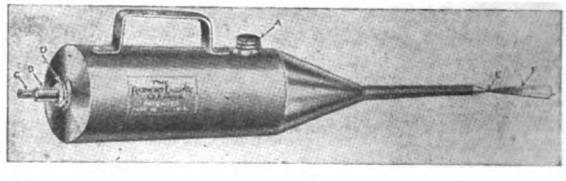
The Hart-Bell Carbon Remover cleans out the carbon with live steam. It is permanently installed on the intake manifold, and a turn of the handle admits a fine spray of water vapor that is instantly converted into superheated steam by the ignition in the cylinder. The steam loosens the carbon while the motor is running so that in five or ten minutes the carbon is blown out.

UTILITY PRODUCTS CO., Inc., 1414 Times Building, New York

THE ROMORT ENGINE CLEANER

For Automobiles and Motor Cycles

PRICE $3.00 Delivered. We Guarantee Satisfaction or refund purchase price.



Fill with two quarts common coal-oil, attach Cleaner to air supply (Power tire pumps or storage air systems preferred). Cleans the dirt and grease from the machinery perfectly. Once a week will keep your car looking new. Full directions with each Cleaner. Ask your dealer or fill out Coupon below.

ROMORT MANUFACTURING CO.,
1322-1326 Michigan Ave., Chicago, Ill., or 1810 Westlake Ave., Seattle, Wash.

Gentlemen:—Inclosed find Three Dollars, please send me by Prepaid express or Parcel Post, One Romort Engine Cleaner, subject to your guarantee of satisfaction or refund.

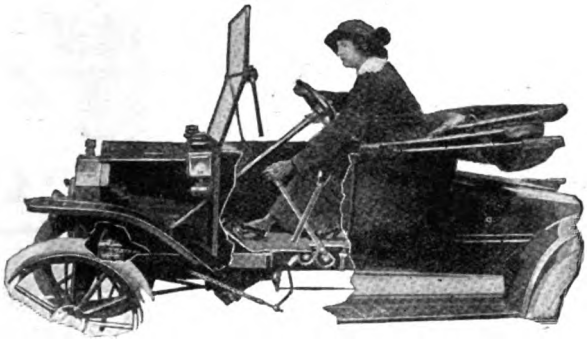
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Robertson's Pres-Toe

1916 Starter For Ford Cars

Patents Pending



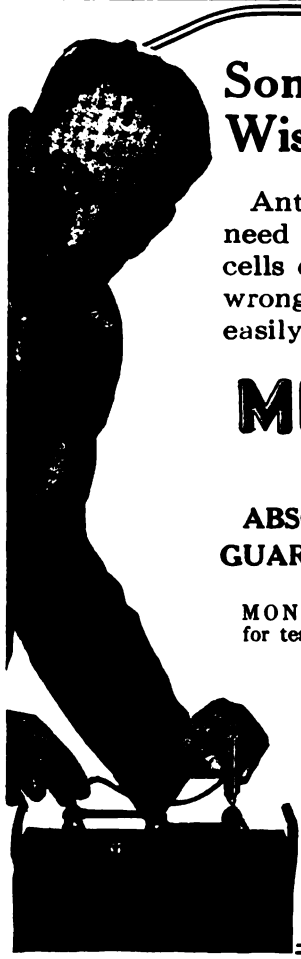
Here is the Scientific, practical Starter. Note that compound geared lever. You can turn the motor over with two fingers on the lever. A seven year old boy can start the motor with ease.

PRES-TOE 1916 is the only ball bearing starter on the market. That means PRES-TOE will outwear all others.

Always ready, out of sight, convenient and safe. **Absolutely Guaranteed.**

Special introductory offer this month to first purchasers in new territory. Write to-day.

W. ROBERTSON MACHINE & FOUNDRY CO.
BUFFALO, N. Y.



Some Day You'll Wish You Had One

Anticipate that inevitable need today. When your dry cells or storage battery goes wrong you can quickly and easily locate the trouble with

MONARCH

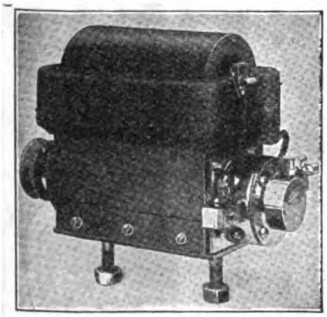
UNBREAKABLE
ABSOLUTELY ACCURATE
GUARANTEED FOR 5 YEARS

MONARCH AMMETER for testing dry cells **$1.00**

MONARCH STORAGE BATTERY TESTER . . **$1.50**

At your dealer's or direct upon receipt of price.

Hercules Instrument Co.
Dept. D. R. Mount Vernon, N. Y.



VOLTA ELECTRIC LIGHTING SYSTEM

can be put on any make of car

Best and simplest generator on the market

Special Outfits for FORD Cars

County and State Agents Wanted

IRWIN D. GROAK ENGINEERING CO.
Engineers, Designers, Builders
MONADNOCK BLOCK CHICAGO, ILL.

STOP THAT LEAK

You are using too much oil!
You are wasting gasoline!
You are not getting enough power!
DON'T THE UP-KEEP GIVE YOU THE BLUES?

Trade Mark



Patent Applied For

AUTO OUTING CO. (Buick Distributors), Baltimore, Md., writes:—When you called 18 months ago about "NO-LEAK-O" Rings, we were not interested. Buick cars were giving such good service, we could not see the need of new rings. You made such strong claims that we tried a set. The increase in power, saving of oil and gasoline was a surprise to us. Our repeated orders for hundreds of "NO-LEAK-O" Rings speak stronger than we can write.

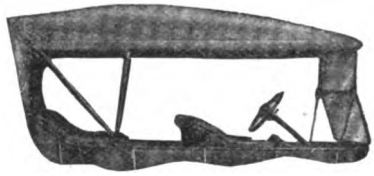
"NO-LEAK-O" piston rings have grooves which CONTROL THE OIL, giving perfect lubrication without waste. No smoke. No carbon. No oily spark plugs. No grinding of valves. We absolutely guarantee each ring for QUALITY, ACCURACY, and SATISFACTORY service. ONE PIECE, LOW COST, HIGH EFFICIENCY. Carbon eliminated by controlling the oil.

AUTOMOBILE ACCESSORIES CO., 816 W. North Avenue, Baltimore, Md.

"Hercules"

ONE-MAN-TOP

EQUIPPED WITH
JIFFY SLIDING CURTAINS AND DUST HOOD
FOR ALL CARS
ALSO RUNABOUT AND 4 POST TOPS
Made of Silk Lustre Mohair, Imitation Leather or Khaki Twill.



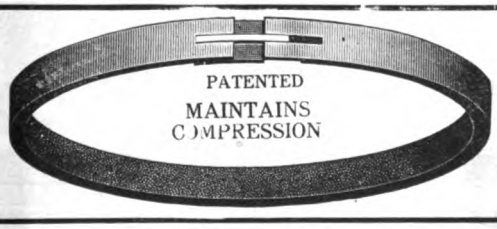
LIBERAL DEALERS' DISCOUNT
Send for General Price List

Ford $30.00 **Hup $33.00**
Overland $35.00 **Hudson $38.00**

(Mohair) Complete with Jiffy Curtains and Dust Hood, F. O. B. MICHIGAN.

HERCULES RUBBER CO.
ONE-MAN-TOP DIVISION
2 Hudson St., New York, N. Y.

It's all in the lock joint



PEERLESS PISTON RINGS

Made In Chicago

The only Efficient, Economical, Sensible and Simple Rings on the market today. A one-piece eccentric ring that is sold on a money-back guarantee. Absolutely compression tight and carbon proof.

Write for Details Now.

Distributors: **LARSON & HILKER, 19 S. La Salle St., Chicago, Ill.**

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More Power or Your Money Back



That is our iron-clad guaranty on

BURD HIGH COMPRESSION PISTON RINGS

No ifs—ands—or buts. No matter what rings you are using now—plain or fancy. We guarantee your motor to develop more power, higher compression and to give more miles per gallon when you install Burd Rings. Write the nearest sales office—now.

BURD HIGH COMPRESSION RING CO., General Offices and Factory, ROCKFORD, ILL.

CHICAGO BRANCH
927 Monadnock Block

DETROIT BRANCH
736-8 Whitney Building

DALLAS, TEXAS
819 Wilson Building

INDEPENDENCE, IOWA
Gidney Hotel Building

KANSAS CITY, MO.
216-217 Rialto Building

MILWAUKEE, WIS.
403 Jefferson Building

MINNEAPOLIS, MINN.
714 Metropolitan Life Bldg.

NEWARK, N. J.
282 Halsey Street

NEW YORK, N. Y.
1105-9 U. S. Tire Building

PHILADELPHIA, PA.
684 No. Broad Street

PORTLAND, OREGON
816-817 Lewis Building

PEORIA, ILLINOIS
Masonic Temple

ROCHESTER, N. Y.
254 East Avenue

SEATTLE, WASHINGTON
427 Central Building

SPOKANE, WASHINGTON

LOS ANGELES, CAL.
316-317 Hass Building

DEALERS!!! — A NEW ARRIVAL

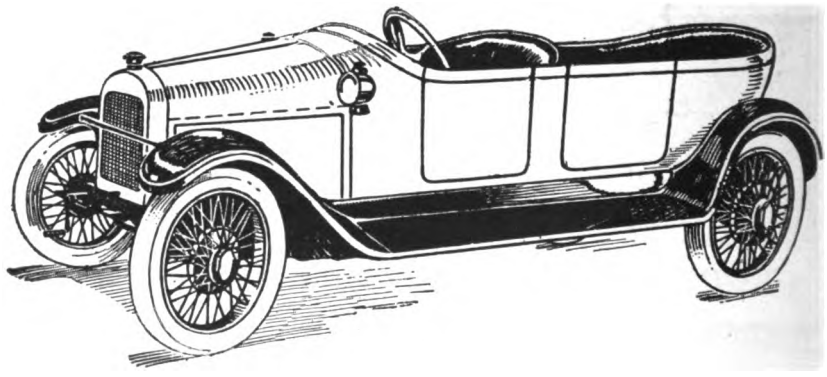
THE LOWEST PRICED CAR IN THE WORLD

NEW
TWOMBLY

Built to Sell for $395, But Now Offered at the Exceptionally Low Price of

$195.

ABSOLUTELY GUARANTEED



WITHOUT AN EQUAL AT THREE TIMES THE PRICE—THE TWOMBLY IS THE MOST SENSATIONAL CAR VALUE YET ADVERTISED. IT WILL TRAVEL 40 MILES ON 1 GALLON OF GAS—200 MILES ON 1 QUART OF OIL AND WILL STAND THE ROUGHEST USAGE ON CITY OR COUNTRY ROADS.

The Twombly is a 2-passenger roadster. Go over the specifications and you will see that this is a car that you can sell without an effort.

Specifications—High grade 15 H.P., 4 cylinder, water-cooled motor; cantilever springs; 100-inch wheel base, high grade radial and thrust self-aligning ball bearings; underslung, giving low center of gravity and perfect balance; extra heavy clincher non-skid tires; high tension magneto, hand or foot control; weight 1025 lbs.

Equipment includes side and tail lights, and complete tool kit.

Our dealer proposition is just as attractive as the Twombly Car and its selling price. Don't delay, but write at once for details.

TIMES SQUARE AUTOMOBILE CO.,

Broadway and 56th St., New York **WORLD'S LARGEST DEALERS** **1210 Michigan Ave., Chicago, Ill.**

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In every important city and in thousands of small towns and villages, in every state, over the entire country, you will notice

CONOVER COWL-WINDSHIELDS ON FORD CARS

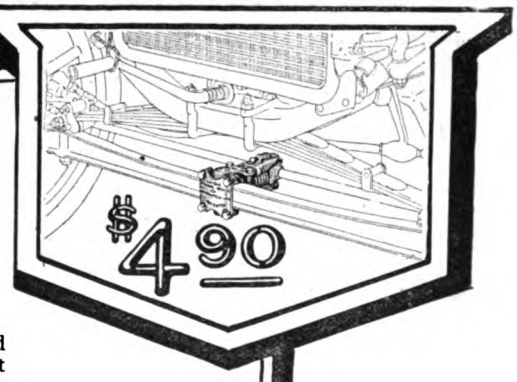
They make such a marked improvement in the appearance of Ford cars that you cannot help but notice them. They are self-advertising. Right in plain sight. Other accessories for Fords that are out of sight when in position on the car do not possess this important advantage. You have to keep pushing them ALL THE TIME. Progressive dealers realize this self-advertising feature of our shields and carry them in stock. We invite all dealers to avail themselves of this opportunity. Every Ford owner appreciates the desirability of a rain vision, ventilating windshield. We are TELLING EVERY FORD OWNER about our shields and are sending them to the dealers. So, Mr. Dealer, you want to be prepared to supply them, with a stock on hand. Better order 10 at least, at once. Some dealers order a car load at a time. We carry a large stock for immediate shipment. We are also selling, in large numbers, our UNIVERSAL shields for the new cowl-dash 1915 Fords. They are also rain vision, ventilating. They cool Fords perfectly in hot weather. They sell on sight. Conover cowl-shields, $15.00. Universals, $10.00.

STOCK UP AND BE PREPARED

PAGE WOVEN WIRE FENCE CO., **Adrian, Mich.**

Windshield Department

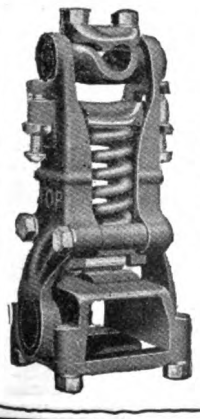
Dealers—Here is a Steering Device that is right both in theory and practice



A large number of steering devices recently placed on the market have failed utterly to do what was claimed for them. Why? Because they were not built on the right mechanical principle. You, no doubt, have tested one or a number of them and have found them inefficient. Don't judge the Savidge by these failures. Prove for yourself that the

Savidge Steering Device

Built Especially for Ford Owners



Will absolutely give you the perfect, positive steering control, easy steering, safe and comfortable driving that no other device can give. Because the Savidge embodies the varible-cam-principle that is vital and necessary to secure a perfect steering device.

No other device can be constructed on this principle because we own and control the basic patents.

The largest distributers in the U. S. are pushing the Savidge because they have been convinced by competitive test that it is the only real steering device made.

Hundreds of dealers tell of the splendid success they are having with the Savidge. One dealer says, "The Savidge is the most successful piece of equipment, of any kind, for Ford cars that I have ever handled."

Not sold through mail order houses. Write for our liberal selling plan.

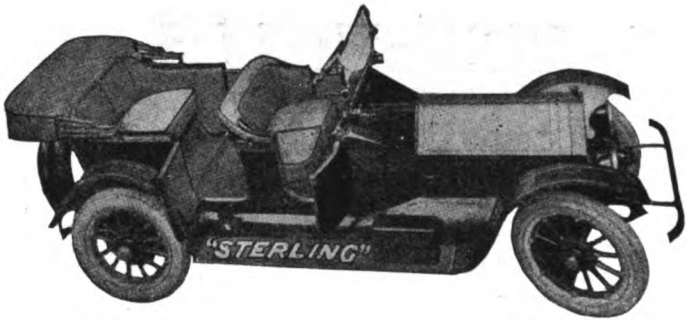
Savidge Steering Device Co.

508 Murphy Bldg., Indianapolis, Ind.

Be a Savidge Dealer -Write To-day!

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LOOK!!! AUTOMOBILISTS, LOOK!!!



PRE-INVENTORY, CLEAN-UP SALE

At Prices Below Cost

Seat and Top Covers

For All Cars

$5.00 PER SET UP

1912-1913-1914-1915

Cadillacs, Hudsons, Buicks, Fords, Overlands, Reos, Maxwells, Chalmers, Appersons, Chandlers, Chevrolets, Dodges, Kings, Mitchells, Studebakers, Oaklands, Etc.

Place Your Order Today. **This is a Chance of a Lifetime.**

Samples of Materials sent upon request.

STERLING TOP & EQUIPMENT CO., Inc.

519-521-523 WEST 57th STREET **NEW YORK, U. S. A.**



PATENTED
PERFECT-LOCK PATCH

"20th CENTURY" PATCHES

are the ONES that interest the JOBBERS and DEALERS—because of the **HIGH QUALITY** and **LOW PRICE** that increase sales. The ONES that interest the MOTORIST—because of the **GUARANTEE** of **Absolute Satisfaction** or **Money Refunded.**

Handled by Jobbers and Dealers Everywhere

20th CENTURY TIRE PROTECTOR COMPANY
MIDLOTHIAN, TEXAS

Largest Exclusive Patch Manufacturers in America



RELIABLE CLINCHER PATCH

SAVE ONE-HALF THE COST OF A NEW AUTO TOP



by using our patent applied, copyrighted, top cover order blank.

Manufacturers of Auto Tops, Top Covers, Seat Covers, Ford Tops.

WRITE FOR CATALOGUE

We can save you money.

BUOB & SCHEU, 300 E. Court St., CINCINNATI, OHIO



BRAENDER
Tires and Tubes

Are Famous For Their QUALITY

We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2 60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

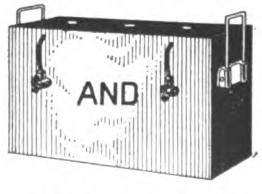
Braender Rubber & Tire Co.

Factory: Rutherford, N. J.
NEW YORK, 250 West 54th Street
Agents in principal cities

Established Agents Solicited.

PLATES JARS SEPARATORS SOLUTION
TERMINALS SEALING COMPOUND

STORAGE BATTERY

REPAIR  AND ASSEMBLY

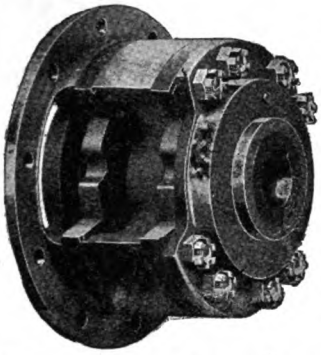


PARTS
IN WIDE VARIETY



WALTER L. THOMPSON, 655 W. 43d St., New York

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The Bailey Gearless Differential

Big Profits for Live Dealers With Little Extra Effort

The Bailey Gearless Differential—not a new and untried device, but one that has been thoroughly proven by thousands of enthusiastic Ford owners—sells almost on sight to every one who drives a Ford car.

It is not so much an accessory as a necessity—for it eliminates at once most of the discomforts and dangers of driving.

On the straightaway it has all the advantages of a solid axle. There is entire freedom from the annoying and at times dangerous sidesway. The tendency to skid is practically eliminated.

On uneven roads, or in turning, power is delivered only to the wheel having traction. There is no waste, and no wearing away of the tires through the spinning of the wheels.

With the Bailey Gearless Differential the driver can pull through roads impassable with a differential-geared car.

It is guaranteed for the life of the car.

Prominent engineers tell us that in two years the differential gear on motor-cars will be a thing of the past.

Money-Back, No-Risk Proposition—Active Co-operation With Dealers

Our experience tells us that one Bailey Gearless Differential properly introduced in a locality means from fifty to a hundred more.

So we have made our introductory proposition exceptionally liberal. We do not ask the dealer to assume any risk. More than that we have devised a plan of co-operation with the dealer in his own territory that brings the prospect, already half sold, into his salesroom.

Write us today—for this really means big money.

Gearless Differential Company

866 Woodward Avenue Detroit, Michigan

Jobbers Carrying Stock:

Chanslor & Lyon Co., San Francisco, and Branches
Auto Equipment Co., Denver, Colo.
The Post & Lester Co., Hartford, Conn., and Branches
Motor Car Supply Co., Chicago, Ill.
Excelsior General Supply Co., Chicago, Ill.
Hippee Motor Supply Co., Des Moines, Iowa
Tri-City Electric Co., Davenport, Iowa
Jones Auto Exchange, Witchita, Kansas
Tisch Auto Supply Co., Grand Rapids, Mich.
W. S. Nott Co., Minneapolis, Minn.
Kansas City Automobile Supply Co., Kansas City, Mo.
N. J. Engineering & Supply Co., Passaic, N. J.
Rogers & Rogers. Buffalo, N. Y.
Syracuse Auto Supply Co., Syracuse, N. Y.
Toledo Rubber Co., Toledo, Ohio
Chemi Co., Richmond Va., and Branches
M. & M. Supply Co., Cleveland, Ohio
Fenfar Company, Cleveland, Ohio
Pennsylvania Rubber & Supply Co., Cleveland, Ohio
Motor Tire & Supply Co., Cleveland, Ohio, and Branches
Auto Rubber & Mill Supply Co., Youngstown, Ohio
Ford Specialty Co., Philadelphia, Pa.
Consumers Auto Supply Co, Pittsburgh, Pa.
L. & L. Motor Supply Co., Sioux Falls, S. D.
Ferris-Dunlap Auto Supply Co., Dallas, Texas
Julius Andrae & Son Co., Milwaukee, Wisconsin
Omaha Rubber Co., Omaha, Nebr.
Paxton & Gallagher, Omaha, Nebr., and Branches
U. S. Automobile Supply Co., Omaha, Nebr.

Walkerville Hardware Company, Ltd., Walkerville, Ont.
John Millen & Son, Limited, Montreal and Branches.

Firestone

Hook-On Boots for Clincher or Straight Side Tires
Lace-On Boots
Blow-Out Patches
Cementless Tube Patches
"Cure-Cut" Cement
Air Pressure Gauges
Tire Tape
Tire Mica, Etc.

The Keystone to Good Motoring Trade

EVERY dealer knows that the emergency help is the kind that motorists value most. The biggest hit you can make is to give help in time of trouble—and that is the "long suit" of the dealer who sells

Firestone

ACCESSORIES

Their prompt use often adds hundreds of miles after the tire would ordinarily reach its age limit. They are the surest economy for car owners and mean a satisfied trade for you.

Are You Watching Our Saturday Evening Post Campaign?

Whole pages about Firestone Accessories—biggest guns ever fired on the subject. Be ready with a full stock.

Write for catalog and description of entire line.

Firestone Tire and Rubber Company
"America's Largest Exclusive Tire and Rim Makers"
Akron, Ohio—Branches and Dealers Everywhere



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Noncarbene
CARBONS

NO CARBON MORE POWER LESS GASOLINE

Noncarbene is a petroleum product containing no injurious substance. It is used constantly with the gasoline—1 gallon of Noncarbene to 64 gallons of gasoline.
The saving in gasoline alone more than pays for the product.
Noncarbene will absolutely PREVENT and REMOVE carbon already formed.

PROVEN BY THE HIGH CLASS OF ITS USERS:

The Automobile Club of America - New York
The Fleischmann Company - - New York
The Rubberset Company - - Newark

Booklet of other endorsements sent upon request.

Prices: 1 Gallon, $1.50; 5 Gallon can, $6.25. Sales proposition upon request.

THE NONCARBENE COMPANY, 1765 BROADWAY, NEW YORK

SPITLER PUNCTURE PLUGS

The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.



Write for Circular.

Price—Four to a Set, $1.00.

(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY

The HUNTER

At Last, Mr. FORD OWNER! A SELF-STARTER For $10

Increases the Value of a Ford Three Times

NOTE THE ADVANTAGES

Powerful—The straight pull and powerful leverage enables a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

Every Ford Owner **wants to make his car up-to-date and at the same time provide for comfort.**

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. Big money for you in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS FOR FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. **Price, $1.00. Quickly installed. Sold by leading dealers.**

THE HUNTER AUTO SUPPLY CO., 4101-5 East Ravenswood Avenue, CHICAGO, ILL.

YOU NEED NEVER WORRY

ABOUT BURNING UP TUBES, OR ABOUT PATCHES COMING LOOSE

If You Repair Punctures and Blowouts with

TIRE-DOH

TIRE-DOH can be used anywhere—on the road or in the shop—requires no heat or tools, and 2 cents worth repairs the average puncture. At any dealer's, or direct from us, $1.00 per outfit.

Tire-Doh Repairs Are Permanent.

TIRE-DOH IS MADE ONLY BY THE

ATLAS AUTO SUPPLY CO., 663 W. Austin Ave., CHICAGO

ZENITH CARBURETOR FOR FORDS



$20 COMPLETE
Including Manifold and Hot Air Tube.

Give to your Ford the same flexibility, power and economy that this carbureter has given to the world's best cars. That unpleasant jerky engine-pull when changing from low to high or when throttled down is entirely eliminated. Insures easy starting and wonderful economy.

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If after 30 days' trial the Zenith Ford Carburetor is not well worth the price return it at our expense and get your money back.

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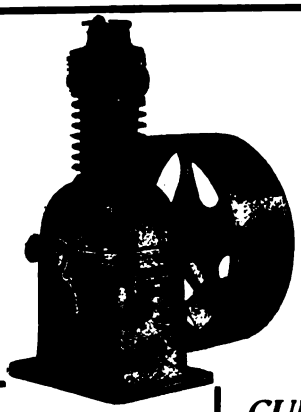
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A heavy, strong, stiff patch that makes a perfect bridge under a blow-out. Seven plies of heavy duck biased to prevent flaps from tearing off. Cannot creep.

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Made by the ESSEX RUBBER CO., Trenton, N. J.



MADE IN FOUR SIZES.

AIR FREE FROM OIL—

THAT IS WHAT YOU MUST FURNISH TO YOUR PATRONS IF YOU WISH TO GIVE THEM GOOD SERVICE.

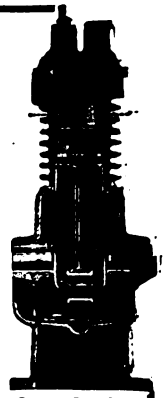
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will furnish AIR FREE FROM OIL because unlike all other air compressors the amount of oil furnished the cylinder is controlled—only sufficient oil furnished to properly lubricate without excess to be carried over into the air line. Examine the cross-section illustrated and note that neither crank nor connecting rod dip into the oil and the oil is not thrown direct into the cylinder.

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Cross-Section of Curtis Compressor.

WHY REPAIRMEN SHOULD USE Marko STORAGE BATTERIES



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

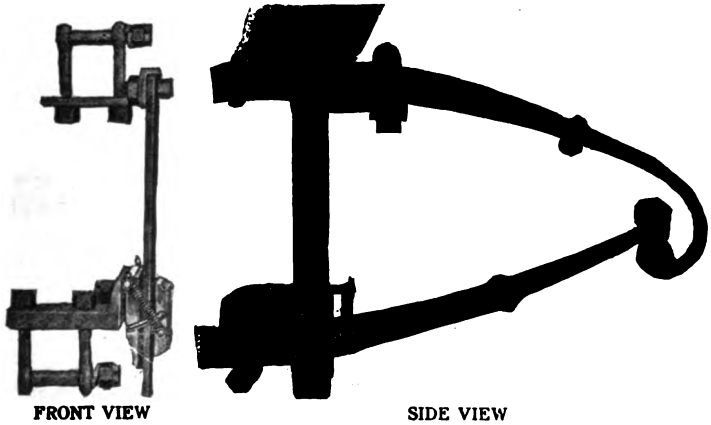
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THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

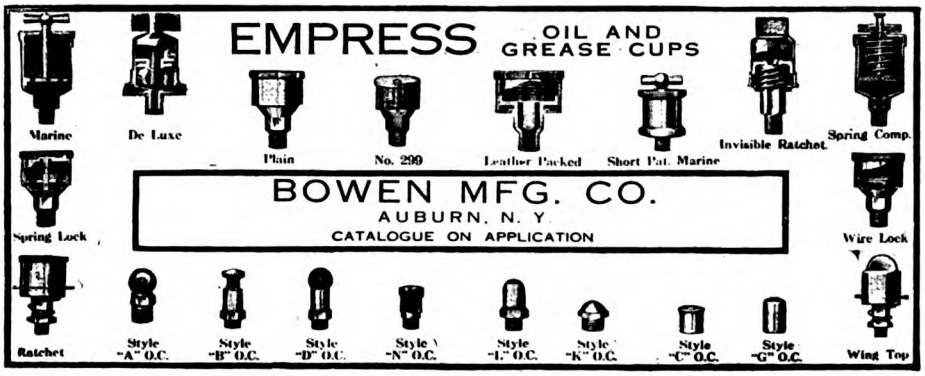
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BEAUTY — ECONOMY DURABILITY

MORE POWER—LESS TROUBLE

A new Rome-Turney radiator on your Ford is more than a luxury. It is necessary if you want to get the full service, power, reliability and durability of your car. Perfect cooling increases power and speed, saves oil and gasoline, prevents delays and prolongs the life of the motor. Every Ford should have one.

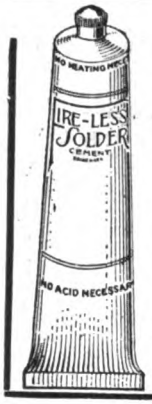
We make Rome-Turney Radiators for Ford cars of genuine square tube honey-comb Mercedes type construction, in both flat front and V-front types. They are furnished in either polished brass or German silver.

EVERY RADIATOR GUARANTEED

Write for prices and information today.

We repair and replace all types of radiators.

ROME-TURNEY RADIATOR CO.
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FIRELESS SOLDER CEMENT

For Repairing Cracked Water Jackets, cylinders and leaky radiators, and any kind of metal. Heat will not affect it. Solder hardens in the air. No heat or acid necessary. Supplied in collapsible tubes. No skilled mechanic is necessary to apply this.

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Eagle Light Cars Equipped with the Wonderful **Macomber Rotary Engine.**
FORTY to FIFTY MILES to the GALLON of GASOLINE
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Most Lubrication—

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The Great Road Builder

In every part of this great country the King Drag can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the King Drag and how to make it.

In localities where the sentiment for good roads needs to be worked up, the distribution of these little pamphlets could not fail to do a good deal of good.

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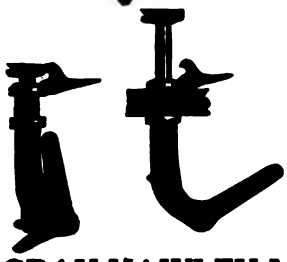


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Simply Cut Notch in Exhaust Pipe and Clamp over it.

PRICES

No. 5B.	For Pipe,	1¼ in. o. d.	$1.50
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No. 3.	Black	$0.60
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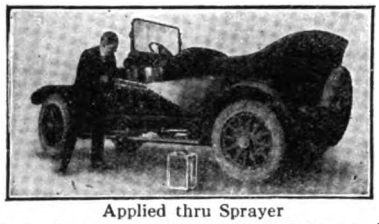
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Removes Road Tar, Oil and Grease

Prevents Rain Streaks



Applied thru Sprayer

Guaranteed Not to Injure Paint or Varnish

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Midget Outfit, With Cloth, $1.00 Giant Outfit, With Cloth, $1.25
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1 Pint of Marvel-Mist is equal to 1 gallon of ordinary polish.
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thoroughly in 10 minutes, leaving cylinders ideally lubricated; costs only

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Just pure oils, harmless to everything except carbon.

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"There's a mighty big difference in lubricators!"

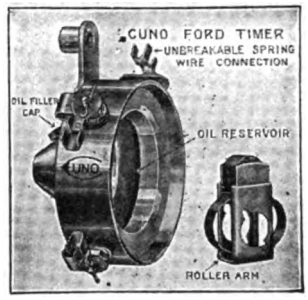
Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

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It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

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PRICE $1.50

MISSING in your FORD Will be STOPPED BY A Cuno Ford Timer

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

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TUTHILL TITANIC SPRINGS

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Guaranteed Against Center Breakage

Also Furnished with Dann Insert

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THE MOST PRACTICAL SMALL VULCANIZER FOR INNER TUBES



Will repair all punctures and 90% of blowouts. Will vulcanize HORSEY No-Cement Patches, and any tube repair gum. HORSEY PONY VULCANIZER with one box containing twelve assorted (large and small) HORSEY NO-CEMENT PATCHES, all complete,

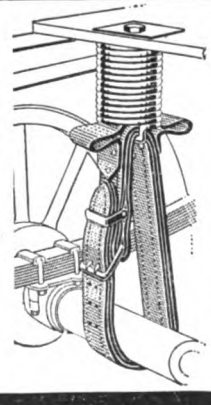
Price, $3.00

Satisfaction guaranteed.

HORSEY NO-CEMENT PATCHES

Large Box, 12 Assorted Patches . . . . . 65 Cents
Small Box, 8 Small Patches . . . . . 40 Cents

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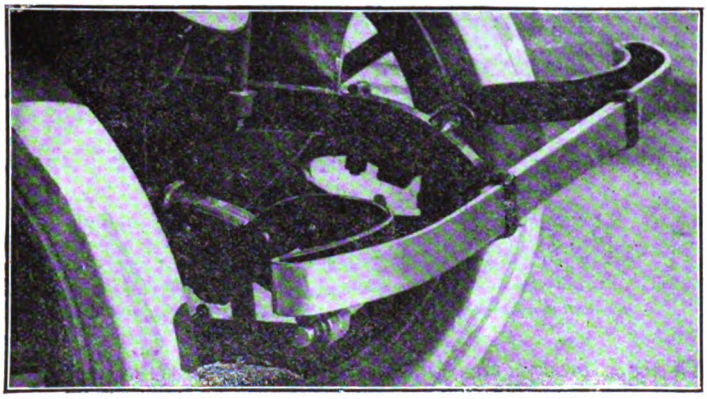
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SHOCK ABSORBERS, $5.00 to $9.00
For cars weighing from 1000 to 5000 pounds. Also special for Ford Cars

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Manufacturers of a complete line of Top Straps, Rebound Straps, Bow Rests Joint Covers Tire Rim Removers, etc.
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SELL the only BUMPER that can be struck without being damaged!



PATENTED

There are Bumpers galore—but only one that really protects and which won't break. The others are all alike. Their claims are strong—but their action mightily inefficient. The

=LYON=
Resilient Bumper

is different. You can run it into a pole at reasonable speed without injuring either the bumper or car! Strong statement? Prove it yourself at our expense.

The LYON is resilient, having ten times as much spring play as any other make.

The LYON is clamped on any car in 15 minutes; harmonizes with streamline bodies and is guaranteed not to rattle or become loose. It is packed in individual boxes, making it easy to reship. The price is low.

$7.50 up to $10.50; all finishes. FORD Bumpers $6.00

Why sell others that cost as much or more and don't deliver the goods? Give your customers their money's worth by selling them the LYON. We have something interesting to say to dealers and garagemen. ***Write us at once.***

METAL STAMPING COMPANY
BOULEVARD, LONG ISLAND CITY, NEW YORK

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

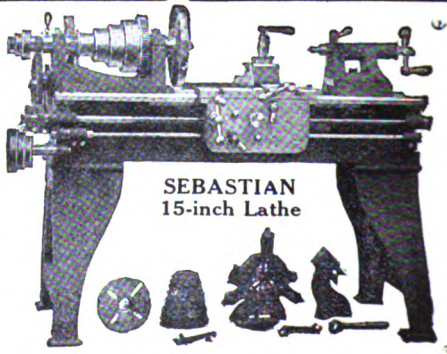
STANDARD FOR QUALITY---LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.
The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)

THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN
15-inch Lathe

HYATT QUIET SERVICE

HY-FLEX-ROL

Hyatt Quiet Bearings are used in the majority of American made automobiles

Bearings required for motor car repairs may be obtained on short notice at any of the service branches indicated.

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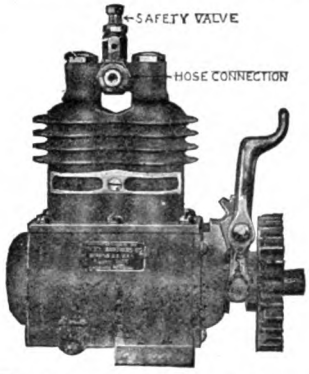
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HYATT ROLLER BEARING CO.
DETROIT, NEWARK, N. J. CHICAGO

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THE MANZEL
Two-Cylinder—Engine Driven
TIRE PUMP

The best tire pump that money can buy. Can be installed by anyone. Will fill the largest tire in less than three minutes.



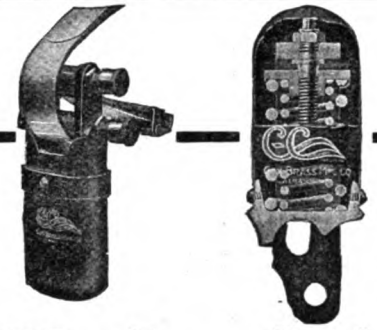
A Few Features of the Manzel Two-Cylinder Tire Pump

Has two cylinders, the most efficient design for a tire pump;—Runs smoothly and easily and gives a practically continuous flow of air;—Built like an engine;—All metal;—Fins for air cooling;—Has safety valve, cannot blow up the tires;—Supplies only pure air;—Only one place to oil;—Accurately made;—All parts fitted and ground;—Great efficiency;—Each pump tested to 250 lbs.;—Steel gears;—No machine work to attach to car;—Anyone can install it.

Dealers—If you are looking for a pump that will give satisfaction to your customers and a good profit to yourselves, write for our interesting proposition.

MANZEL BROTHERS COMPANY
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Special Manzel Pump for Ford Cars only $7.50



2 Reasons
Why Every Dealer Should Sell C. C. Shock Absorbers

1. Because C. C.'s are made for both Heavy Cars and Fords, and you can sell every automobile owner in your territory.
2. Because the price is reasonable—***only $10.00 for set of 2 for heavy cars—$4.50 set of two for Fords, $8.00 for set of four.***

MORE REASONS

Because the price permits ***every*** car-owner to own C. C.'s.
Because you make ***quick*** sales—***often*** and get a good profit on each sale.
Because they are made to give long-wear, service and satisfaction—every set sold under the ***COX*** guarantee—now being nationally advertised.
Some dealer in your territory is going to take advantage of out National advertising and Dealer Helps and will make good money selling C. C.'s.
Why not you? Send for our free booklet, "Proof of Profit." It tells our story from ***your*** side of the fence.

COX BRASS MFG. CO.
Dept. M ALBANY, N. Y.
Distributors and Salesrooms in all principal cities in the U. S. A.

GARDNER
"GEE GEE"



The simple—reliable—large capacity air compressor for ***your*** garage.

Self oiling, no adjustments, no grease cups, requires no attention, and is "fool-proof."

"The Gardner 'Gee Gee'—Best of All the Garage Pumps"

LOW IN PRICE
GARDNER IN QUALITY

Write at once for "Garage Booklet AC-7" which describes the complete Gardner garage line.

The Gardner Governor Co.
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RAJAH GIANT
300% in One Year!
That is the increase in the sales of the Rajah Giant Plug



This Plug was originally designed for racing purposes, but its widening popularity for general use on motor boats, tractors, trucks and pleasure cars has necessitated its addition to our regular line.

In construction, with the exception that it is much heavier in the porcelain and metal parts, it is the same as the

RAJAH "STANDARD" PLUG

Extremely simple for cleaning:—only four parts—shell, porcelain, bushing and gasket. All standard threads.

Rajah Giant Plug $1.50
Rajah Standard Plug 1.25 } Postpaid—with Thumb-nut Terminal

DEALERS: If you do not carry Rajah Plugs in stock, take a minute to consider how many sales you may have lost! Many thousands of car owners use Rajah Plugs only—many thousands more **eventually will!**

WRITE NOW FOR PARTICULARS TO

RAJAH AUTO-SUPPLY CO.
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REPAIR PARTS FOR FORD CARS

We are the largest independent manufacturers and dealers in repair parts for Ford cars in the world.

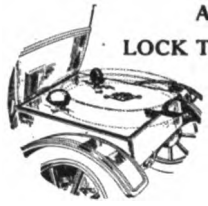
Our price list, containing over 300 parts, in frequent demand by the dealer and repairman, will be sent on application.

Rear Axle Shafts	Front Radius Rods
Differential Drive Gears and Pinions	Front and Rear Springs
Connecting Rods	Bushings
Nuts	Screws
Bolts	Pins
Keys	Ball Bearings
Gaskets	Washers, Etc.

HILL-SMITH METAL GOODS CO.,
88 Pearl St., Cor. High St.,
BOSTON, MASS.

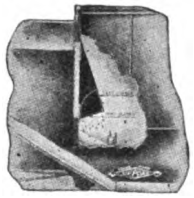
UFASCO
PRODUCTS
SPECIALTIES FOR FORD CARS

PROTECTION
AT ALL TIMES



LOCK TIRE HOLDER FOR FORD CARS
No. 88-9
For $2.50 you can leave your car anywhere as long as you want to, and know that your spare tire cannot be stolen.

COMFORT
IN HOTTEST WEATHER



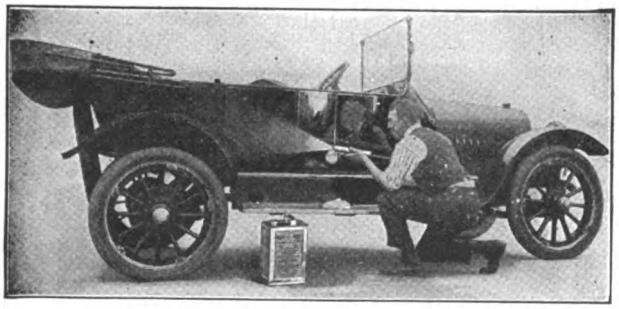
DASH VENTILATOR
FOR FORD CARS. No. 240
For $2.00 you can keep cool all summer.
Just put on a pair of "Ufasco" dash ventilators and drive away that heat from your feet.
Be comfortable.

Jobbers and Dealers—Write for literature and discounts.
UNIQUE FINDINGS & SUPPLY CO.
PROVIDENCE, R. I., U. S. A.
Automobile Mountings, Parts and Accessories

WONDER-MIST

Cleans and Polishes

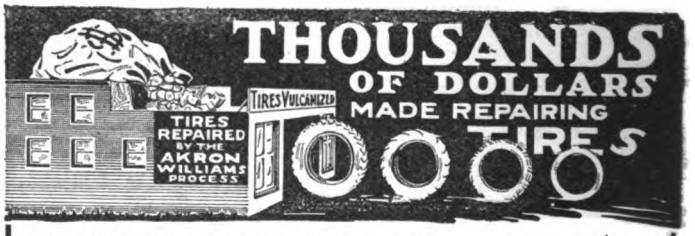
It removes dust and stains and restores the original lustre to any polished surface.
It contains neither acid, gum nor any other injurious substance.
It preserves and protects the finish.



Applied with sprayer, which deposits the liquid in a fine mist evenly. Then polish with a cheesecloth. It is extensively used in Public Garages and by Automobile Owners. A trial makes a constant user.

If your dealer cannot supply you, send us his name.

The Wonder-Mist Co., 14 Federal St., Boston, Mass.



Tire Repairing by the Akron-Williams process opens the way to prosperity and success and big money making on small investments.

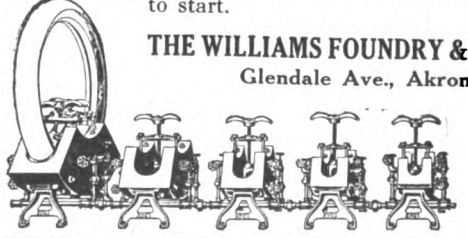
The business is growing faster than men can be found to take care of it. There's a man needed in almost every town. The better repair shops everywhere use the

Akron-Williams Tire Repair Outfit

Endorsed by 30 Leading Tire Manufacturers

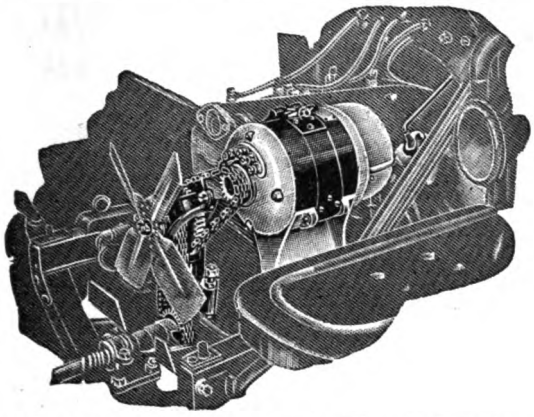
These men are making from $1,500 to $3,000 a year clear profit. You can do it too—with an Akron-Williams outfit.

The A-W Repair Outfit is used and endorsed by 30 leading Tire Manufacturers. So you take no chance in equipping with Akron-Williams. We'll help you to learn the business. Write for our catalog No. 121 and learn the great money-making possibilities of Tire Repairing and how little money you need to start.



THE WILLIAMS FOUNDRY & MACHINE CO.
Glendale Ave., Akron, Ohio

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North East System of Electric Starting and Lighting for the Ford car.

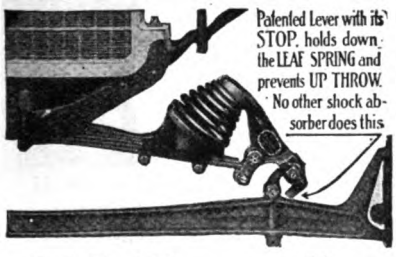
It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.

Ask for Bulletin 33-A

North East Electric Company
ROCHESTER, N. Y.



HASSLER

SHOCK ABSORBER FOR FORD CARS.

$15 For a Set of Four

An Investment— Not An Expense

The increased tire mileage alone gained by equipping your Ford with a set of Hassler Shock Absorbers will soon save you the price you paid. A large public service corporation in Indianapolis reports 12,000 miles tire mileage from Hassler equipped cars and the tires are still good.

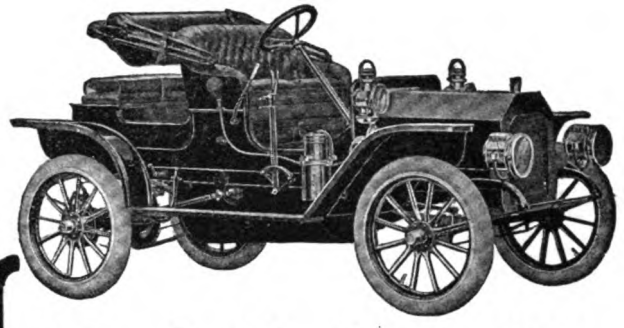
Easy Steering - Safe Driving - No Rebound - No Tossing

The perfect riding comfort, the easy steering and absolute driving safety secured with Hassler Shock Absorbers is unequaled by any shock absorber at any price. 50,000 in use to-day—not a dissatisfied customer.

—Dealers—

The Hassler is sold under rigid money back guarantee. We will send you a trial set. Our proposition is better than ever. Many Ford owners have been waiting for this new price. A profitable, permanent addition to your business. Good profit. Exclusive territory. Not sold through jobbers. We protect you. Write for liberal selling plan.

ROBERT H. HASSLER, Inc.
INDIANAPOLIS, INDIANA



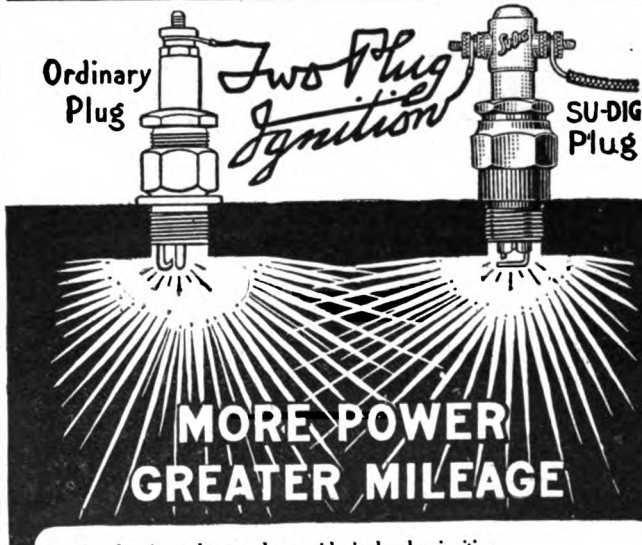
A Free Book for Auto Repair Men

The **Auto Repairers' Guide & Price Maker** is issued in the interest of automobile repairers, dealers and garage men—**it's free to the trade** and sent to them only.

Think of it, **512 pages of bargains**—about 3000 illustrations—a complete auto repairers' guide and price maker—quotes **lowest wholesale prices on** first quality automobile supplies, auto repairers' tools, tool kits, spark plugs, horns, lamps, pumps, springs, forgings, brass fittings, batteries, coils, switches, auto tops, Ford Specialties, and in fact **everything used on an auto.**

Write for your copy today, sending business card, letterhead or some other evidence that you are in the trade.

CRAY BROTHERS
JOBBERS AND MANUFACTURERS OF AUTO ACCESSORIES
1119-1123 W. 11th St., Cleveland, Ohio



Combustion takes too long with single plug ignition.
Fuel waste from slow burning is frequent and costly.
Ignite the mixture at two points at once, by using SU-DIG Series Plugs in connection with your regular plugs. It will burn more than twice as fast.
A wonderful increase in power, snap, and gasoline mileage will result. Spark advance is greatly reduced and carbon deposit minimized.
No Change needed in magneto or battery system. Tap the valve caps if necessary.
Our National advertising campaign is creating a demand.

Write today for interesting information and valuable new dealer helps.

SUPERIOR MOTOR POWER CO.
24 Irving Place NEW YORK CITY

Salesmen wanted to handle SU-DIG Plugs as a side line.

SU-DIG

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Puts Pep In Motors

You men who sell or repair automobiles, get wise to the wonderful three-piece piston ring that puts PEP in gasoline motors. Ever-Tight is its name, and **ever tight** it is—always. New motors equipped with this ring give better service, and worn motors repaired with it are practically as good as new.

EVER-TIGHT

Piston Ring—"For Leaky Cylinders"

is composed of three perfectly grooved sections that play upon each other easily. It is so flexible that it instantly takes the form of an out-of-round cylinder, prevents power-waste, lessens friction and keeps oil out of the combustion chamber. This means full motor power and no carbon.

Ever-Tight is the only satisfactory three-piece ring made. Repairmen should write if local dealers do not carry it. We want jobbers and dealers in every city and town. *Write for particulars.*

THE EVER-TIGHT PISTON RING CO.
1428 CHESTNUT STREET ST. LOUIS, MO.



PATENTED AUGUST 6, 1912

BROWN SUB-BASE OILER
FOR FORD CARS



PAT. DEC. 8, 1914

The hit of the season. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

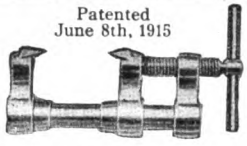
THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.

Knowlson's Spring Spreader

Drop Forged

Nickel Plated and Polished

Patented June 8th, 1915



100% Easier Riding

Stops the Squeak

No. 1142280

WARNING To The Trade

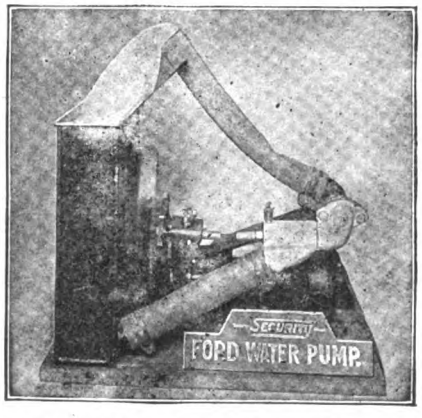
Our Patent is basic, covering all spring spreaders with wedges on the market no matter how operated. Our rights will be protected.

At all best Dealers, or sent prepaid anywhere for **$1.50.**

Money returned if not satisfactory.

Write for complete particulars.

Spring Leaf Lubricator Co., 1000 Forest Ave., Ann Arbor, Mich.



SECURITY

WATER PUMP FOR FORDS
Price $6.00

Positive Gear Drive, Guaranteed to pump 10 to 15 gallons per minute.

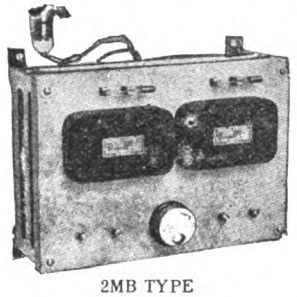
Sold by your dealer or direct.

Dealers Write for Discounts.

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THE SECURITY CO., 54 Terminal Way, Pittsburgh, Pa.

ST. LOUIS BATTERY CHARGER



2MB TYPE

The Simplest and Most Economical Device for Charging Storage Batteries Made.

Operates from the ordinary alternating current light wires.

Sizes for the Garage and the Car Owner.

Prices Low

ST. LOUIS ELECTRICAL WORKS
Arlington and Easton Aves., ST. LOUIS, MO.



SMOOTH-ON

TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - $1.00

SMOOTH-ON MFG. CO.,
Jersey City, N. J.

CHICAGO, 221 N. Jefferson St. SAN FRANCISCO, 36 Sacramento St.

Gouin ANTI-RATTLERS for Ford Cars and Any Car With or Without Door Jambs

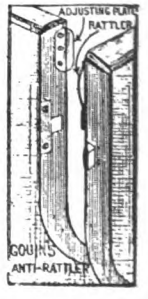
Every FORD owner is interested in this Device as it will stop that troublesome rattle of the car doors.

Send us your check or money order for a set of three for your FORD.

Price, $1.00 or send us $1.25 for a set of four if you have Four Doors and kindly mention your dealer's name.

Dealers, write for our prices and secure your share of this business.

ASK YOUR JOBBER



Manufactured by L. J. GOUIN COMPANY,
14 Roosevelt Ave., POUGHKEEPSIE, N. Y.

CHANSLOR & LYON CO., 1238 Van Ness Avenue, San Francisco, Cal., Distributors for the Pacific Coast.

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A Low-Priced Vulcanizer

FOR CAR OWNERS AND GARAGES, THAT DOES AS GOOD WORK AS THE HIGHEST PRICED VULCANIZER

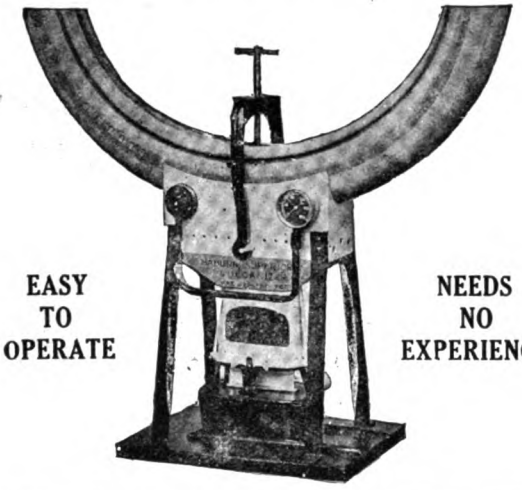
Why should you pay big money for vulcanizers when you can get the **SUPERIOR VULCANIZER** at a price that will enable you to pay for it on a few jobs?

No rubber air bags, bead molds, solid forms, etc. As simple as we know how to make it.

Write for our book fully describing machines. Free for the asking.

Money back if not satisfied.

LEE C. MAPES, 16 FULTON AVE., ROCHESTER, N. Y.



EASY TO OPERATE

NEEDS NO EXPERIENCE

He Did **USE A TIRE PRESSURE GAUGE** He Didn't



Don't Be Careless

and neglect having the correct air pressure in your tires. Rim cutting, loosening of the tread, and fabric separation are common results of underinflation which are easily avoided. Test the air pressure in your tires regularly with the handy, accurate

ALLEN TYROMETER
TIRE PRESSURE GAUGE



Made of heavily nickeled brass tubing, with sliding band which holds the indication as long as you want it. Only 4½ inches long, with clip attached for carrying in the pocket.

Satisfaction Guaranteed or Money Back

AT YOUR DEALER'S

or write the manufacturer, direct.

PRICE $1.00

The Allen Auto Specialty Co.

Manufacturers, also, of the Famous Allen Tire Case

1926 Broadway, New York — 1627 Michigan Ave., Chicago

THE SIMMS HIGH-TENSION MAGNETO
AND
SIMMS-HUFF MOTOR GENERATOR

Increase the power of your car by equipping it with a **Simms High-Tension Magneto** — the most efficient ignition system for gasoline motors.

The **Simms-Huff Motor Generator** is the most powerful, simplest, lightest weight starting and lighting generator.

Automobile experts acknowledge that we make the "sure fire" starter.

SIMMS MAGNETO COMPANY
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Manufacturers of the most reliable ignition, starting and lighting systems for automobiles

Springs Shipped Same Day Order Received — Springs for all Makes of Automobiles



Quickest! Most Complete Spring Service
Saves You Time and Money!

Spring delays done away with by our one-day service. We carry 14,000 springs in stock—springs for all makes of cars (no matter how long manufacturer has been out of business). We ship same day order is received.

We also repair broken springs—re-arch and re-temper them, returning them same day. Our charges much less than automobile factory prices. Send all your spring replacements and repairs to us.

New Catalogue! Just Out!

MAIL COUPON!

New catalogue lists spring prices, tells all about our service—a guide to economical and satisfactory spring buying sent free if you'll drop us a card or **Send Coupon.**

TO GARAGE MEN

Our plan will make you the spring headquarters in your town. If you want to practically corner this big profitable business, write us at once.

TRIPLE ACTION SPRING CO.,
55-57-59 East 28th Street, Chicago

Please send full details of your spring service and new spring catalogue.

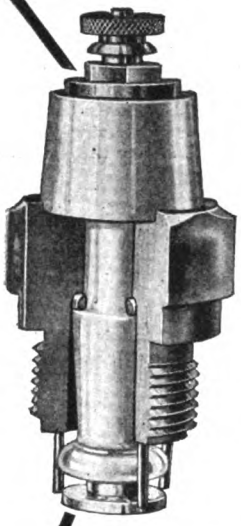
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PECO
VALVE PLUG



Automatically tightens itself. No cement, no mechanical pressure on insulation. Cannot leak, any more than the poppet valve in the engine can leak.

Peco non-**STATIC** two point ignition plug delivers the current at the spark gaps, hot and full of electric ginger. The only non-**STATIC** plug made (recent discovery). Peco Plugs tune your motor to the highest pitch. Fully guaranteed.

"More Power to You"

Live representatives wanted in unoccupied territory.

Valuable information about spark plugs free.

POWER & EFFICIENCY CO.
Broad-State Building, - Trenton, N. J.

The Most POWERFUL and RELIABLE STARTER is

The Compressed Air Rotary

Thurber Starter



AND TIRE INFLATOR

Air Pumps and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 R P M under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc. Hundreds in use. **PRICES: Model M, Large Cars, $85.00—Model J, Medium Cars, $70.00—Model F, for Fords, $65.00.** F. O. B. Cars Our Works, Detroit.

NORTHERN ENGINEERING WORKS
12 CHENE STREET - - DETROIT, MICH.

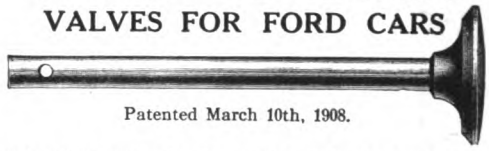
ROUGH VALVE BLANKS

REPAIRMEN—make your own valves and save money by buying the rough blanks from us; we can furnish you blanks with any size head or stem in quantities to suit you. All blanks have **Cast Iron Heads** and **Carbon Steel Stems** fused by a patent process and guaranteed.

Write for Price List and Discounts

We can furnish you the **Finished Valve**, if you prefer.

VALVES FOR FORD CARS

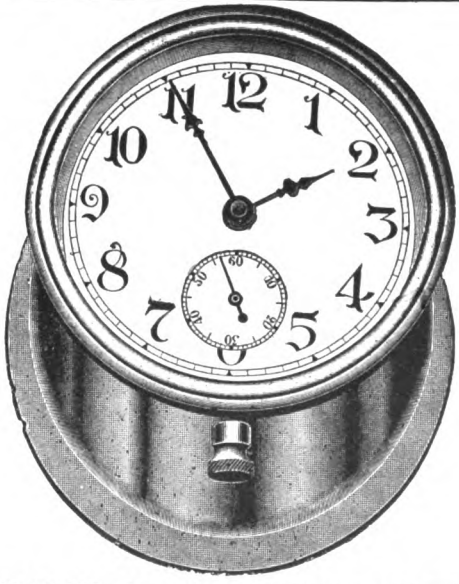


Patented March 10th, 1908.

We make them and make them right, all finished complete. A large stock always on hand.

Get Our Prices Before Buying Elsewhere

MICHIGAN ENGINE VALVE CO. - Detroit, Mich.

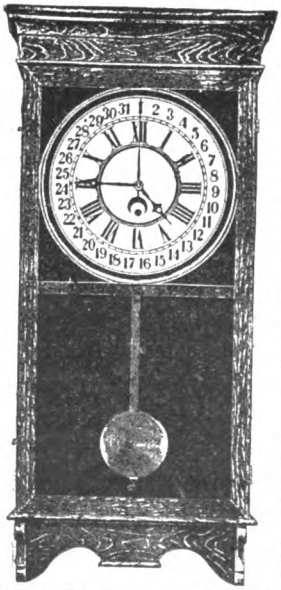


DO YOU WANT A MOTOR CLOCK

For your car, and a good one? The clock illustrated in this connection is manufactured by one of the most reliable clock companies in the country and is warranted in every respect. It is not liable to get out of order. It has interchangeable parts. It is the product of skilled labor combined with the most improved Waltham Automatic Machines. This clock is 3⅜ inches high, and has a Porcelain dial 2½ inches in diameter. It has a one day movement with second hand. It can be furnished in burnished brass or nickel plated whichever is preferred. The arrangement we have made enables us to furnish **one of these clocks and a subscription to the Automobile Dealer and Repairer for a year** to all residents of the United States and its territories for the precise price the clock retails for, namely, **$2.50.** If an eight day clock is preferred send 50 cents extra or $3.00. Canadian subscribers should add 50 cents extra to cover the extra postage required on the **Automobile Dealer and Repairer.** This clock cannot be sent to foreign countries. The clock can safely be sent by mail and will be forwarded postage prepaid to any part of the country. Remittances can be made in any convenient way. Address

MOTOR VEHICLE PUBLISHING CO.
71-73 Murray Street, - - - - New York, N. Y.

Every Repair Shop or Garage
SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers in the United States or its territories a **Regulator Eight Day Calendar Clock** 38½ inches high, with a 12 inch dial, finished in **Oak** or **hand-rubbed Mahogany**, with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of **$3.90.** This clock cannot be sent to any foreign country except Canada, and Canadian subscribers must send **50 cents** more to cover extra postage on the paper.

Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

The engraving shown gives the correct appearance of this clock.

This offer is good for either old or new subscribers.

Remittances can be made in any convenient way. **Be sure to state** whether you want this clock in Oak or Hand-Rubbed Mahogany.

Address all orders to

THE MOTOR VEHICLE PUBLISHING CO.,
Publishers of THE AUTOMOBILE DEALER AND REPAIRER
71-73 Murray Street, NEW YORK, N. Y.

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IF

one piece piston rings could exert the same pressure against the cylinder walls at every point,—

and if

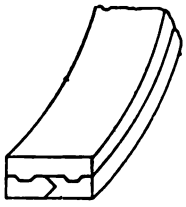
two piece piston rings, under stress, did not work "egg shaped" and "out of round"—

then three piece piston rings would not be a necessity.

But three piece piston rings are absolutely necessary to stop that costly leakage of power and compression.

"A Motor Is No Better Than Its Piston Rings."
Efficiency Ed.

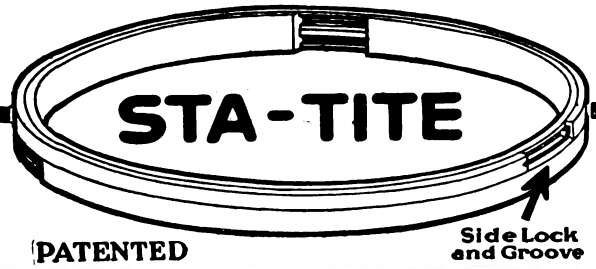
Sta-Tite Piston Rings are made up of three individual interlocking rings grooved together with their section openings so distributed that multiple contact against the cylinder walls is always assured.



LEAKAGE IS A MECHANICAL IMPOSSIBILITY

Special Inducements to Dealers and Agents. Rings in all sizes. Write for literature.

STA-TITE PACKING RING CO.
3037 Olive Street St. Louis, Mo.



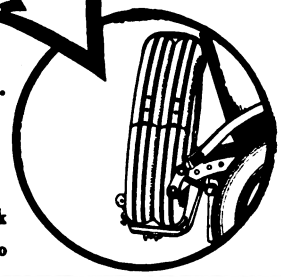
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This Tire Case Gives a Real Protection to Spare Shoes

Allen



EVERY spare shoe needs a sure protection from the deteriorating effects of sunlight, oil and water. The Allen Tire Case, absolutely waterproof, made of highest quality enamel duck by expert workmen, meets every requirement. Made in all sizes and colors to suit. Prices $3.00 and up. At your dealer's. Send today for the interesting booklet of Allen accessories.



The Allen Auto Specialty Co.

Manufacturers, also, of the Allen Tyrometer, air pressure gauge. : : :

1926 Broadway - - New York
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CITRUS
CUBA

Wonderfully rich land, good water, good title. Outdoor life the year 'round. A ten acre grape fruit grove will pay you $2,500 per annum for life. Eastern Cuba is to be the great winter playground of the American. The land is so fertile and accessible that fortunes are to be made in fruits and vegetables. Great country to relieve and cure rheumatism, nervous and respiratory diseases.

Present price of land $50 per acre. No frost and no irrigation or fertilization required. The young man's opportunity and the old man's paradise.

The grape fruit raised here surpasses in flavor and quality anything grown in Florida or Southern California.

The most delightful place in the world for a winter home, and very accessible. Boats sail from New York to all the principal ports, and at very reasonable rates.

For literature and further details address the

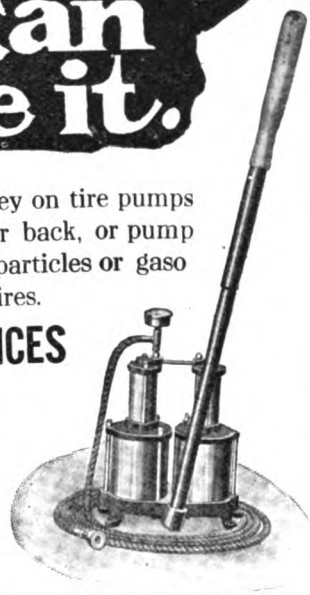
CITRUS DEVELOPMENT CO.
101 Tremont St., Boston, Mass.

At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



"DEAD EASY"

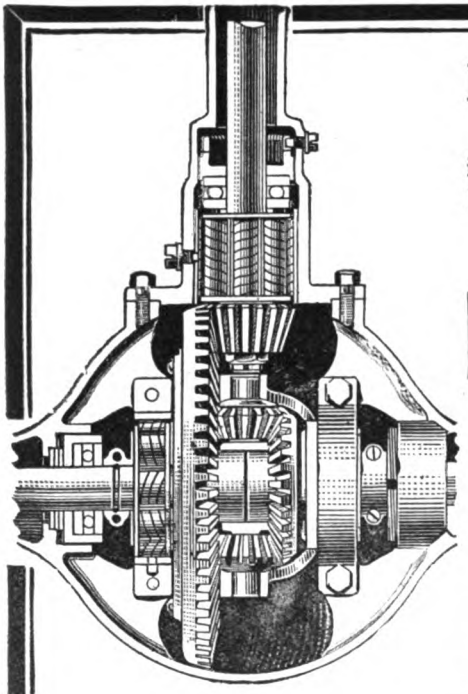
Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

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Differential Lubrication IS VITAL

Its bevel gears and ball and roller bearings **must be unfailingly lubricated.** Its mechanism is a hot-bed of friction when lubrication fails. **Insure proper lubrication, by using**

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE

NON-FLUID OIL is **especially adapted** to this exacting requirement. **It never fails** to envelop the gears and bearings with a heavy coat of durable lubricant,—not merely wet them like **oil** or film them like **grease.** The gears **never fail** to mesh in a soft, yielding cushion—metal never touches metal—the only wear is a slow, oily polish which transmits power with least friction and with least loss.



"K No. 000"
for differential, compression cups, and all bearings.
"K No. 00 Special"
for sliding gear transmission

GET A CAN TODAY AND PROVE IT

Reduced prices for 1915. *Ask your dealer. The* ***original*** *NON-FLUID OIL is identified by the orange-colored can bearing the above sprocket-wheel trade mark. Avoid substitutes.*

New York & New Jersey Lubricant Co.

165 Broadway, New York 1430 Michigan Ave., Chicago

SEES ALL TELLS ALL

MOTOR EYE



DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH

$2.50

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

COUPON

W. LEWIS MACK, General Distributor
"Department A," 26 W. Jackson Blvd., Chicago, Illinois

Gentlemen: Enclosed find money order for $2.50 for which kindly send me, postage prepaid, one MOTOR EYE.

Name.....

Address.....

SAVE YOUR TIRES



Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

VULCANIZIT For inner tube punctures and blowouts,
KUTFILLER For filling cuts and other injuries,
SANBLIST A cure for sand-blisters, repairs blowouts,
NEWTRED For retreading worn tire sections,
PATCHIT Two colors, white and black, for repairing Hot-Water Bottles, Air-Cushions, Rubber Boots, Overshoes and kindred articles.
¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

MONEY BACK IF NOT AS REPRESENTED

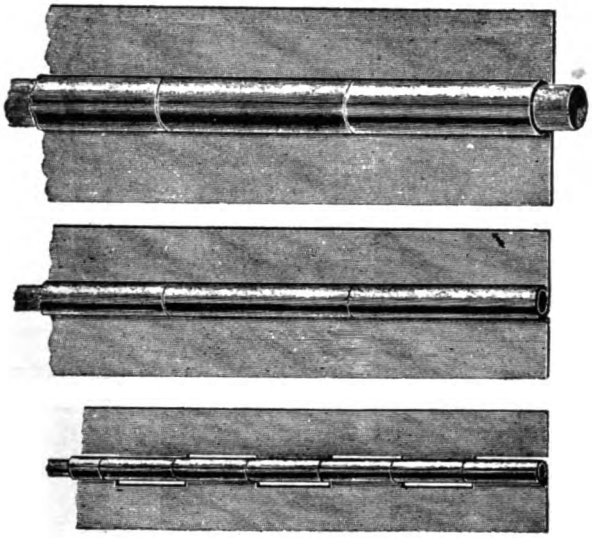
Agents wanted everywhere, liberal terms.

Send immediately for descriptive circular giving full particulars of all our special products.

SELF-VULCANIZING RUBBER WORKS, MORRISTOWN, N. J.

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Automobile Hood and Continuous Hinges



These hinges are made in a variety of sizes, both as regards width and length, as well as size of hinge pins.

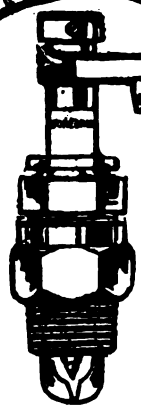
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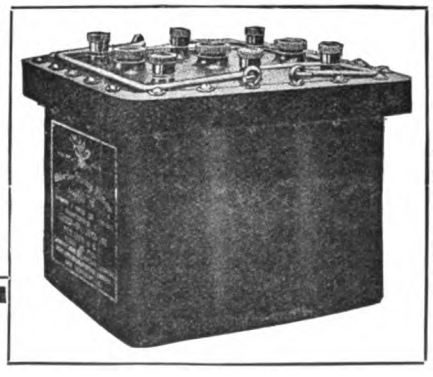
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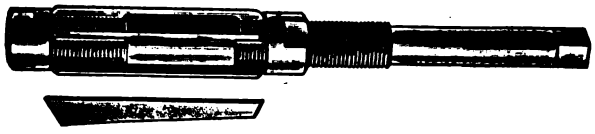
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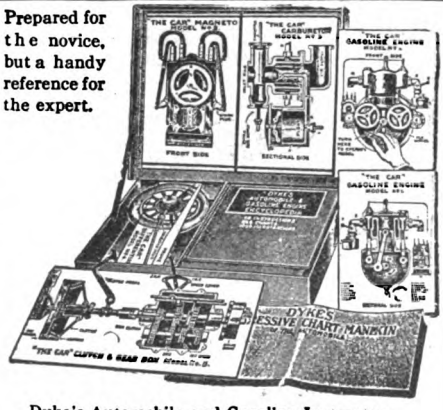
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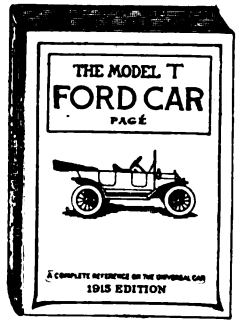
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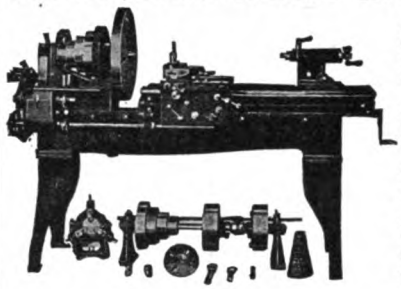
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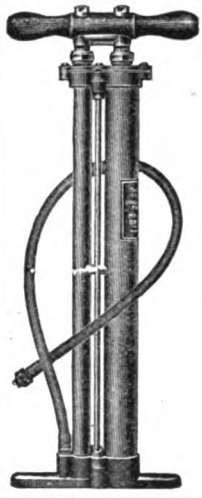
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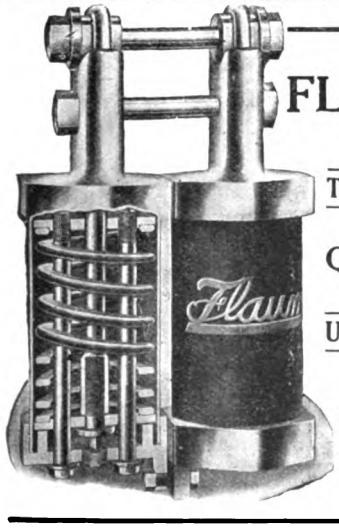
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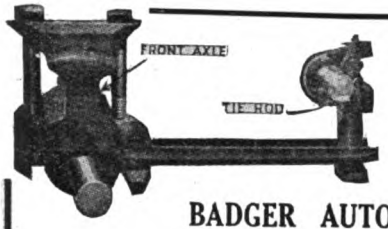
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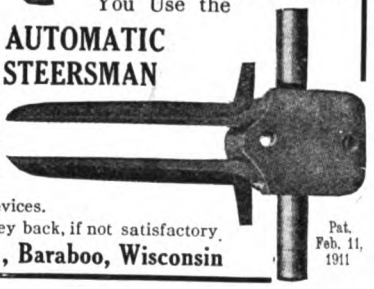
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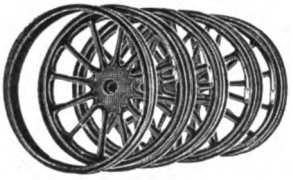


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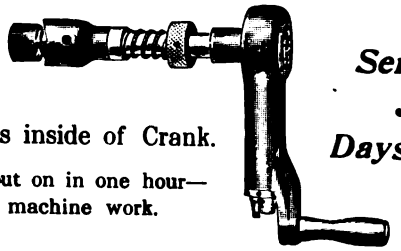
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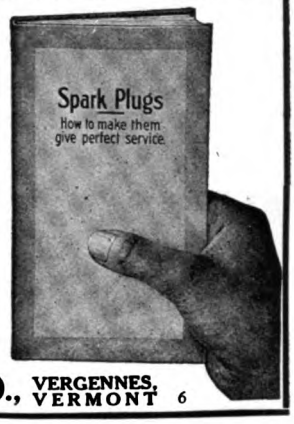
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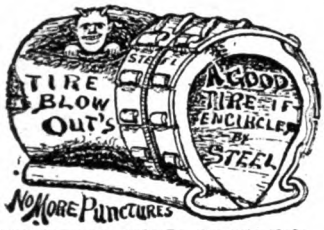
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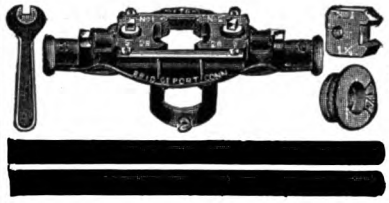
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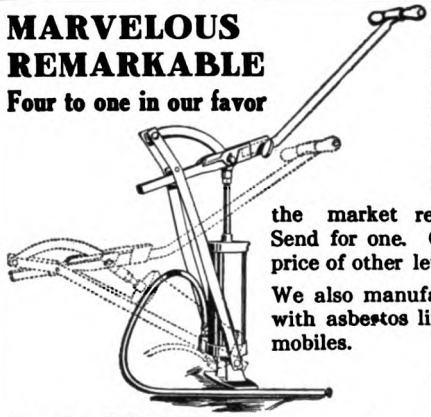
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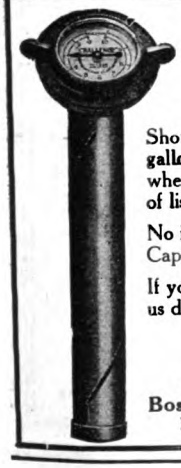


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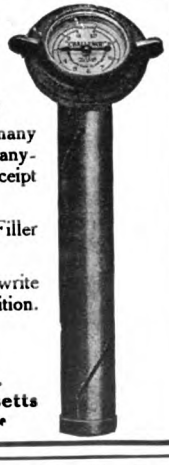
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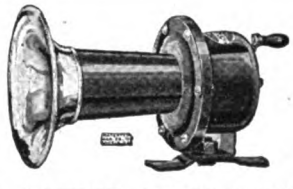
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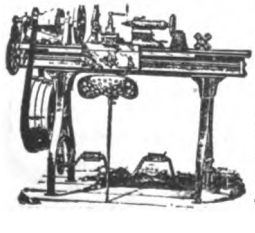
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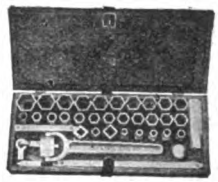
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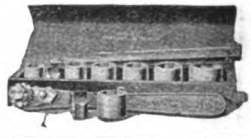
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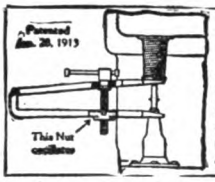
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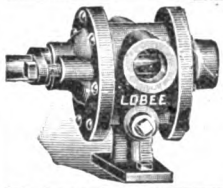
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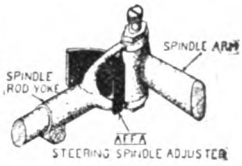
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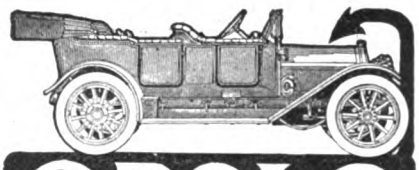
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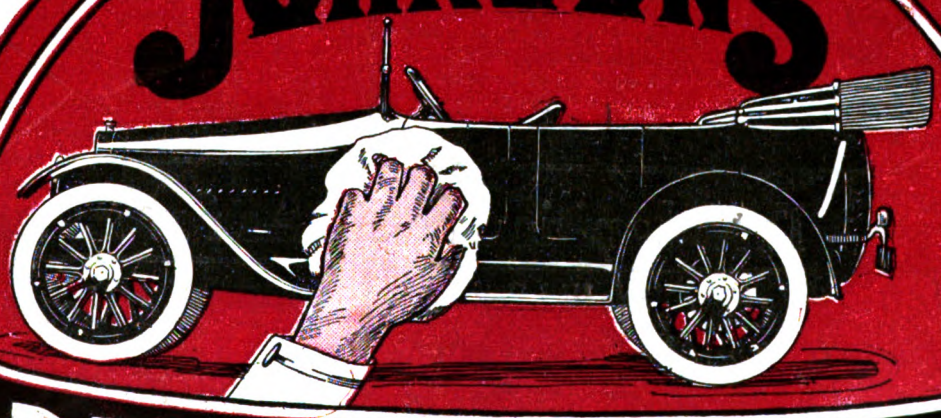
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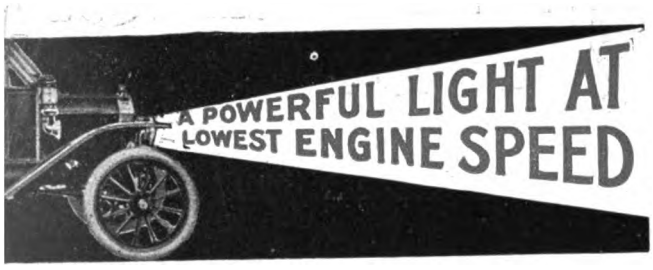
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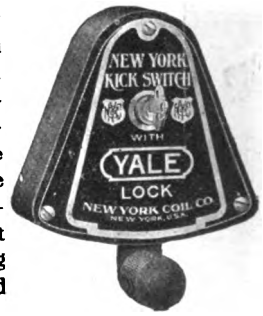
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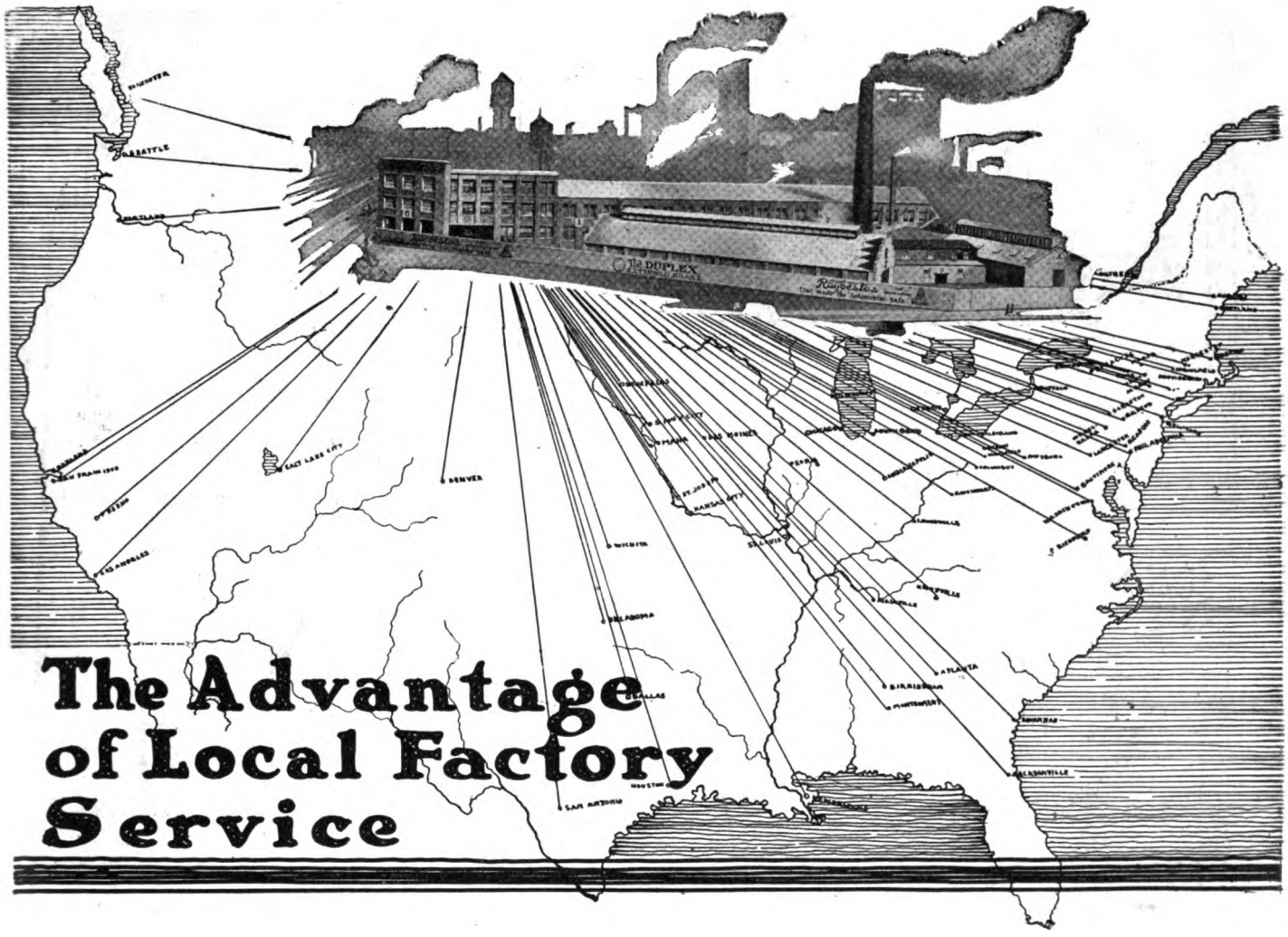
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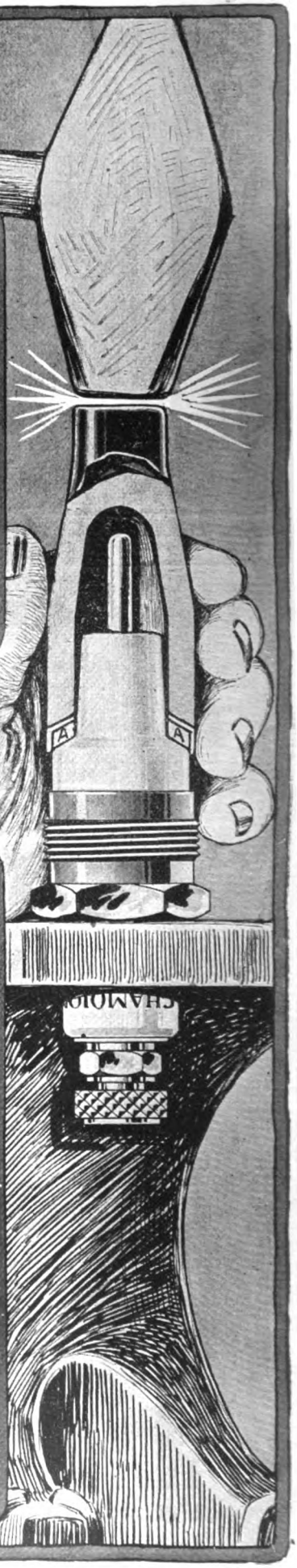
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Don't Throw Away Your Half-Worn Tires

They're Still Good for 5,000 Miles

European Methods of Half-Soling Tires Makes Them Run 10,000 to 15,000 Miles. Signed Guarantee for 5,000 Miles Without Puncture. Skidding Rendered Impossible.

You Take No Risk—We Ship On Approval

The man who throws away his half-worn tires or sells them to the junk man for a few cents a pound is just as extravagant as the man who throws away his shoes when the first sole gets thin.

For over three years European motorists have been "half-soling" their tires, just as we half-sole our shoes. As a result, they are getting 10,000 to 15,000 miles out of ordinary pneumatic tires, while American motorists are getting from 3,000 to 5,000 miles—and what is just as important, they have almost entirely eliminated punctures, blow-outs and rim cuts with their ever constant dread. To say nothing of making skidding impossible.

Save $50 to $200 a Year

Figure this out by the individual—how it affects you—your pocketbook.

Every mile you travel on the bare tire is costing you from 1½c. to 4c. in tire wear alone, to say nothing of the lost time and expense for the repair of punctures and blow-outs.

Just stop for a moment and consider what it means to you to get 10,000, 12,000 or 15,000 miles out of your tires and at the same time drive your car without the constant nerve-racking dread of tire trouble and skidding.

In round numbers it means a saving of $50 to $200 each year—a saving sufficient to pay your gas and oil bills each month. Yet this saving is not all—the tire vacation and relief from skidding assured you certainly means a gratification which cannot be estimated in dollars and cents.

No More Skidding

Durable Treads are as sure footed as a Rocky Mountain burro, and they're supremely convenient.

They are studded with sharp-edged steel rivets which dig right down through the mud and slush and get to earth every time. In London and Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of the steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and—what is more important, you receive perfect non-skid service while your tires are protected instead of injured. They cover the tire completely, extending entirely around from rim to rim. Nothing can work its way in between. They afford a perfect protection—that's why we can guarantee them as we do.

No Matter How Cut or Worn They Are

No matter how cut or worn they are, you can get more mileage from them and the few cents the junk man would give you can be turned into dollars.

The strongest proof of the economy of Durable Treads is their unprecedented record of sales: 40% of the business comes direct from recommendations of users; in eight months the sale of Durable Treads increased over 700% in the United States alone.

Where is there an automobile accessory which has received such instant and country-wide endorsement?

Think of it—a 5,000 mile tire vacation—to be able to FORGET tires!

This is a pretty strong statement unsupported, but it's not merely a claim.

Durable Treads are delivered to you under a signed guarantee for 5,000 miles of wear without puncture.

This guarantee is an ironclad agreement—as good as a government bond and holds good whether your tires are new or old, tread worn, rut worn or rim cut.

Special Discount Offer

To motorists in territory where Durable Treads are not as yet represented we offer a special introductory discount for advertising purposes, equal to the full dealer's profit.

We have made some strong statements in this advertisement. Make us prove them. You have everything to gain and absolutely nothing to lose, for all we ask is the opportunity to give you a demonstration at our own expense and risk.

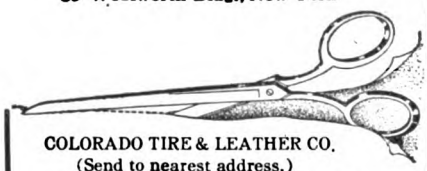
We have a catalog, sample and copy of written guarantee ready to send and they're yours free for the asking.

Don't let the tires on your car run another week in "bare-footed" condition—don't wait until you get your next puncture or blow-out.

Fill out and mail the coupon right now and you will hear from us within a week; no expense and no obligation to you.

Colorado Tire & Leather Co.

95 Tread Building, Denver, Colo.
Dept. 15, Box 228, Chicago, Ill.
59 Woolworth Bldg., New York



COLORADO TIRE & LEATHER CO.
(Send to nearest address.)

95 Tread Building, Denver, Colo.
Dept. 15, Box 228, Chicago, Ill.
59 Woolworth Bldg., New York

Gentlemen: Please send your free catalog, sample and copy of written guarantee for 5,000 miles without puncture. This request carries no obligation.

Name .....

Address.....

City.....State.....

My tire sizes are.....

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FOR FORDS

Gemco MILWAUKEE TRADE MARK "THE SIGN OF SATISFACTION"

FOR FORDS

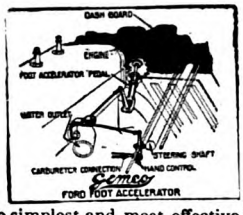
The Big Line of

POPULAR FORD SPECIALTIES

To Invest Your $50.00 Refund In.



Combination Rear End Tire Holder.
Complete with Straps.....$3.95
Without Lamp and License Bracket..... 3.20



The simplest and most effective Foot Accelerator on the market. It is positive action, easy to attach and is proving a tremendous seller. Directions for attaching furnished with each Accelerator.

Price, Complete.....$1.50



Pneumatic-Springs are real Shock Absorbers that belong on every Ford car. Mechanically perfect and thoroughly guaranteed.
Price, Per Set of Four.....$15.00

Illustration at right shows the Gemco Mechanical Starter—Shock Absorbers and F-10 License Clamp and Bar. These are three important Ford Accessories.
Starters.....$15.00
F-10, Complete..... 1.00

GEMCO OFFERS YOU

The most complete line of high-grade Ford Specialties to be had.

More than fifty different articles, including:

Starters	Radiator Caps
Shock Absorbers	Spark Plugs
Tire Holders	Anti-Rattlers
Bumpers	Truss Rods
Steering Wheels	Wheel Pullers
Brake Bands	Robe and Foot Rails
Brake Shoes	Chain Grips
License Brackets	Mud Hooks
Wind Shields	Foot Accelerators
Lamps	Cutout and Horn Outfits
Radius Rods	Standard Bolts and Nuts
Radiator Cradles	Tools, Etc.

The best proposition offered the live dealer this season—Quick Sales, Good Profits and Satisfied Customers. Sold by leading supply houses throughout the country.

Send for Ford catalog today.

The Latest and One of the Most Important Ford Parts

The Gemco Quick Detachable Transmission Bands

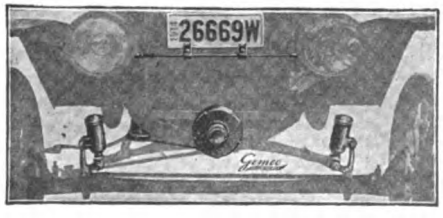
20 Minutes to Attach the New Band. (See Illustration and Description.)

THE OLD WAY	THE NEW WAY
Means Tearing Down Transmission Case — Three or Four Hours' Time and Several Dollars Expense.	Open Case Cover—Insert Gemco Quick Detachable Band (See Illustration). 20 Minutes' Time. Practically No Expense.

Gemco Manufacturing Company,

Formerly Garage Equipment Mfg. Company

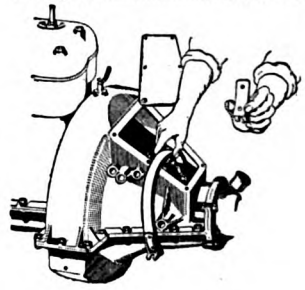
756 So. Pierce Street, Milwaukee, Wis.



17" Tilting Steering Wheel for Ford Cars



Easier Steering—Greater Leverage—More Room.
17 in. Stationary, Plain.....$3.60
Corrugated..... 4.50
17 in. Tilting, Plain..... 4.50
Corrugated..... 5.50





Twenty Minutes to Attach These New Transmission Bands. Detach Removable Ear-Pass around Transmission and Lock (See Illustration).

The initial expense of this new Band is about one-third of the cost to install the old Band. These Bands can be relined at a small expense and will last the life of the car. Prices:
Gemco Quick Detachable Bands, Lined.....each, $1.50
Lining Only, Three in a Box, with Rivets..... 1.00

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Announcing

Campbell Detachable Upholstery

(The First of a Series of Full Page Advertisements in the Saturday Evening Post, Literary Digest, etc.)

WHAT a Paris frock does for a woman, Campbell Detachable Upholstery does for a motor car—*classes* it.

Over the shabby upholstery of last year's car, or the shining newness of this year's, it works a genuine transformation. At a stroke, it gives the interior trim a luxurious look, a soft warmth and *tone*, found only in the finest limousines.

There is a set specially designed for practically every model of every car. It fits over the regular upholstery like the upholstery itself, becoming in appearance an inherent part of the car body. Anyone can install it—no alterations are necessary. With a snap of its fasteners you adjust each hand-tailored part over seats, backs, arms and doors. With equal ease you slip it off for cleaning.

There is the same satisfaction in owning a car equipped with Campbell Detachable Upholstery that there is in being faultlessly dressed. There is an added comfort, and a very practical satisfaction in the always cool, always clean seats. If you are buying a new car, ask to see it equipped in this latest style. If you want to make an old car look like new again, order its particular set of Campbell Detachable Upholstery from your dealer—today.

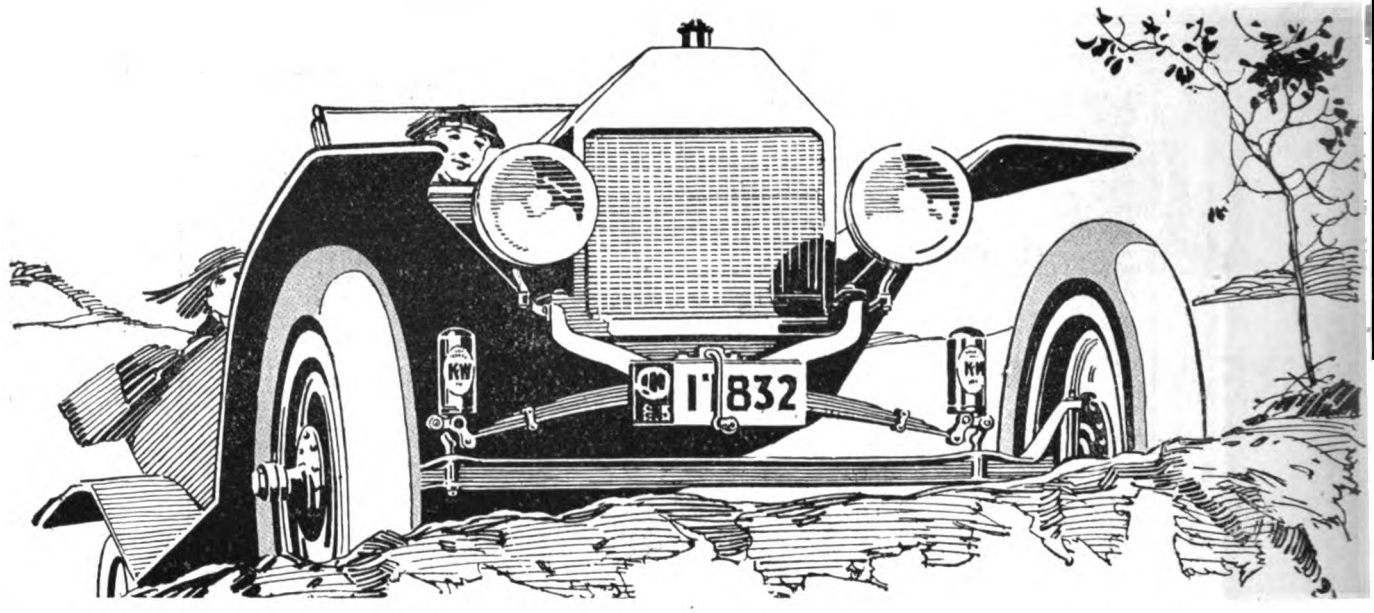
Dealers: Write for folder of fabric samples and discounts.

Campbell Detachable Upholstery is made in a variety of smart motor fabrics and linens, to harmonize with cars of every color. Send for folder showing actual samples, and price list, with special discounts to the trade. Address The Perkins-Campbell Company, 628 Broadway, Cincinnati, Ohio. New York Office, 89 Chambers Street.

CAMPBELL

The name Campbell on the fasteners is the quality mark of genuine Campbell Detachable Upholstery.

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Enjoy the Scenery—Forget the Bumps

Be a Tourist—Not a mere Road Inspector

Many motorists today are slaves to the road. Their daily drives and week end trips are limited because of rough, rutty roads. They arrive home tired from being bumped around and "picking the roads"—they see nothing else all day.

Don't be a mere road inspector—equip your light, economical Ford with K-W Road Smoothers and get the greatest enjoyment and comfort.

K-W Road Smoothers give you this enviable comfort because their design combines these four factors:

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.
4. A construction that does not interfere with the steering.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost *twice the length of spring action* or "travel" (in actual service) of any other.

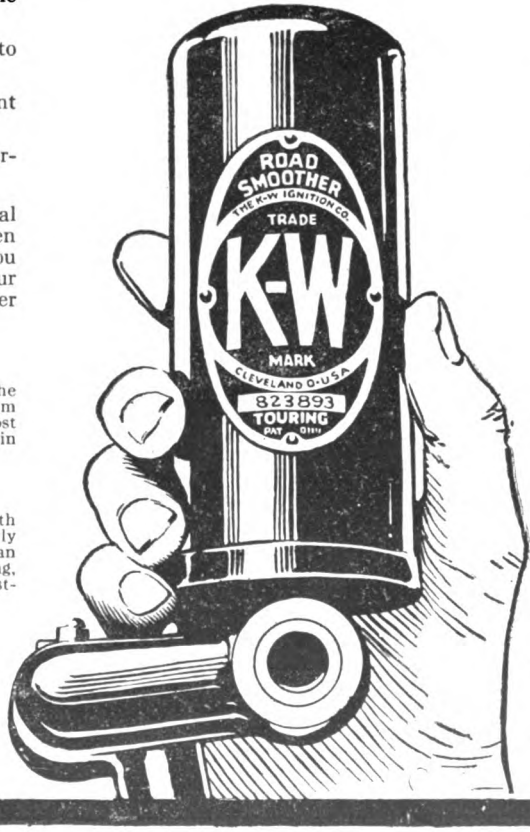
The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.

$15 SET OF FOUR ONE FOR EACH WHEEL



K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all these vital factors *only* in K-W Road Smoothers

That is why they lengthen the life of your car, by eliminating shock and vibration. Tire economy is assured, because K-W Road Smoothers enable the wheels (not the whole body of the car) to follow the contour of the road. That means no grinding off the rubber of the tires. K-W Road Smoothers always make good because they are built with characteristic K-W Quality throughout.

But after all's been said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your car's usefulness, and bring you home with that "satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet "That Satisfied Feeling"

THE K-W IGNITION Co.
2817 CHESTER AVE. CLEVELAND, OHIO. U.S.A.

Makers of 125,000 Master Vibrators

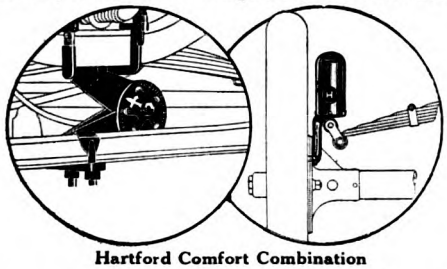
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STANDARD **Hartford** EQUIPMENT FOR **Ford** CARS

REAL BIG-CAR COMFORT FOR FORDS

Controlled spring action at the front, greater resiliency at the rear. Result—real big-car comfort.

The Hartford Comfort Combination makes every road a boulevard for Ford owners. At front, where the greater weight is, the Hartford Shock Absorber prevents violent movement of the front springs; at rear, where less weight is, two Hartford Cushion Springs supply the needed resiliency.

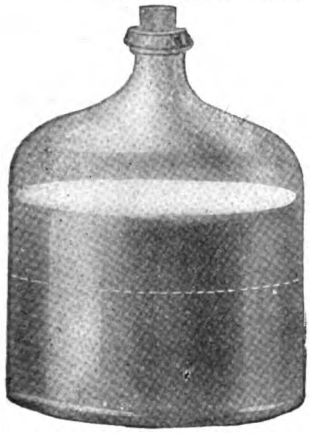


Hartford Comfort Combination

Try this combination. It's a comfort-maker.

*Hartford SHOCK ABSORBER On the front of a Ford AND Hartford CUSHION SPRING On the rear of a Ford

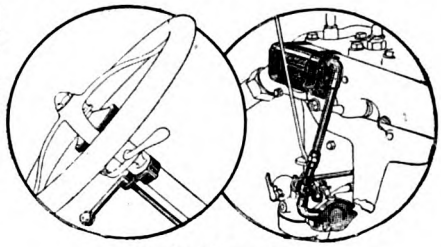
PRICE {ONE HARTFORD SHOCK ABSORBER / TWO HARTFORD CUSHION SPRINGS} **$12.00**



That Above Dotted Line Shows the Saving

Is a Saving of 35% in Gasoline a Consideration?

If so, get acquainted with a Ford accessory that cuts down your "gas" bills over one-third, gives greater power to your engine, makes it run more smoothly. The



Hartford Economizer

Hartford ECONOMIZER

feeds more air and less gas to a Ford engine, furnishing an ideal mixture. It's a genuine **economizer** and its price is exceedingly low—

$6.00, COMPLETE

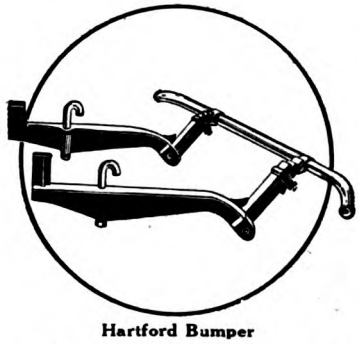
Lengthens the Lines of a Ford

enhancing its good looks while protecting lamps, radiator, mudguards **and car.** That's why a

Hartford BUMPER

is the best bumper for a Ford. It is shock-absorbing. When something hits its bump bar, the force of the collision is dissipated by friction leaves of spring-steel. **All** your Ford is saved from harm. Bolts on without drilling.

PRICE, Complete, $10.00



Hartford Bumper

HARTFORD SUSPENSION CO., E. V. HARTFORD President **141 Morgan St., Jersey City, N. J.**

Makers of the Hartford Cushion Spring, E. V. Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper

BRANCHES: BOSTON, 319-325 Columbus Avenue; CHICAGO, 2637 Michigan Avenue; NEW YORK, 1846 Broadway and 212-214 West 88th Street; NEWARK, N. J., 273 Halsey Street; INDIANAPOLIS, 425 North Capitol Boulevard.

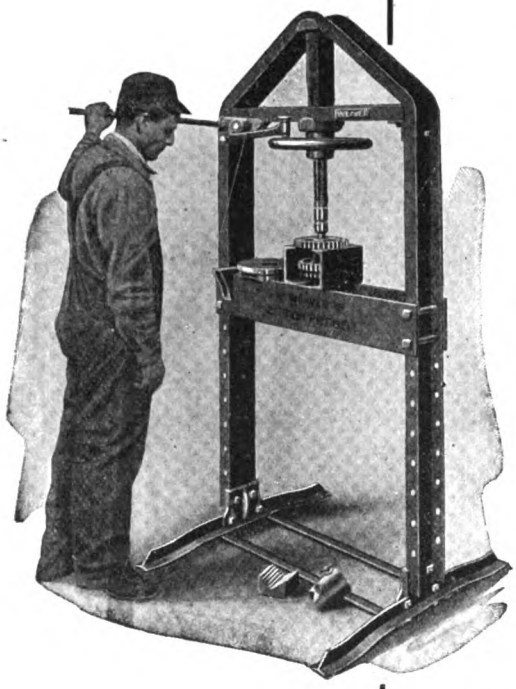
DISTRIBUTORS: Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; L. Mastrangel & Co., 117 South Beatty Street, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Charles Rubel & Co., 1311 Fourteenth St., N. W., Washington, D. C.

**Formerly the Truffault-Hartford.*

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Do ALL of Your Repair Work and do it at a Profit with a

WEAVER
GARAGE PRESS



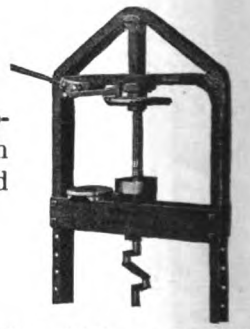
Stop paying out money to some "machine" shop for handling your difficult jobs—

A **Weaver Garage Press** will eliminate that outlay and bring jobs from other shops to **you.**

Don't antagonize and exasperate your customers by tying up their cars for two or three weeks while you send work "to the factory" which you **should** handle in your own shop—

Install a **Weaver Press** and **surprise** them by repairing their cars "while they wait"—They'll come back and bring others.

For Automobile Work



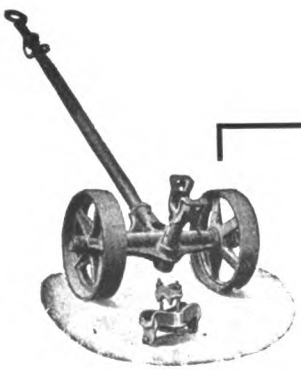
This Press was designed to handle the problems of the Auto Repairman. It is wide enough to accept an auto wheel and can be adjusted to meet practically any requirement.



Built Right

Leverage 1500 to 1; from 74 inches high, made of one piece of heavy 5-inch Channel Steel; ball bearing wheel with Bronze thrust bearings. **The Screw does not revolve.** Width between frame 32 inches; perpendicular adjustment 48 inches; weight 425 lbs.

Net Price (Complete with Equipment) $48.00



WEAVER Auto Ambulance

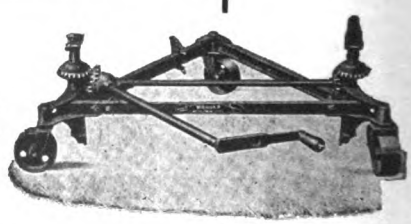
For towing disabled cars; will attach to either front or rear axle. Roller bearing *Cast Steel* Wheels; telescoping tongue.

Weight 140 Lbs.
List Price.....$30.00

WEAVER Auto Twin Jacks

One man can handle any car with ease. Full ball and roller bearing casters and lifting mechanism. Made in **two** sizes.

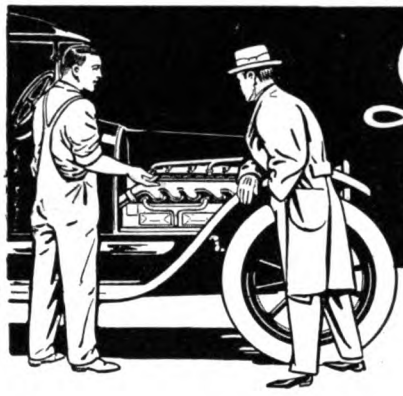
Per Set (Two)
$20.00 —— and —— $36.00



WEAVER MANUFACTURING CO.

2175-79 So. 9th Street Springfield, Illinois

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Dealers - Attention

Money for you when times are dull

Lots of your customers think they can't run their cars in winter. They're right enough, too, if they've known what starting trouble means and had experience with power failure on the road—been stalled a few times in the snow or mud.

They put their cars away and your business with them comes to a standstill until they begin to get ready for spring.

We're out now with a plan to get automobile owners sold on the idea of running their cars through the winter months. We're going to show them that winter weather need have no terrors for them if they take out power insurance with a set of

Made in All Sizes **LEAK-PROOF** *Easily Adjusted*

Piston Rings

MADE BY McQUAY-NORRIS MFG. CO.

Page advertisements are coming out this month in the leading automobile journals reaching car owners, and we've accumulated enough experience to know that arguments like those we're putting up are going to "get over." No owner wants to store his car if he can be shown a way to keep it in use.

Your chance to make dull times busy times, is to get behind us and push LEAK-PROOF PISTON RINGS with your customers. Talk LEAK-PROOF to them. You know what these rings can and will do to make winter driving easy and economical. Dealers everywhere have made good profits in this business—and good friends out of their trade besides.

Don't be put off the track with imitations or substitutes for LEAK-PROOF PISTON RINGS. This is the only piston ring so designed and constructed as to make leak proof service always sure and efficient. Note the angle-to-angle interlocking construction of the two members and always use this feature to identify the LEAK-PROOF Ring.

Write for Free Booklet, "To Have and To Hold Power"

It explains Leak-Proof construction—gives you facts and arguments that will sell your customers on Leak-Proof Rings.

McQuay-Norris Mfg. Co., Dept. R, St. Louis, U. S. A.

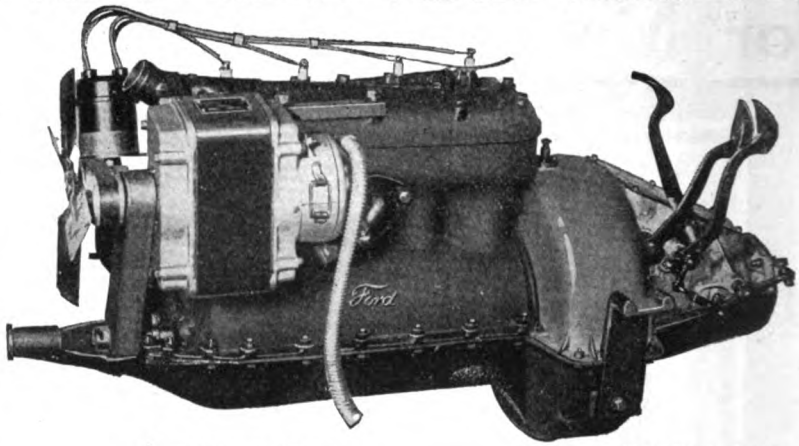
Canadian Factory: W. H. Banfield & Sons, 120 Adelaide St., West, Toronto.

BRANCH OFFICES **New York:** 1919-29 Broadway at 64th St. **Pittsburgh:** 002 Second Nat. Bank Bldg. **Kansas City:** 513 New Nelson Bldg. **Chicago:** Suite 718 Michigan Blvd. Bldg. **San Francisco:** 164 Hansford Bldg. **Los Angeles:** 224 Central Bldg. **Dallas:** 509 Juanita Bldg. **St. Paul:** American National Bank Bldg.



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Westinghouse
Starting - Lighting - Ignition
For Ford Cars



No change required in engine. Silent chain drive to crank shaft. Simple connections. Durable construction. Battery, wiring and all parts included. Folder 4311-A gives full particulars.

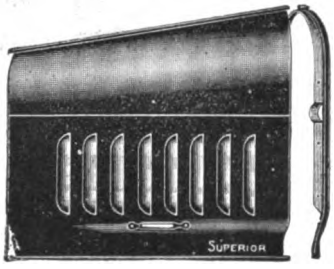
Installations made complete at Westinghouse Sales Service Stations and Agents listed herewith:

Atlanta, Ga. ..... Ozburn Automobile Supply Co.
Boston, Mass. ..... Motor Parts Co.
Buffalo, N. Y. ..... Motor Parts Co.
Chicago, Ill. ..... Westinghouse Sales Service Station
Chicago, Ill. ..... Motor Car Supply Co.
Cleveland, Ohio ..... The Auto Electric Equipment Co.
Cleveland, Ohio ..... Westinghouse Sales Service Station
Detroit, Mich. ..... Westinghouse Sales Service Station
Houston, Tex. ..... Tel. Electric Co.
Indianapolis, Ind. ..... Westinghouse Sales Service Station
Kansas City, Mo. ..... The Equipment Co.
Memphis, Tenn. ..... Ozburn Automobile Supply Co.
Minneapolis, Minn. ..... Reinhard Brothers Co.
New Orleans, La. ..... Shuler Rubber & Supply Co.
New York, N. Y. ..... Westinghouse Sales Service Station
Oelwein, Iowa ..... Charles W. Bopp
Oklahoma City, Okla. ..... Severin Tire & Supply Co.
Omaha, Neb. ..... Powell Supply Co.
Philadelphia, Pa. ..... Motor Parts Co.
Pittsburgh, Pa. ..... Pittsburgh Auto Equipment Co.
Pittsburgh, Pa. ..... Westinghouse Sales Service Station
Springfield, Mass. ..... Motor Parts Co.

Westinghouse Electric & Manufacturing Co.

Automobile Equipment Department — Shadyside Works, Pittsburgh, Pennsylvania

"SUPERIOR" STREAMLINE HOODS FOR FORDS



FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are merely painted and chip off easily. Buy the Smooth Long-Line Hoods.

BUILT OF HEAVY STEEL—TO LAST. **IMMEDIATE DELIVERY.**

Patented

NEW SURE-FIT HOOD
Complete, $8.00
Model "A" Fits 1912-13-14 Fords
Model "B" Fits All 1915 Fords

NEW WINNERS!!

Crown Fenders, Cowl Shields, Demountable Natural Wood Wheels, Lamps, All Types, Tool Boxes, 1915 Convertible Lamp Brackets.

GET THE NEW PRICES!

Send for Latest Illustrated Sheet.

"SUPERIOR" V-Type Honey-Comb Radiators
For Ford Cars.

The New Constructed Vertical Water Flow Core.



Brass, $34.70 — New Proposition. Get Our Credit Allowance On Old Radiators.

German Silver, $38.00 — Write Today. All Types of Radiators Built and Repaired.

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

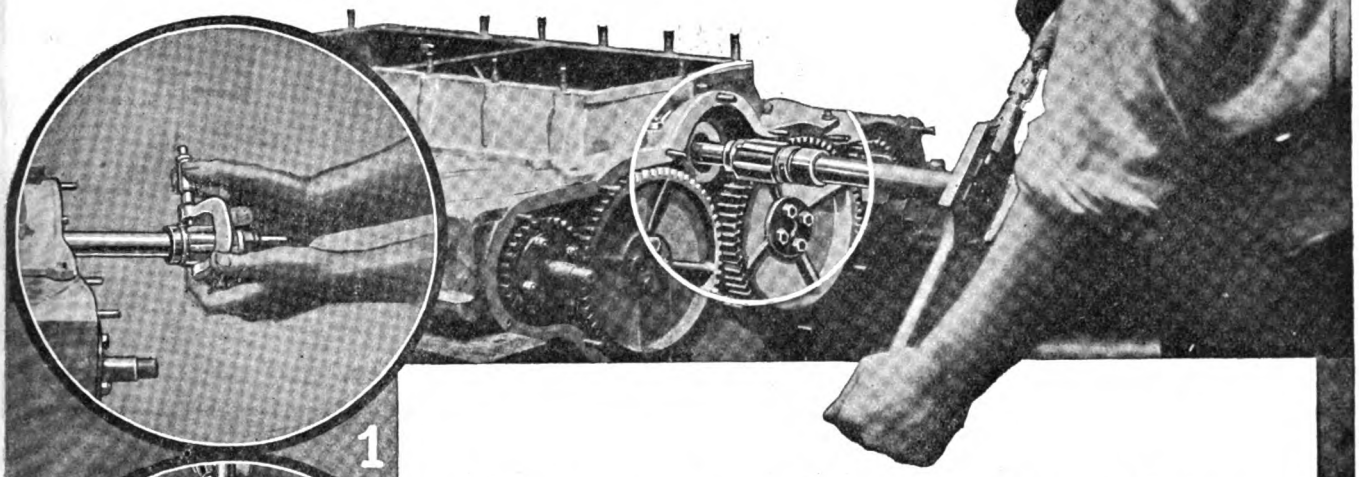
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For Motor-Bearing Work

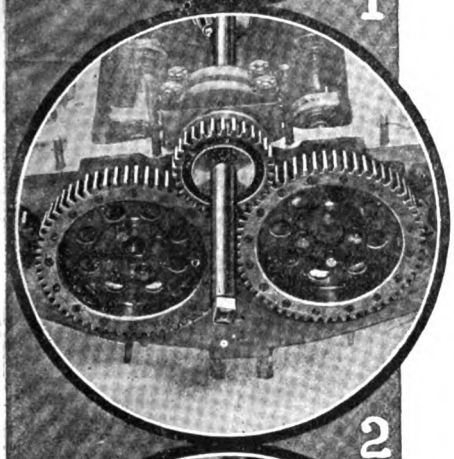
Bearings can be bored out in absolute alignment and to the exact size of the crank shaft with the

MARTELL A-L-I-G-N-I-N-G REAMER

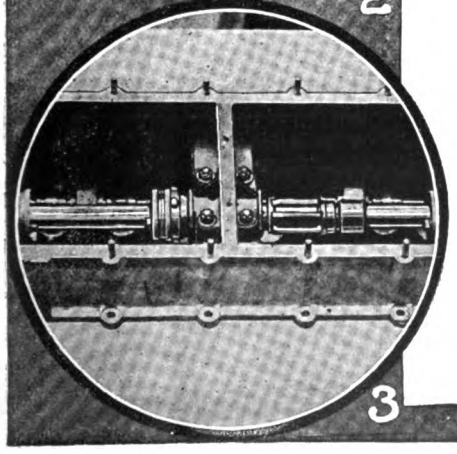
It takes but one-quarter the time required for hand scraping.



1



2



3

Better Bearings in Less Time

To scrape in a set of motor bearings by hand is a long, hard job requiring from three to five days. The work is seldom satisfactory—it is so difficult to meet the requirements of perfect gear mesh, absolute alignment, and accurate size.

This work of scraping motor bearings can now be done in an exact, scientific way in one-quarter the time required for the hand process. This is done by means of the MARTELL ALIGNING REAMER.

This tool will bore out the bearings to exact size, leave them in perfect alignment, permit the proper mesh of gears, and will burnish the bearing surfaces. The reamer equipment consists of the aligning shaft, two reamer heads, six adjustable bushings, and a short shaft for connecting-rod bearings.

The reamer head may be set to exact size by micrometer (See Fig. 1), after calipering the crank shaft. By means of a special bushing the crank shaft gear is located on the aligning shaft so that it will run in perfect mesh. (See Fig. 2.) The aligning shaft is supported by eccentric bushings, secured in a tapered sleeve having fine threads on the tapered portions. These are screwed securely into the ends of the bearings to be reamed. (See Fig. 3—which shows middle bearing.) The eccentric bushings are provided with flanges, on the faces of which are vernier scales reading in .001 of an inch and recording the *amount* and *direction* in which the reamer shaft is moved.

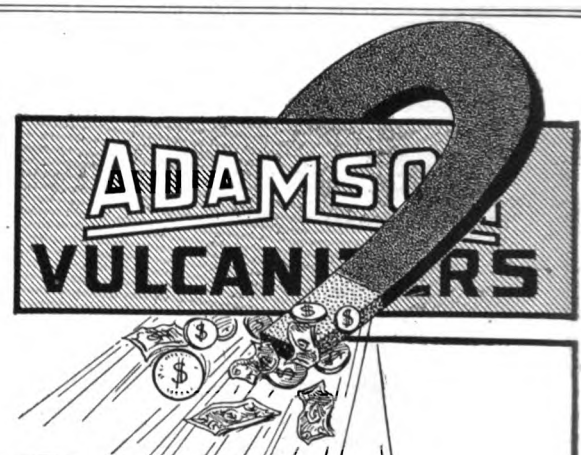
Send for free booklet,
"A BETTER WAY TO SCRAPE BEARINGS."

67-6

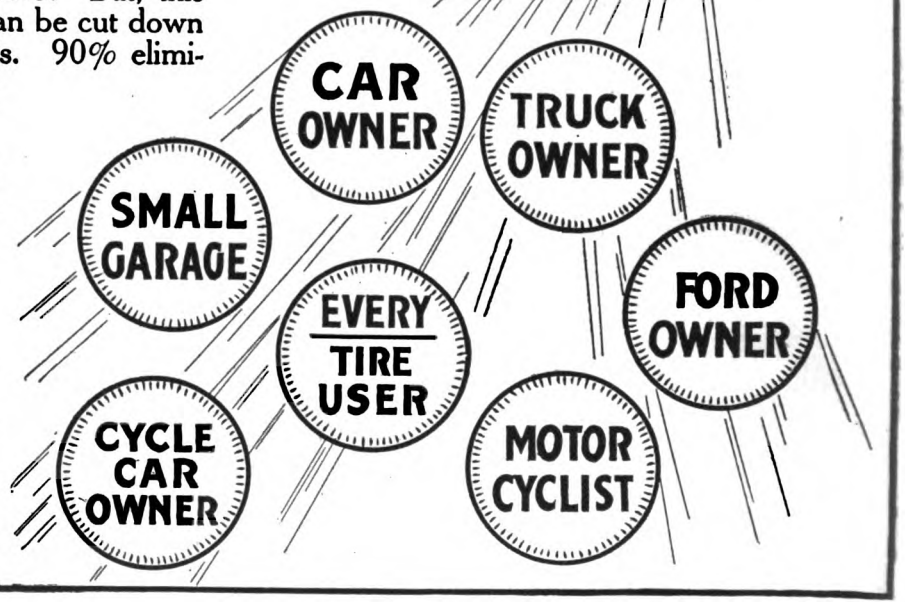
Harding Manufacturing Company, 40 Court St., Boston

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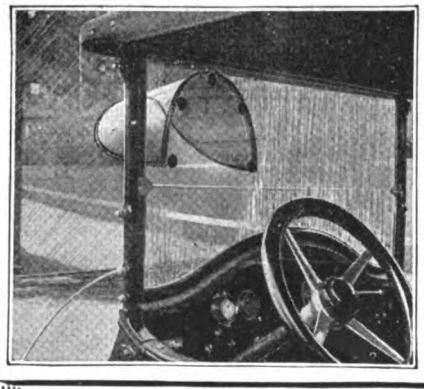
DRAW PROFITABLE BUSINESS!



Every tire user has **trouble.** And so far as we can see, he always will have! But, this trouble can be lessened. It can be cut down to one-tenth of what it now is. 90% eliminated. This: by using the "ADAMSON" Vulcanizer. Every tire user sees the logic in our principle--and BUYS SOMETIME, for it's economy to carry an outfit in every car. Are you going to gather in some of these dollars which the "ADAMSON" is attracting? They will come to your place of business--if you've "ADAMSON" outfits on your counter. **Write for the dealer's proposition to**



Adamson Mfg. Co.
East Palestine, Ohio Hamilton, Ont., Canada



View From Rear

FREY'S U-CAN-C RAIN SHIELD

Made of tough, flexible, transparent Pyralin. Lasts for years. Attached to glass in 10 seconds and as quickly removed. No water can run under or drip off the edge.

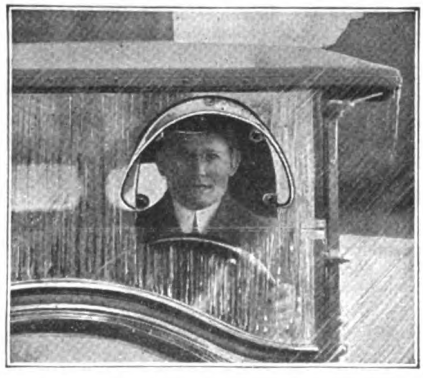
It Rolls Up
and goes into a strong tube, 11x3 in.

Send us your dealer's name with $1.50 and we will mail you prepaid, one of these necessary shields.

Fits All Cars

FREY'S U=CAN=C TRADE MARK RAIN SHIELD

First New Automobile Accessory In Five Years



View From Front

You Can See this from the pictures.

Stick it on your wind-shield and know the comfort and safety of driving your car in all storms, with a clear view ahead.

It sticks to your glass windshield with five vacuum cups. **We guarantee** no wind can pull it off when properly applied.



DEALERS—Write quick for prices and agency proposition. **Stick** one to the glass of your show window. You will sell one to every car driver.

List Price, Complete

Amber.....$2.00 Each **Clear**.....$1.50 Each

FREY MANUFACTURING CO.
1516 MICHIGAN BLVD. CHICAGO, ILL.

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This Wrench Fits the Fourth Connection

A Prize Tool



35 Cents

REMEMBER

WALDEN WORCESTER WRENCHES

Real Tools

Demanded By — Every Good Mechanic —

INSIST ON

WALDEN WORCESTER WRENCHES



USED ON

Cylinder Head Bolts,
Water Intake Pipes,
Crank Shaft Bearings,
Reverse Bands,
Grinding Valves,
Main Bearings,
Rear Axle Nuts,
Rear Axle Housing,
Brake Bands,
Fender Eye Bolts,
Connecting Rods,
Engine Base Bolts,
Many Other Nuts.

If your dealer or jobber does not carry these tools, advise name and we will ship, charges prepaid, on receipt of price.

SEND FOR CATALOG AND TRADE PRICES.

Walden Mfg Co., 64 Central St., Worcester, Mass.

We Manufacture Wrenches Only

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Carry Your Spare Tire on the Extra Rim Furnished with Each Set of PARKER-HYDRAULIC PRESSED STEEL WHEELS FOR FORDS

They give you the quickest and easiest demountable rims—the only part to come off being the rim itself. No loose parts—nothing to stick—rims cannot be mounted crooked—and always run true.

To change a tire simply unscrew each bolt about two turns. This loosens the clip and releases the rim.

These wheels are the strongest wheels made, yet they are much lighter than wooden wheels with demountable rims. This great strength insures your safety, which alone is worth many times their first cost. Their handsome non-rustable and durable finish adds to the attractiveness of your car.

Sold by reliable dealers everywhere. If you don't know yours, write us.

These wheels offer a real opportunity to live dealers. Full details on request.

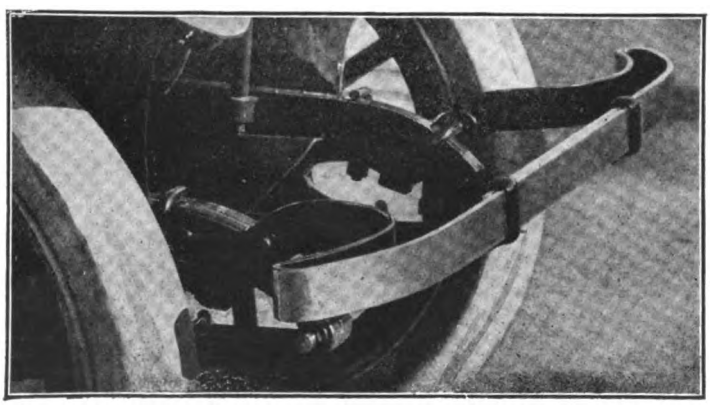
$19.75
SET OF FOUR

Enameled black, 30 x 3½ inch wheels, spare clincher rim, full set of new hub bolts and brace wrench. With wheels enameled red and clincher rims enameled black, $20.50.

THE HYDRAULIC PRESSED STEEL CO.,
3158 East 61st Street, CLEVELAND, U. S. A.

Builders of "Hydraulic" Pressed Steel Frames on which Reliable Cars are Built.

SELL the only BUMPER that can be struck without being damaged!



PATENTED

There are Bumpers galore—but only one that really protects and which won't break. The others are all alike. Their claims are strong—but their action mightily inefficient. The

LYON Resilient Bumper

is different. You can run it into a pole at reasonable speed without injuring either the bumper or car! Strong statement? Prove it yourself at our expense.

The LYON is resilient, having ten times as much spring play as any other make.

The LYON is clamped on any car in 15 minutes; harmonizes with streamline bodies and is guaranteed not to rattle or become loose. It is packed in individual boxes, making it easy to reship. The price is low.

$7.50 up to $10.50; all finishes. FORD Bumpers $6.00

Why sell others that cost as much or more and don't deliver the goods? Give your customers their money's worth by selling them the LYON. We have something interesting to say to dealers and garagemen. ***Write us at once.***

METAL STAMPING COMPANY

BOULEVARD, LONG ISLAND CITY, NEW YORK

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"Oh John!"

Thousands of Motorists Know KELLOGG Specialties!

Do you, Mr. Dealer, realize your opportunity of selling high-grade specialties to the best trade in your locality?

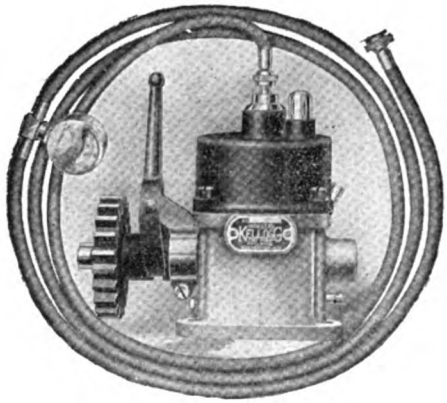
KELLOGG Engine Driven Tire Pump

Made with complete attachments ready to install on any car.

We are delivering them as fast as we can produce, to trade for the Buick, Chalmers, Chandler, Hudson, Hupmobile, Overland, Studebaker, Reo, Franklin, King, Packard and others.

$15 Complete with air hose, gauge and all attachments.

Special Ford Outfit, $9.50; Dodge, Maxwell and Chevrolet, $10.



No. 101, All Metal

Get Our Attractive Proposition on the Following Specialties

KELLOGG "Special" Compound Hand Pumps.
KELLOGG No. 8 Compound Hand Pumps.
KELLOGG Pressure Indicators.
KELLOGG Valve Grinders.
KELLOGG Combination Grease and Oil Guns.

Complete stock carried by prominent distributors in all parts of the country.

Shipments prompt. Write Us for Catalog and Prices.

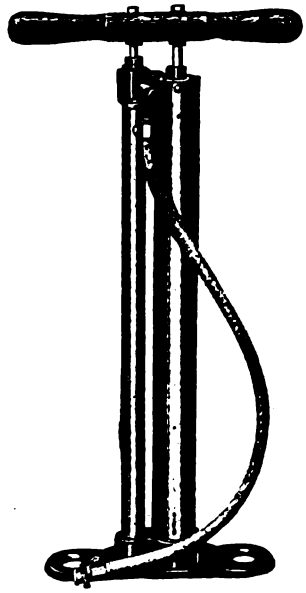
KELLOGG MFG. CO., 1266 Circle St., Rochester, N. Y.



Kellogg Valve Grinder



Kellogg Oil and Grease Gun

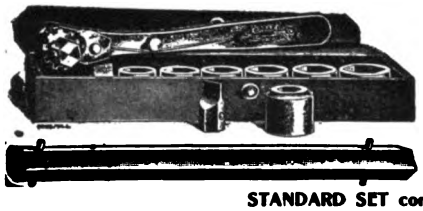


Kellogg No. 8 Compound Pump

Garage Pumps which give maximum efficiency and service at minimum operating expense. Let us quote.

Send for attractive display card.

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LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U.S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.
Price, in leather case, - - - - $3.00

Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER, 180 N. Dearborn Street, CHICAGO, ILL.

The Trade Is Cautioned Against Selling Infringements On My Patent.

The HUNTER

At Last, Mr. FORD OWNER! A SELF-STARTER For $10

Increases the Value of a Ford Three Times

NOTE THE ADVANTAGES

Powerful—The straight pull and powerful leverage enables a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carbureter for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

Every Ford Owner **wants to make his car up-to-date and at the same time provide for comfort.**

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. **Big money for you** in this—the lowest priced reliable Ford Starter made.

HUNTER LOCKS FOR FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. **Price, $1.00.** Quickly installed. **Sold by leading dealers.**

THE HUNTER AUTO SUPPLY CO., 4101-5 East Ravenswood Avenue, CHICAGO, ILL.

Noncarbene
CARBON SMOKE ESTEMA

NO CARBON MORE POWER LESS GASOLINE

Noncarbene is a petroleum product containing no injurious substance. It is used constantly with the gasoline—1 gallon of Noncarbene to 64 gallons of gasoline.
The saving in gasoline alone more than pays for the product.
Noncarbene will absolutely PREVENT and REMOVE carbon already formed.

PROVEN BY THE HIGH CLASS OF ITS USERS:

The Automobile Club of America - New York
The Fleischmann Company - - New York
The Rubberset Company - - Newark

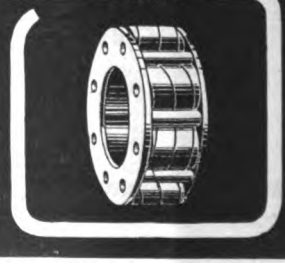
Booklet of other endorsements sent upon request.

Prices: 1 Gallon, $1.50; 5 Gallon can, $6.25. Sales proposition upon request.

THE NONCARBENE COMPANY, 1765 BROADWAY, NEW YORK

How Far Has Your Car Run On HYATT QUIET BEARINGS?

$1000.00 for best Hyatt Service Records



Write for Entry Form to Dept. 22
HYATT ROLLER BEARING CO.
755 WOODWARD DETROIT MICH.

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SPITLER PUNCTURE PLUGS

The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

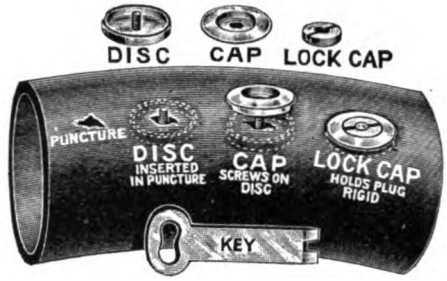
The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.



Write for Circular.

Price—Four to a Set, $1.00.

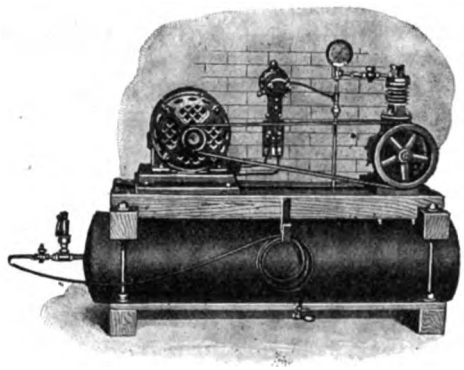
(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, **1790 Broadway, NEW YORK CITY**

GARDNER'S LATEST

Large Capacity—Automatic—Simple Tire Inflator for Filler Stations

A complete, large size, automatic air compressing plant. Absolutely no attention needed. Just turn on switch and forget it. It will take care of itself, and keep up a constant supply of air at the right pressure **all the time.** This is the latest of the Gardner Outfits, and sells at an **unusually low price.** It is fully equipped with valves, air hose, tire connection, relief valve, and all electric connections.



Write at once for full information and prices.

THE GARDNER GOVERNOR COMPANY, Station R, **Quincy, Illinois**

SAVED $94 ON ONE JOB! *YOUR EARNINGS ARE GREAT!*



This aeroplane engine cylinder was put out of commission by the crack you see at the base,—but Imperial Equipment repaired it and *made it as good as new for only $6.* Think of the money **you** can make by having Imperial Equipment in **your** garage!

Welding broken automobile parts *at great profit*—removing carbon from engine cylinders *in a jiffy*—often saving enough *in a single operation* to pay for *the entire cost* of the equipment.



Imperial Welding and Cutting Equipment

Oxy-acetylene Process

—safe—portable—*economical.* Has a new mixing principle—accurate and uniform gas delivery—highest efficiency torches—wonderfully wide range. Imperial Equipment is *the ideal apparatus* for garages.

Ask for new catalog and prices. Learn all about this big *money-making* equipment. *Write to-day.*

The Imperial Brass Manufacturing Company
520 South Racine Avenue . . . CHICAGO

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

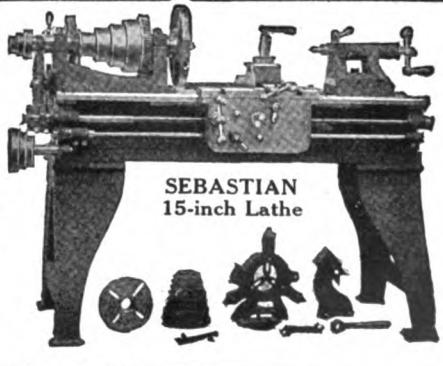
They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)

THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN
15-inch Lathe

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Garage and Repair Men

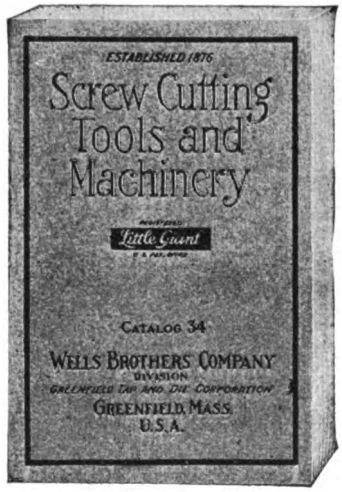
Look into the showing of Screw Cutting Tools and Appliances

Note particularly the

Combination Screw Plates

Both S. A. E. and United States Standard Threads in the same assortment.

Very handy for both general and automobile repairs.



(Taps, Dies, Screw Plates, Reamers, Gages, etc.), in this New Wells Brothers Catalog No. 34—Just Out.

All of the celebrated brand

Little Giant

Standard for 40 years

Write for your copy NOW

WELLS BROTHERS COMPANY, Division
Greenfield Tap and Die Corporation
Greenfield, Mass.

New York Chicago Philadelphia Detroit

In Canada: WELLS BROTHERS COMPANY OF CANADA, Limited, Galt, Ontario



STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY
Specialists in Piston Rings
MUSKEGON - MICHIGAN

The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,
"Worn Out Tires Made New."
Please mention the size of your tires.

TRIPLE TREAD MFG. CO.
1542 MICHIGAN AVENUE CHICAGO
Factories: San Francisco, Chicago, Winnipeg

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MARATHON TIRES

Get and Hold Business

To the Dealer who is desirous of securing the better class of trade—who is seeking to establish for himself a name for quality and fair dealing the big opportunity lies in

SPEED MARATHON ENDURANCE

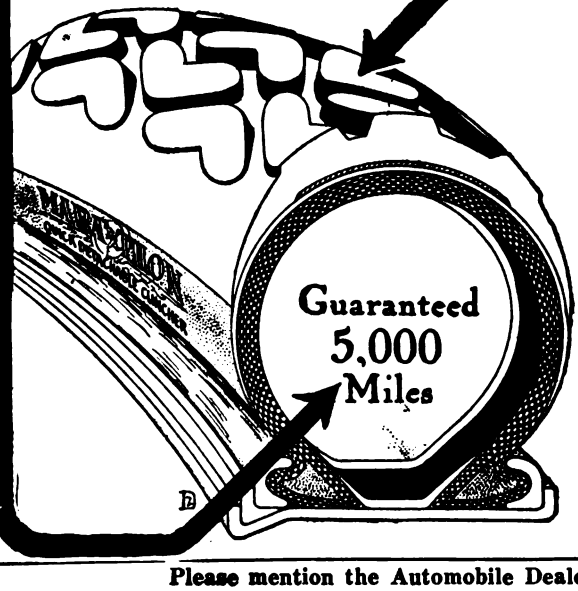
TIRES

Marathon Tires are built entirely by hand of the finest materials obtainable and are vulcanized by the Unit-Cure Wrapped-Tread method.

Our exclusive agency proposition by which the dealer controls his own territory will open up new avenues of profit for you.

Your inquiry will bring you full particulars as to our selling plan and Individual Dealer's co-operation.

THE MARATHON TIRE & RUBBER CO.
CUYAHOGA FALLS,
OHIO



TRADE APCO MARK

Door Anti-Rattler

FOR FORD CARS



The fastest selling accessory for Fords ever put on the market, and with the name APCO behind it there is no reason why it should not have the proverbial hot cakes beaten to a frazzle.

It Does Stop the Rattle

The most annoying rattle on the Ford is that caused by the doors, and it is also the hardest to locate and therefore the hardest to eliminate. The APCO anti-rattler is made from one piece of hardened spring steel enameled black. TO ATTACH, SIMPLY REMOVE ONE SCREW, PUT THE ANTI-RATTLER IN POSITION AND REPLACE SCREW, A MINUTE'S WORK. They come on cards, 24 to a card, and list at twenty cents each, and OUR PRICE to you is so low that you can afford to put a boy (a man isn't necessary) out selling the Ford owners. The proposition is so big that we want you to have a sample to try out, and therefore the free offer. Fill in the coupon now while it is on your mind. USE YOUR LETTERHEAD, and coupon, as this offer is for dealers only.

Makers of Good Accessories for Fords

Auto Parts Company

Providence, R. I.

Auto Parts Co., Providence, R. I.

Enclosed find 2c. to pay the postage on your sample door Anti-Rattler, which you offer free to dealers.

NAME.....

STREET.....

CITY.....

STATE.....

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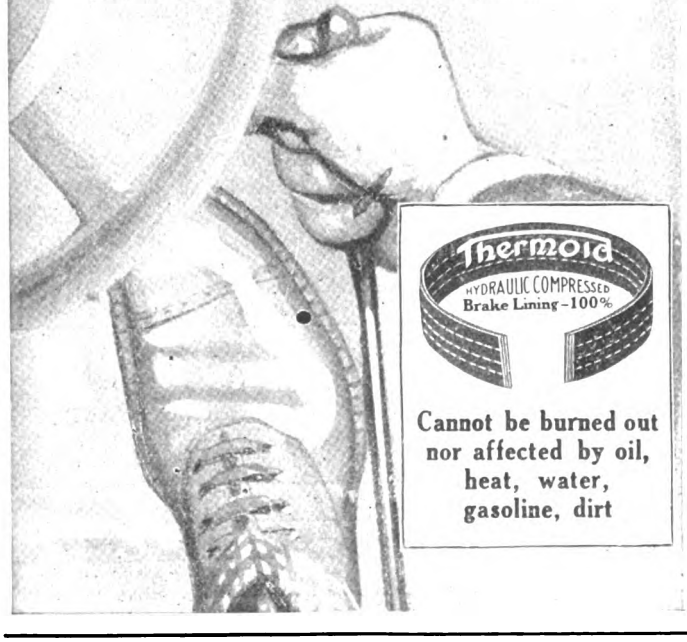


Thermoid Brake Lining SAVED THE CHILD

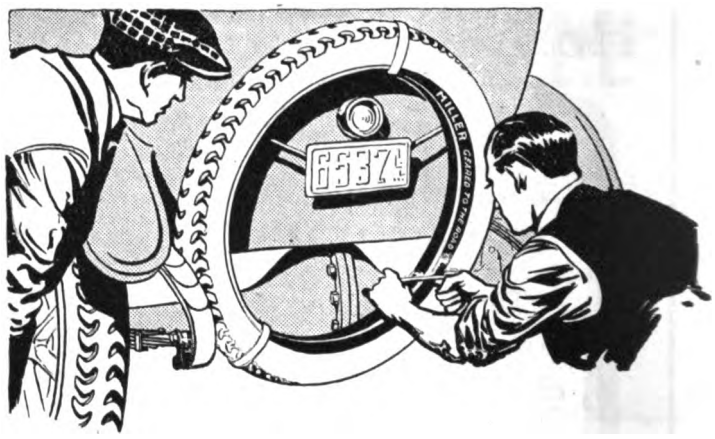
It never fails in emergency. It has the same sure gripping friction at the core as on the outside. It is 100% brake lining. Watch your brake lining—guard against accidents with

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%

Thermoid Rubber Co.
Trenton, N. J.



Cannot be burned out nor affected by oil, heat, water, gasoline, dirt



To Avoid Trouble on the Road Take Mileage With You

The Miller process of building tires prevents trouble by avoiding its cause — by retaining all the natural vegetable wax and oil in the cotton fabric. This keeps it from becoming brittle and weakened and gives it the power to resist. For a blow-out comes from the inside — from a bruised and deadened fabric. The Miller process of building

Miller Geared to the Road Tires

does not cook this life-giving lubricant out of the fabric or destroy the native toughness of the rubber, but retains both and makes a rugged unit of them. No Miller tire is handicapped in its manufacture—therefore not handicapped on the road.

The price of a tire is meaningless until it has been proven on the roads. This is why Miller users stick to Miller Tires. The roads have proven every Miller claim to be the whole truth—and the Miller price to be actual economy.

The answer to the skid question is Miller **Geared-to-the road** Tires! Scientifically built, they gear your car to the road through mud, sand or slush. **With Miller tires on your car you're in control. Its tread is an integral part of the tire and retains its safety features until the entire tire is worn out.** The greater mileage you get from them will make your choice of Miller Tires an economy, as well as a permanent safeguard.

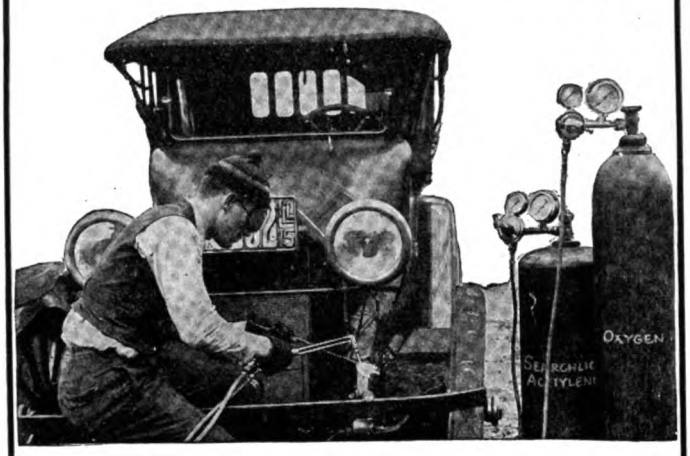
MILLER TUBES answer the tube question.

Ask the Miller Dealer to show you a section of the Miller Tire

THE MILLER RUBBER CO., Akron, U. S. A.

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Here Is Where The Big Profits Lie



The work your competitor can't handle, is the work which makes you your biggest money. . . .

You'll find no end of profitable work like this for a *Searchlight Welder.*

You will be able to repair broken castings and auto parts easily, quickly and cheaply, getting a long price because of the strength and neatness of the job and because of the time saved for the delayed tourist.

You will also be able to build up a very profitable general repair business with the factories in your neighborhood.

Broken castings which tie up factory machinery often cost hundreds of dollars in profits lost. No process or method of repair (or even of replacement) can compete with the Acetylene Welder. It is easily portable. You can carry it right to the job. You make repairs without even dismantling the machine. Guarantee a good, quick job, and quote a good fat price. You will get it every time.

The *Searchlight Welder*

For Garages

Is the only welder in its class which sells for less than $100. **Our price** for complete equipment is only **$50.00** (cylinders of gas extra, of course).

Write for complete information and we will show you the new source of big profit.

The Searchlight Company

1014 Karpen Bldg. Chicago, Ill.

BRANCHES AND REFILLING STATIONS

Atlanta, Ga.
Boston, Mass.
Buffalo, N. Y.
Camden, N. J.
Chicago, Ill.
Cleveland, Ohio
Dallas, Texas
Detroit, Mich
Kansas City, Mo.
Minneapolis, Minn.
New York City, N. Y.
San Antonio, Texas
Toronto, Ontario
Warren, Ohio

NO CENTER BOLT

TUTHILL'S TITANIC SAFETY-FIRST

Guaranteed Forever Against Center Breakage

NO CENTER BOLT

Are you getting your profit?

More Tuthill Titanic Springs are used to replace broken springs than all other makes combined

Largest stock— Quickest delivery

Nowhere else can you find such a large, complete stock of springs for all makes of cars—nowhere else can you get such prompt, satisfactory service—most sizes you can get from your nearest distributor on very short notice.

Get your share of the replacement business—become known as headquarters for the famous Tuthill Titantic Unbreakable Spring—guaranteed forever against Center Breakage—and cost no more than the ordinary kind.

Tuthill Titantics are also furnished with the Dann Insert—the Inter-leaf Shock Absorber—if desired.

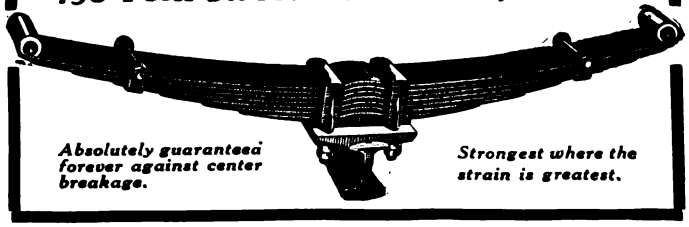
Write us or get in touch with your nearest Tuthill Distributor.

Dealers—write to your nearest Tuthill Distributor

Albany	Albany Hardware & Iron Co.
Atlanta	Elyea-Austell Co.
Baltimore	Baltimore Hub Wheel & Mfg Co.
Boston	Post & Lester Co.
Buffalo	H. D. Taylor Co.
Chicago	All Jobbers
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El Paso	Western Motor Supply Co.
Indianapolis	W. J. Holiday Co.
Kansas City	The Faeth Iron Co.
Lincoln	Nebraska-Buick Auto Co.
Los Angeles	Chanslor & Lyon Co.
Milwaukee	Babcock Auto Spring Co.
Minneapolis	Western Motor Supply Co.
New York	W. E. Pruden Hardware Co.
Oakland	Chanslor & Lyon Co.
Peoria	The National Electric & Auto Supply Co.
Philadelphia	Manufacturers Supplies Co.
Pittsburgh	Pittsburgh Auto Spring Co.
Portland	Chanslor & Lyon Co.
Rochester	Sidney B. Roby & Co.
St. Louis	Auto Devices Co.
San Antonio	The Fisk Co. of Texas
San Francisco	Chanslor & Lyon Co.
Seattle	Chanslor & Lyon Co.
Sioux Falls	The H. F. Brownell Co.
Spokane	Chanslor & Lyon Co.
Tampa	The American Supply Co.
Toledo	Union Supply Co.

Tuthill Spring Co.

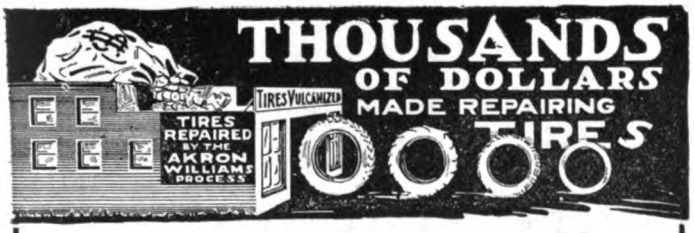
758 Polk Street CHICAGO, U. S. A.



Absolutely guaranteed forever against center breakage.

Strongest where the strain is greatest.

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Tire Repairing by the Akron-Williams process opens the way to prosperity and success and big money making on small investments.

The business is growing faster than men can be found to take care of it. There's a man needed in almost every town. The better repair shops everywhere use the

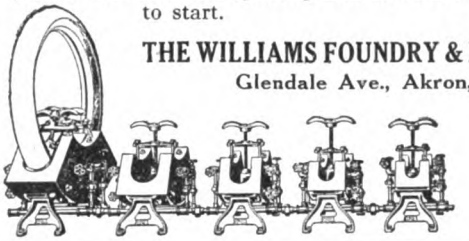
Akron-Williams Tire Repair Outfit

Endorsed by 30 Leading Tire Manufacturers

These men are making from $1,500 to $3,000 a year clear profit. You can do it too—with an Akron-Williams outfit.

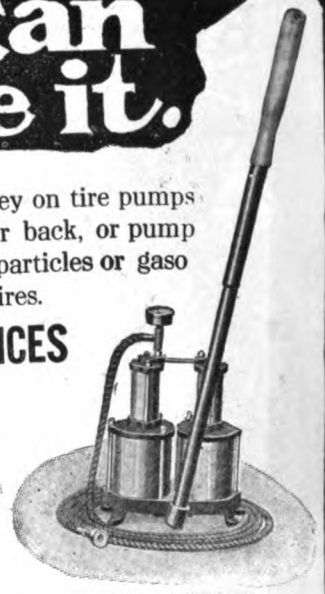
The A-W Repair Outfit is used and endorsed by 30 leading Tire Manufacturers. So you take no chance in equipping with Akron-Williams. We'll help you to learn the business. Write for our catalog No. 121 and learn the great money-making possibilities of Tire Repairing and how little money you need to start.

THE WILLIAMS FOUNDRY & MACHINE CO.
Glendale Ave., Akron, Ohio



At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.



"DEAD EASY"

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

SIMMS High Tension MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers unite in pronouncing Simms Products "Electrical Equipment Par Excellence."

The SIMMS MAGNETO *Co.*
East Orange, N.J.

INLAND 1 PIECE PISTON RING



A perfect one-piece Piston Ring

that has all the virtues of eccentric, concentric and more-than-one-piece construction; and none of their disadvantages.

A continuous ring cut spirally for half its circumference; heat-treated so that the free ends hug tightly together; the result is an absolutely *gas-tight* ring that uncoils in expanding, insuring uniform pressure and perfect contact with the cylinder walls.

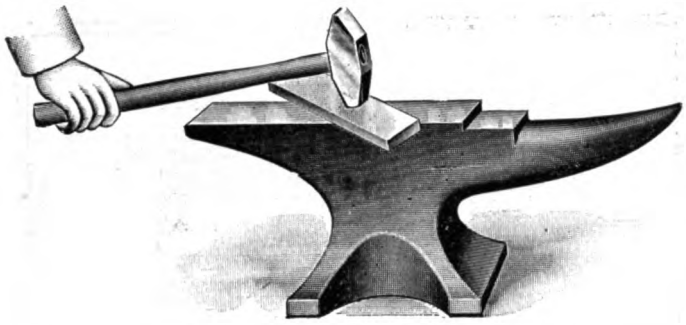
The strongest gas-tight ring on the market, because of its simple one-piece construction, and, for the same reason, it costs less to buy, and less to install, for it is easier to put on and will not break in handling.

Absolutely guaranteed; money refunded on any ring that fails to give perfect satisfaction after 90 days' trial.

Full description in free booklet.
Dealers and jobbers should write for interesting prices.

INLAND MACHINE WORKS, 802 Mound St., ST. LOUIS, MO., U. S. A.

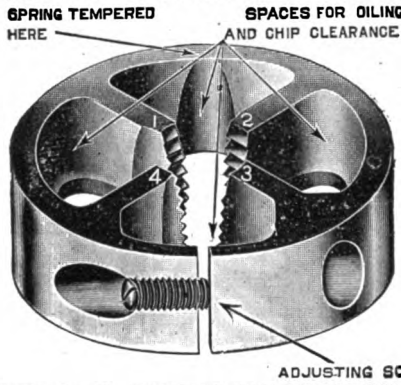
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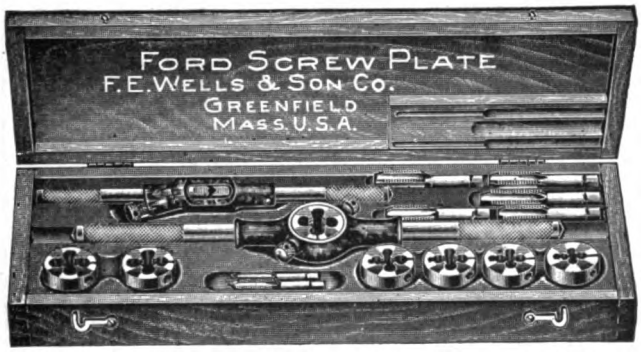
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.

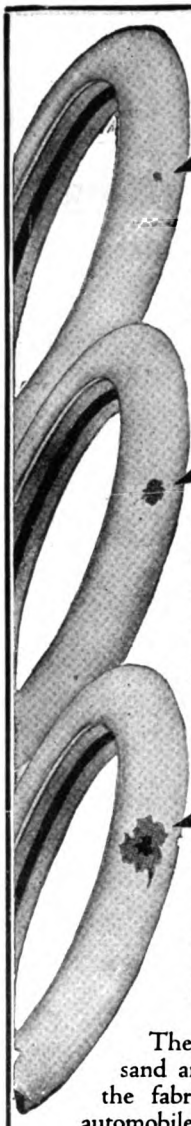


THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.



Going!

After 400 miles, the tire is cut by a sharp stone or a piece of glass.

Going!

After 800 miles, the hole is still further enlarged and dirt has been forced under the tread forming a "sand-pocket"

Gone!!

After 1200 miles the inner tube has blown clear through the casing—throw it into the junk-heap.

The small cut or little hole exposes the fabric to sand and water—causing sand pockets, and rotting the fabric. The outside coating of rubber on an automobile tire is intended to protect the "carcass" or fabric of the tire from wear and water. Keep the protecting coating of rubber in good condition and you will greatly increase your mileage.

SHALER Vulcanizer

Trebles Your Mileage

You can repair any puncture, blow-out, tear or hole in a few minutes with a Shaler Vulcanizer and make the repair the strongest part of the tire.

Remember that your old tire might just as well have run 10,000 miles. The new one ***will*** run 10,000 miles if you vulcanize it with a Shaler.

Prevent Blow-outs and Save Repair Bills

by keeping your tires in sound condition. Every time you seal a cut or repair a hole in your casing you prevent a blow-out—and possibly a serious accident—that is bound to occur if the cut is left open and the fabric exposed to dirt and water. A little intelligent care of your tires will pay big returns in the saving of repair bills and increased mileage.

GET OUR FREE BOOK **"Care and Repair of Tires"**

Every motorist needs it, because it tells what to do for every kind of tire trouble and gives valuable hints about the care of tires. Catalogue gives full information about our complete line of vulcanizers—Electric—Gasoline—Alcohol and Steam for every requirement of the motorist's use at home and public garage service.

C. A. SHALER COMPANY
808 Fourth Street **WAUPUN, WIS.**

The Largest Manufacturers of Vulcanizers in the World

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The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

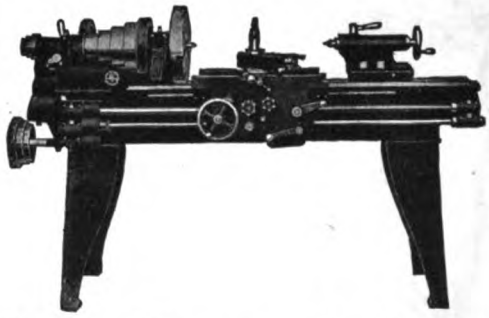
They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company
3326 Ludlow Street **Philadelphia, Pa.**

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South
A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

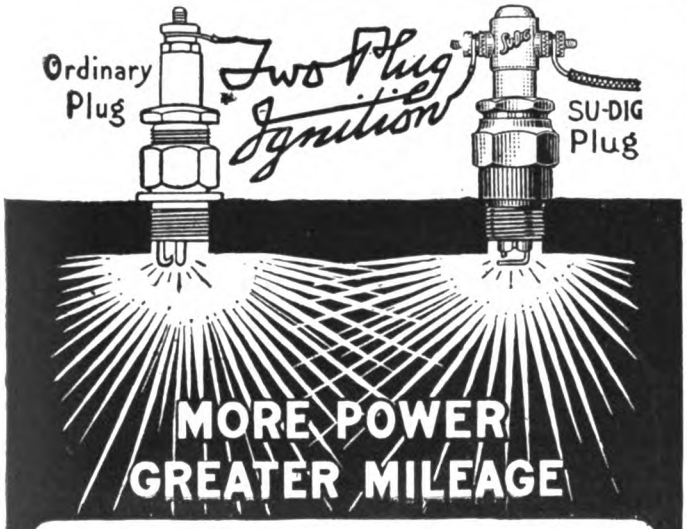
Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

Send today for catalog No. 6 and prices.

THE MONARCH MACHINE CO.
SIDNEY, OHIO



Quicker combustion will transform the behavior of any car. **One** spark burns the gas slowly. **Two** simultaneous sparks—starting flame from **two separate** points at once—burn it almost instantly.

More power, greater gasoline mileage, less carbon deposit, less gear shifting—all these result from simply adding

SU-DIG SERIES PLUGS

to the regular plugs. They are a revelation to every user.

No change in magneto or battery system required; just add one SU-DIG Plug per cylinder, connecting as shown above. Tap valve caps if necessary.

Our national advertising is creating a great demand for Su-Dig Plugs. Write today for valuable dealer helps.

Superior Motor Power Co.
24 Irving Place **New York City**

Salesmen wanted to handle SU-DIG Plugs as a side line.

SU-DIG

SAFETY FIRST

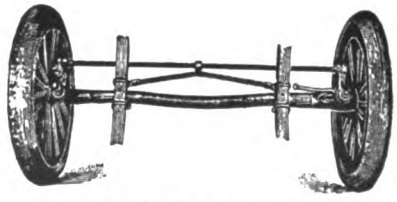
USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D. **CHATHAM, N. Y.**

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Are You Losing This Chance?

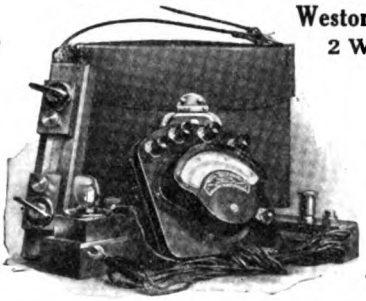
The Garage man who can repair and adjust Electrical Equipment is going to get the cream of the garage business. The ever increasing demand for attention to self-starting and lighting systems will compel you to equip to handle this business.

Weston Model 280 GARAGE TESTING INSTRUMENT

Is your one great and urgent necessity, to enable you to quickly locate electrical troubles and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electric equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.



Weston Electrical Instrument Co.
2 Weston Ave., Newark, N. J.

New York	St. Louis
Boston	San Francisco
Philadelphia	Montreal
Buffalo	Vancouver
Richmond	Toronto
Denver	Winnipeg
Chicago	Berlin
Detroit	Paris
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Install Micro Two-Part Pressure-Tight Rings

and you will save their cost in lessened regrinding of valves and decarbonizing of cylinders.

Without other benefits Micro Rings are highly profitable, but they also save much oil and gas, and assure a service improvement on leaky old type rings.

You would like the lastingly better compression, the snappy start and steady pull of a Micro-equipped motor, especially when climbing hills and traveling over bad roads.



Micro ring parts individually cast from fine grained flexible gray iron and machined to micrometer accuracy, are safe from breakage in placing and always fit close against the cylinder walls.

Write for our dealers' proposition and booklet, "How Micro Rings Improve Efficiency."

Micro Piston Rings
The watchdog of a motor's power.

MICRO PISTON RING CO.
1960 Broadway New York



The Top That Gives Double Protection

Cover your car with Rayntite. Protect yourself, your car and your friends from drizzles or cloudbursts. Safeguard your pocketbook from constant repair drains. Make sure of a handsome, durable, washable top unaffected by changes in temperature.

RAYNTITE

Guaranteed one year not to Leak

is *sincerely guaranteed*—backed by the century-old Du Pont reputation for integrity of purpose, superiority of product and financial responsibility. It gives real service because real service is built into it. Made in both single and double texture. Any top maker can supply you. Insist upon Rayntite for new tops or tops that need re-covering.

Write for free samples and booklet

Du Pont Fabrikoid Company Wilmington, Del.
Canadian Factory and Sales Office, Toronto

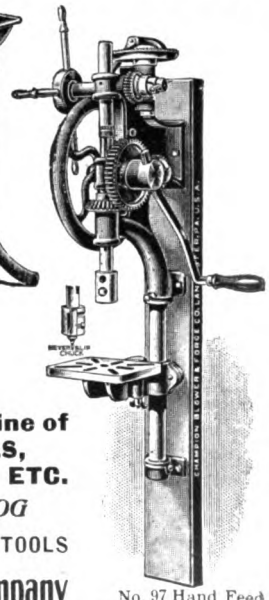
THE CHAMPION BLACKSMITH TOOLS

A FAMOUS LINE KNOWN THROUGHOUT THE WORLD FOR THEIR QUALITY

THE No. 73 MIDWAY SPIRAL GEARED FORGE
Convenient for Garage Use



No. 73 FORGE
Hearth 23x35. With Half Hood.



No. 97 Hand Feed and Quick Return Self Feed Drill.

We Manufacture a Complete Line of BLOWERS, FORGES, DRILLS, SCREW PLATES, GRINDERS, ETC.

WRITE FOR OUR CATALOG

ALL LEADING DEALERS HANDLE OUR TOOLS

Champion Blower & Forge Company
LANCASTER, PENNA.

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LOOK THROUGH THESE FOR A BETTER MOTOR!



"One-In-One" Piston Rings, *"Concentric,"*

Will show better results than any other type of ring.

BECAUSE, they are made of a fine gray iron, compatible with cylinder and piston; are made and ground—true to size— in 2 units to expand equally against the cylinder wall—reducing the friction caused by a single eccentric ring—and insuring **more Compression and Power and less Carbon and Smoke.**

Write for circular.

"ONE-IN-ONE" PISTON RING CO.

P. O. STATION "S" PHILADELPHIA, PA.

WITHERBEE BATTERIES

are the kind you should stock, Mr. Dealer. We offer not only the largest and most complete line of Starting and Lighting Batteries, but by far

THE BEST VALUE

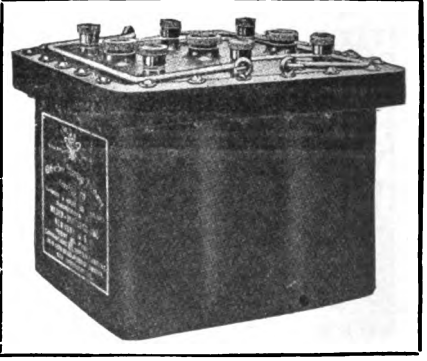
on the market. They are conservatively rated. Comparative test will show that they have nearly double the ampere hour capacity that can be secured from some others of the same rating. This means that

Your Customers get their Money's Worth

when you sell them **WITHERBEE BATTERIES.**

Satisfied customers are your best asset. Our liberal selling terms insure you a substantial margin of profit—write for full details and Dealer Proposition.

MEDER-STAUDT CO., Inc.
Sole Manufacturers
1876 Broadway, New York
Factory:
Springfield, Mass.
Distributors and Service Stations in the principal cities.



Schrader



FREE

AIR IS FREE—
Rubber Costs Money—
RIDE ON AIR

When the air in your tires falls below a certain pressure you no longer are riding on air, but **on rubber.**

Measure your air with a

Schrader

UNIVERSAL TIRE PRESSURE GAUGE

and save your tires.

Price, **$1.00**

at your dealer's, or

A. SCHRADER'S SON, Inc.
783-793 Atlantic Ave. Brooklyn, N. Y.



Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish.

Waterproof and weatherproof.

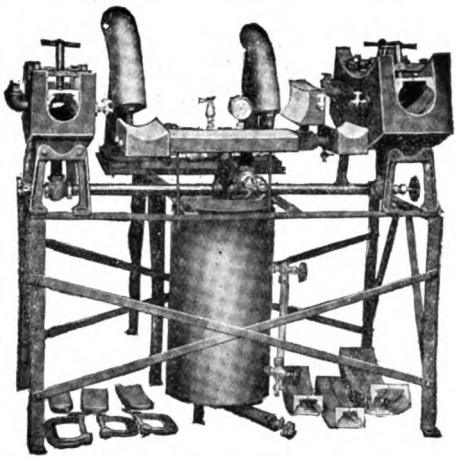
Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri



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Vanderpool Vulcanizers Satisfy

A. W. Childress, Richmond, Va., July 3rd, writes: "The machines that I bought from you have been in use every day, and the more I ***use them, the better I like them.*** I consider your Vulcanizer ***the equal of any on the market*** and ***better than most.***" Mr. Childress bought one Vulcanizer and after using it about 4 months, he sent us his order and check for a second machine.

Moler & Steward, Mount Orab, O., July 1st: The Vulcanizer is working fine. We have had no trouble with it since we got it. ***It is doing fine work.***

A. M. Johnston, Mechanicsburg, O., June 1st: The machine is doing good work. I am well pleased with it.

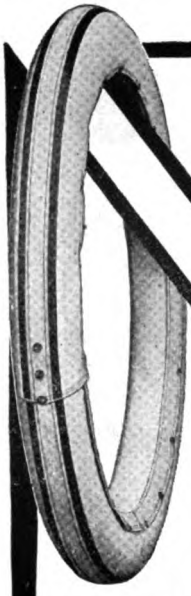
W. D. Patrick, Elba, Alabama, May 20th: Am turning out quite a nice lot of work with the Vulcanizer. Well pleased with it.

Wheeler & Wheeler, Columbus, O., June 24th: We have the machine set up and doing fine work with it.

A Vulcanizer that satisfies others is a good one to start in business with. They do good work in our shop and they will in yours.

Catalogue on request.

VANDERPOOL CO. - Springfield, Ohio



The ALLEN TIRE CASE

The tire case for spare shoes has come to stay, because it has a real reason for existence. The spare shoe must be protected from the deteriorating effects of sunlight, water and oil, and for this purpose the Allen Tire Case has demonstrated its positive value. The Allen Tire Case is made of highest quality enamel duck, in all sizes, and in all colors to suit. Prices $3.00 and up. Send for illustrated booklet.



$1.00 invested in the handy, accurate Allen Tyrometer, air pressure gauge, may likely save you many dollars in tire bills—it's the only way to **know** the air pressure in your tires.

At your dealer's, or write

The Allen Auto Specialty Co.

1926 Broadway New York — **1627 Michigan Ave.** Chicago

For Dealers Only

ADVANCE EDITION 1915 CATALOG AUTO SUPPLIES

Off the Press July 26th

—and chuck full of everything new and good including staple lines that have made good.

A Copy for Every Dealer in the Country.

Something New

A large, complete catalog of auto supplies, **exclusively for dealers,** published in mid-season and containing many new lines that you would not get ordinarily until next year.

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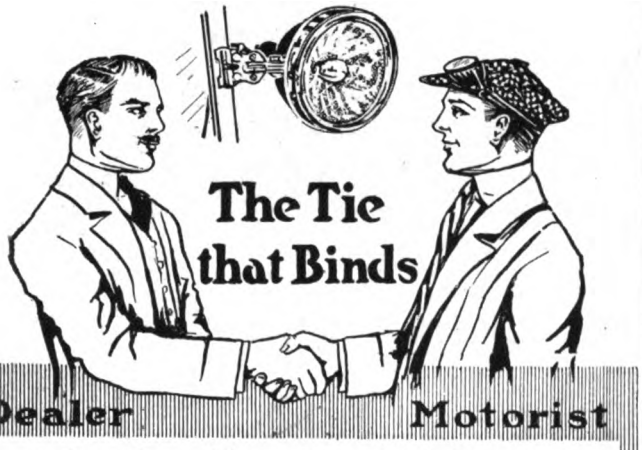
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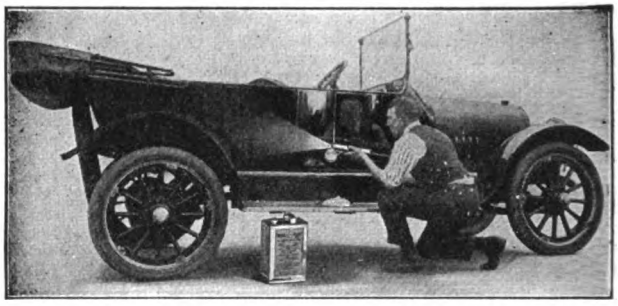
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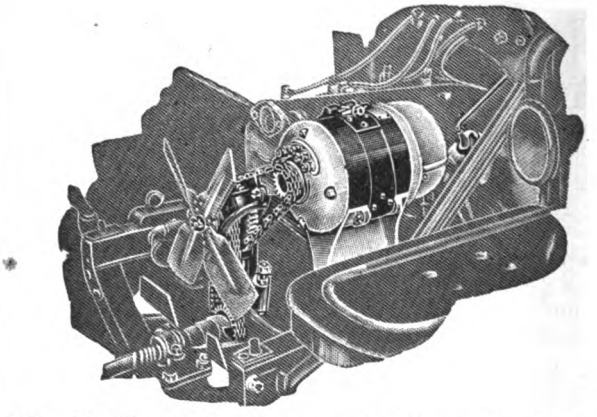


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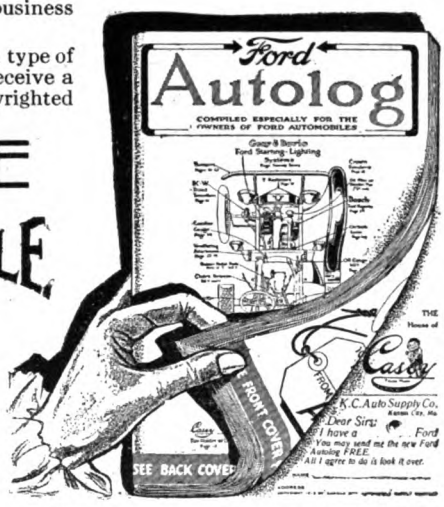
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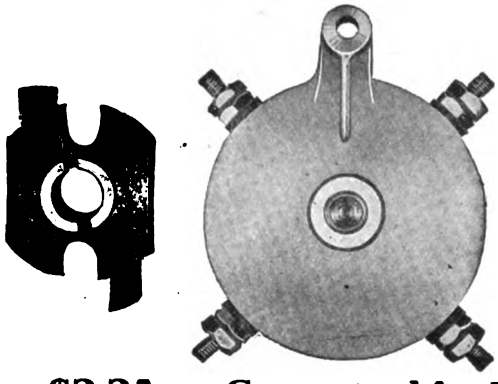
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With this Timer you get a wipe contact instead of a rolling contact. This contact is made by a low resistance composition brush which makes a positive wipe contact. Furthermore, there is a felt wiper which travels ahead of the brush, which positively keeps contacts clean at all times.

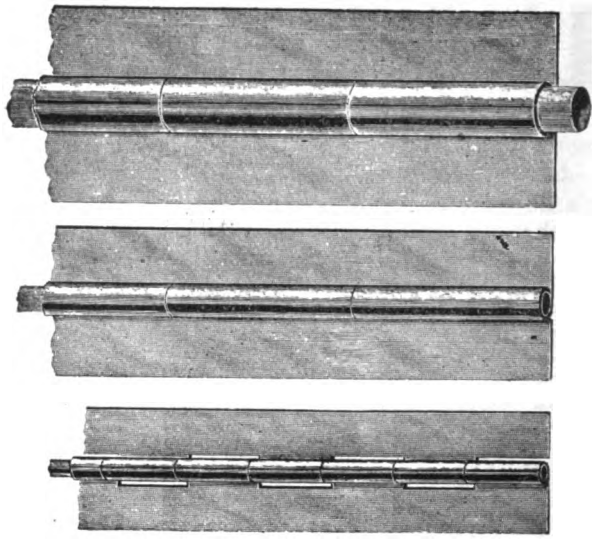
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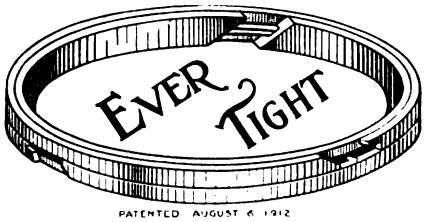
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We also make a large line of **AUTOMOBILE HARDWARE.**

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With reference to my recent trip from San Diego to New York, I beg to advise that I owe much of my success to the Ever-Tight Piston Ring, inasmuch as the car did not lack a bit of power, and the way it pulled through the sand and took the hills and mountains was certainly remarkable. The EVER-TIGHT Piston Rings truly deserve full credit for their reliability. Yours very truly,

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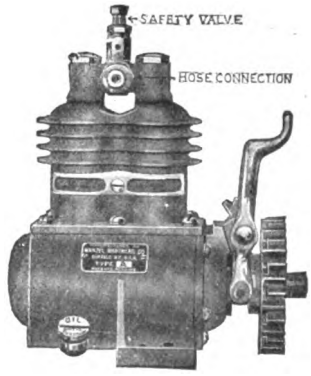
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We want jobbers and dealers in every city. Write for full particulars.

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Two-Cylinder—Engine Driven
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The best tire pump that money can buy. Can be installed by anyone. Will fill the largest tire in less than three minutes.



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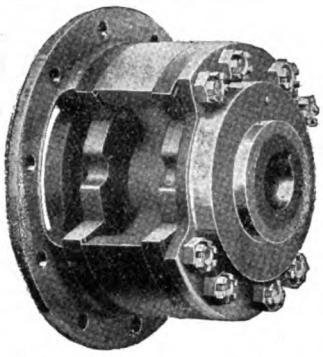
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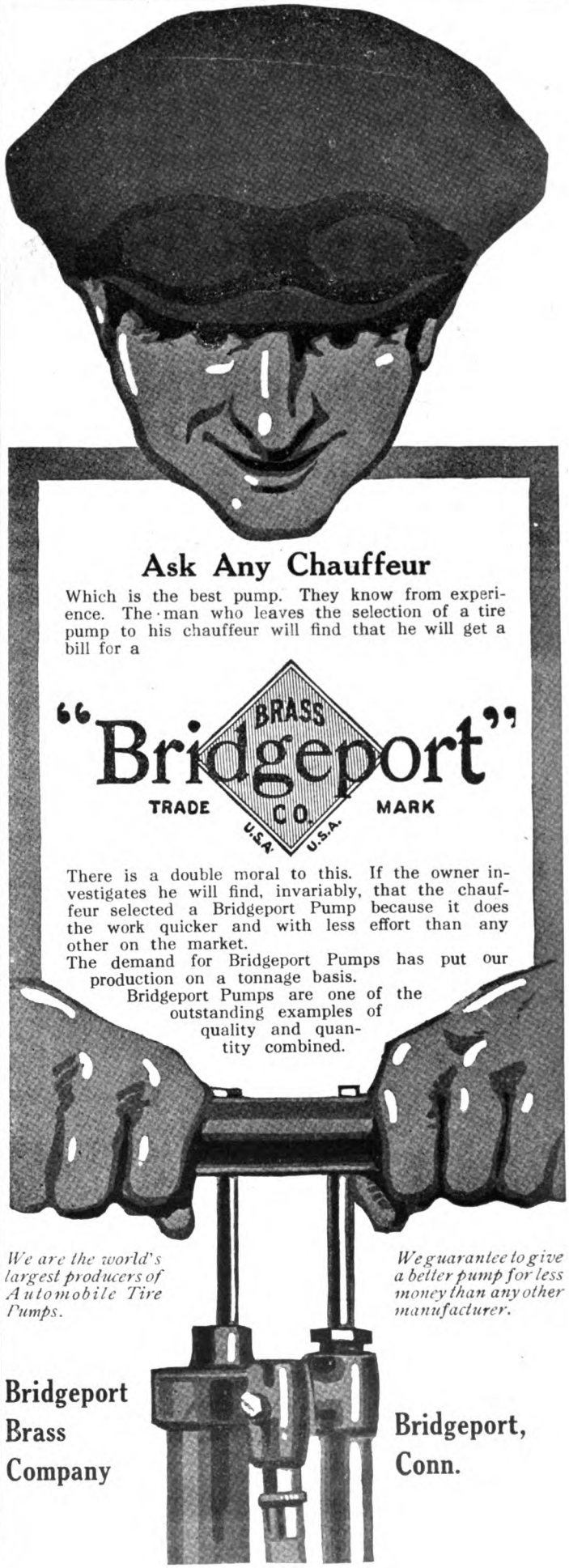
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The Woodworth Trouble-Proof Tire



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Think of the satisfaction of having a tire that is guaranteed trouble-proof; of knowing when you start out you will reach your destination without tire troubles and that you obtain this not only without extra cost but at a cheaper cost per mile than with ordinary tires.

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The Handy Traction Chain

You do not intend to use Tire Chains unless it is absolutely necessary, but when you have to use them you want chains that you can put on easily. EASYON CHAINS can be applied or removed in a moment even when stuck in the mud.

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Price $3.20 per set for tires up to and including 4 inches.
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If your dealer does not have them we will ship, parcel post, on receipt of price.
Carry a set of EASYON CHAINS and get a grip on any roads.

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Automobile Dealer AND Repairer

A JOURNAL OF PRACTICAL MOTORING

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VOL. XX, No. 1. NEW YORK, SEPTEMBER, 1915. PRICE { 10c PER COPY $1.00 PER YEAR

RADIATOR REPAIR.

Full Directions as to the Necessary Tools and Methods for a Good Job.

From J. N. Bagley, Nebraska.—Ever since the beginning of automobile repair, the radiator has been to the repairman a sort of bugbear, and nearly every repairman dreaded to undertake it, but instead, would put into it a little compound of some sort, in the hope a temporary repair could be made until someone else would make a permanent one. Occasionally we find a repairman who has the nerve to tear into the radiator, and even rebuild it. To do the ordinary repair job, no great number of tools are needed. Occasionally a radiator freezes, or meets with an accident, which makes the repair a trifle difficult, but the ordinary leaks are not at all hard to handle, if taken in time.

The tools shown in Fig. 1 are all simple and inexpensive, and with them many jobs can be done, if care is taken. At A, we have a common pot for heating the irons. At B, we have an iron with a hook bill, which comes in good play for getting on the back side of a tube to repair a crack or a seam. At C, we have a common iron, with the point tapering, one corner sharp and one round. At D, we have a pair of long-nose pliers, which come handy for pulling the tubes and handling the fins. At E, we have a pair of ordinary pliers, with a couple of strips of steel, 1 inch by 1/8 of an inch. This tool comes in good play for straightening the kinks out of the fins. All that is necessary to remove a kink

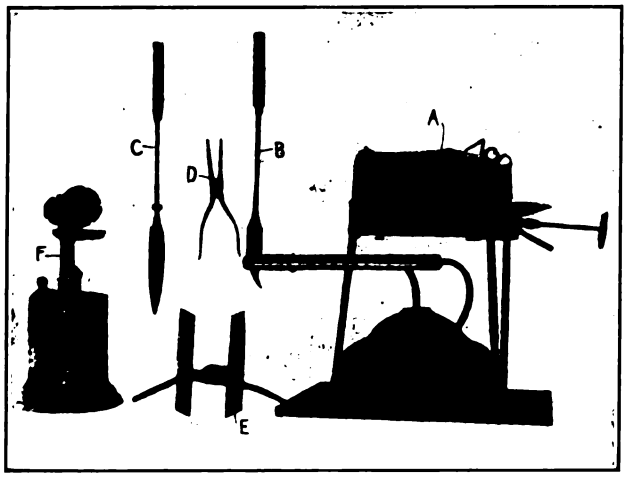


Fig. 1.

is to place the tool over the fin, grip it firm, slide it the length of the fin, and it will come out straight and true. This is not necessary, but it improves the looks of the job quite a little.

At F, we have the ordinary blow torch, which is a part of every garage equipment, and will be found useful in melting joints apart. In tearing the radiator apart, care should be taken that the parts are not pried while hot, as the brass of which they are made is very brittle when heated, and unless caution is used the crimped edge will be broken off, making it a trifle difficult to put it together to make a good-looking job. If it be necessary to remove some of the tubes, as in case of freezing, it will be advisable at first to remove both top and bottom. This is done by applying the torch flame to the parts sold-

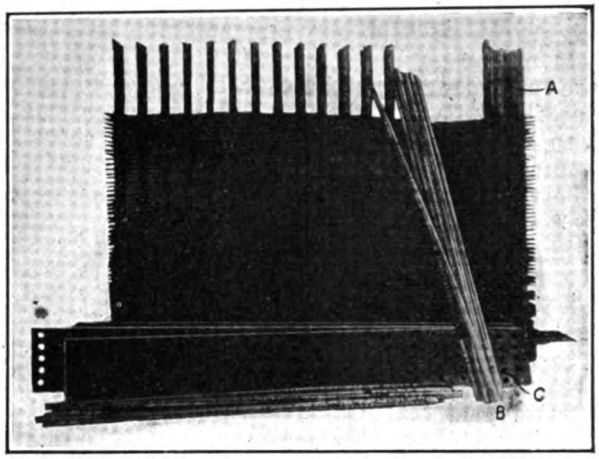


Fig. 2.

ered together, and, as fast as the solder is melted, it should be shaken out and the parts tapped apart sufficiently to prevent their being stuck together again. Continue to melt apart the joints of top and bottom, until the body of the radiator is all that is left containing the tube. In this condition, it is an easy matter to draw the defective tubes from the radiator.

To remove the tubes, take the snipe nose pliers, catch the projecting end, play the flames of the torch up and down the tube, until the solder in the fins is melted, and with a firm pull, the tube will slip out and leave the hole free and clean. Continue to pull the broken tubes until none remains.

To test the tubes for leaks, use a small rubber tube, with a nipple on the end. That will cover the end of the tube; a pump connection, such as the Acorn, will answer well. Stick a small plug into one end, and apply the water pressure to the other. If the tube leaks, it will be seen at once. No great amount of pressure is needed, as five or ten pounds will do the job very successfully. A very good plan is to have a small tank, holding about five gallons of water, under the pressure wanted, and a small valve between the hose and the tank, so that the pressure can be released at will.

Now that we have drawn all of the defective tubes, we are ready to supply the new ones. The new ones can be purchased, or they may be taken from old radiators that have been discarded; in fact, I prefer taking them from old radiators, as it saves buying, and the old radiators are of no value except for junk. And by tearing up the old radiators, one

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can learn quite a little as to construction, which may some time be quite valuable in repairing. When pulling out tubes for repair use, we should be a trifle more careful than when we pull the broken and defective tubes. Play the torch up and down the tube until it can be slipped out. While it is still hot, and the clinging solder is in a melted condition, take a cloth and stroke it the entire length to remove the little lumps of solder that cling to it, as if allowed to remain in bunches, they will interfere with placing them again in the next job.

In Fig. 2, we have a radiator body, with the defective tubes removed and ready for the perfect tubes to be placed. The tubes shown have been taken from another radiator, which is quite a saving, when everything is considered. To replace the tubes, we will begin at the row of tubes in the next row, A, which have not been removed.

Now, with the torch flame, we will play up and down the fins, at the same time keeping it far enough away, so that the fins will not be burned. As soon as the particles of solder remaining on the fins are melted, take the long-nosed pliers, grasp the tube at the end, and slide it down in place, taking pains to keep all the ends even, or nearly so. Continue until the tubes have been replaced, when we shall be ready to replace the fins, which have been taken from another radiator. The fins are very thin, and will not stand abuse, so, as we come to replace them, we shall have to take one for a pattern, and make a template of iron, one-eighth of an inch thick, to force them to place at one operation, for, if we were to place one end down and the other up, we would stretch the fin and it would not look well.

After replacing all tubes and fins, it is necessary carefully to go over the testing operation again, to see that no tubes have been placed that have leaks

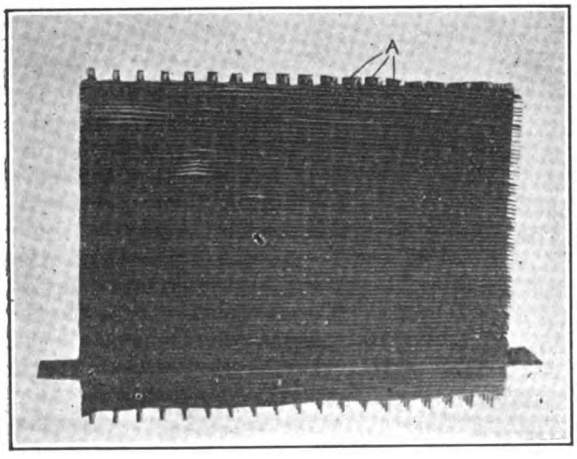


Fig. 3.

in them, or that none of them has been damaged in the operation of replacing them. Go carefully over the projecting ends, both top and bottom, and straighten up such edges as have been jammed or closed during the operation of making the changes. We are now ready to proceed with the assembling of the radiator, as all tubes are tested and placed, as well as fins, as shown in Fig. 3. Now that we have inserted all missing tubes, as shown at A, Fig. 3, we are ready to place the top on the radiator, which had been removed to allow of the tubes being replaced with new.

After setting the top back over the tubes, which has a sheet with a hole for each and every tube to stick or project through, we must, after placing it, go carefully over the end of each tube, and solder it to the plate, to prevent its leaking and running down the outside of the tube. All the ends of the tubes, as shown at A, are tinned, and will solder fast to the already tinned plate in the top with little trouble.

We have, in Fig. 3, a number of fins, which have been jammed, but these we will leave in this condition until the job has been completed, so far as repair is concerned, as in shifting it about they may become jammed and bent more or less.

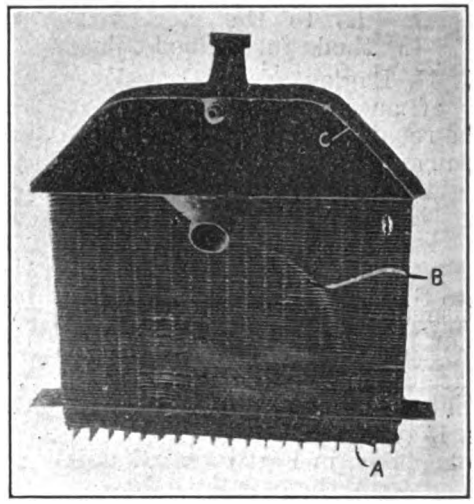


Fig. 4.

In Fig. 4, we have the top, back and seams, at C, soldered up. We also have, at B, on the back side of the radiator, some more of the jammed fins to straighten up, when the bottom is placed and the jacket is fastened in position. The seams, C, should be soldered carefully, and made as smooth as possible, as these joints are exposed, and around the front of the top no more solder should be used than is necessary to make the job tight.

Now that the top has been placed in position, the tubes projecting through the bottom should be straightened up, as in the top and bottom, placed in position, and the ends of all the tubes soldered to the plate. After all soldering is done and the bottom made secure, before placing the jacket, the radiator should be tested for leaks. This can be done by placing water in it, and using about 5 lbs. air pressure. If no leaks appear, the job is well done, and the jacket can be placed in position and made fast, using just as little solder on the front side as possible, to make the job strong. As soon as the jacket is placed in position, the tool E, in Fig. 1, can be used to straighten the fins, as already described. The fins should be spaced, and if any of them are stretched until they do not hold their spacing, a drop of solder can be used to hold it to the tube. As soon as all fins are straightened, a blacking should be used on the fins and tubes; in fact, all parts except the brass parts should be polished. For this purpose a liquid stove polish will answer well, and can be placed with a long bristle brush, as it will be impossible to get the inner tubes blackened unless a long brush is used. It is a good plan to place the radiator over a pan, and pour the blacking back and forth through the fins and over the tubes, that all may be blackened alike, for the job will not look well, no matter

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how well done, with the outer row of tubes blackened and the inner ones spotted with blacking.

Now that the blacking is done, we are ready to polish the brass parts, and finish the job, to pass the inspection of the anxious customer. With a thin instrument, scrape all solder which is not necessary, from the seams on the front of the radiator, and make them look as well as possible. To polish the brass, use a good brass polish; or in case none is at hand, a weak solution of muriatic acid and water, with a little rubbing, will answer the purpose very well.

In case the radiator has a few leaky tubes, and not enough to pay to replace with new, we can repair as shown in Fig. 5. Here we have a radiator with two or three leaky tubes, and to get to these we will separate the fins, as shown in the illustration. With the use of the hook-nose soldering iron, the tubes can be soldered successfully. After soldering and testing, the fins can be slid back to their position, and the tool used to straighten the fins up. This job should be blackened and polished, and made to look just as neat as possible, as the customer will then be satisfied with the job and will say: "I had it repaired or rebuilt by Mr. So and So;" but if it looks half finished, he will say it was patched. See the difference?

Two men in the same town or city may be repairing radiators, but the man who takes pains in the finishing touches, as we call them, is the fellow who gets the work, although the balance of the work may not be as well done as the one left roughly finished. In this day and age of the world, the outside appearance goes a long way with the average man, whether it be on a radiator or some other part of the car.

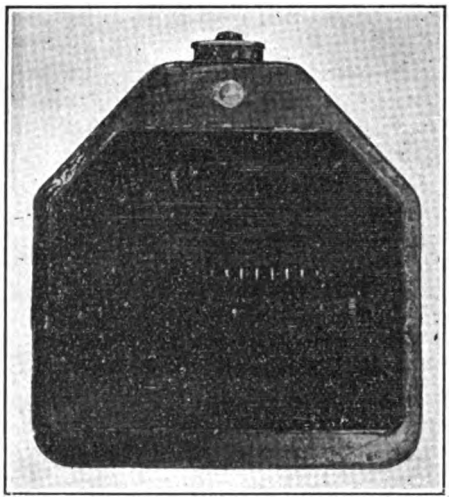


Fig. 5.

A very good soldering acid can be made by taking muriatic acid and cutting in it all the zinc that it will cut, setting away to settle. After settling, strain it through a cloth, dilute with half water, and place in a jar for use. For soldering tubes, where little solder is needed, I find the wire solder works quite a little better than the bar solder, as less is spread over the surface where it is not wanted.

A leather washer underneath the metal washer will often remedy a tendency to rattle, and will give an elastic compression that will avoid stripped threads where the bolt is rather small for its work.

DRY BATTERIES.

Their Evolution and How They Can Be Made to Give Good Service.

BY SYDNEY F. WALKER, M. E.

No. 3.

It will be understood that the quantities employed in any particular battery cell, have to be proportioned to the current the cell is intended to furnish; in other words, the larger the current that is to be supplied, particularly if it is to be supplied more or less continuously, the larger must be the quantities of the different substances, and the greater must be the care taken over the points mentioned. In all chemical work, and particularly where electricity takes a hand in the game, hydrogen gas performs its work in depriving the oxide of manganese of its oxygen, and in forming water, thereby reducing, and with a proper proportioned cell, neutralizing the back pressure set up; but the action does not cease there. When a current is passing through any battery, in which a liquid is employed, there is an actual transportation of the substances contained in the liquid, in the direction in which the current is going. In any galvanic battery, the current passes from the zinc plate to the copper or carbon plate inside the cell, and back from the copper or carbon plate to the zinc plate outside the cell. A certain confusion arises in the nomenclature of the parts of a battery from this fact. Thus, the copper or carbon plate forms the positive pole of the cell, because the useful current issues from it; but the plate itself is really the negative plate of the cell. It is the zinc plate which does the work, and which is the positive plate of the cell. Therefore within the cell, current passes from the zinc to the copper or carbon plate; and the return current enters at the zinc plate. In passing through the liquid contained in the cell, it decomposes them, certain elements such as oxygen, chlorine, an acid radical, and others, turning towards the zinc plate, the hydrogen metals, including the hypothetical metal ammonium, passing towards the carbon or copper plate. It will be remembered again, that the current which any battery will furnish, depends directly upon the pressure at the terminals of the battery, and inversely upon the electrical resistance opposed to that pressure. The resistance opposed to the pressure is made up of two quantities; that of the wires, etc., through which the current passes to do work outside of the battery, and the resistance of the liquid, the porous diaphragms, etc., inside of the battery. When porous diaphragms are used, their resistance is very high when the cell is first put into service, because the pores of the porous cell are filled with air. As the liquid penetrates and fills the pores, the resistance of the cell gradually decreases, and there is a very instructive point about the passage of the liquid in the direction in which the current is moving. If when a battery is first put into service, it is worked moderately hard for a short time, it will be found that its strength gradually increases, because the current carries the liquid into the pores of the porous cell, and gradually reduces the resistance of the cell as a whole. Later on when the secondary salts mentioned above, zinc ammonic chloride, and oxy-ammonic chloride are deposited in the pores of the porous cell, there is less and less room for the liquid to pass, and consequently the internal resistance of the cell is steadily increased, till when all the pores are filled, the cell

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will give absolutely no current. In addition to this, as the deposit of the secondary salts over the small pieces of carbon and manganese goes on, they also gradually prevent the hydrogen from attacking the oxide of manganese, and from obtaining the oxygen it requires; so that the deposit of these salts tends to lower the pressure which the cell furnishes. The writer would like to draw attention to one point here, that is of importance where batteries are worked continuously, as when furnishing the current for lamps, or for the ignition of a number of cylinders of a fast running engine; the more continuous the passage of the current through the cell is, the less chance is there for the working back of the ammonia, and for the formation of the secondary salts. This means that providing there is a sufficient surface of oxide of manganese and carbon to neutralize the hydrogen gas as it is given off, the trouble from the secondary salts should be very slight.

There is another matter in connection with the working of wet batteries that is of importance, as showing how difficult is the designing of a dry battery. It has been found that the larger the amount of liquid in which the zinc is immersed, the better does the battery work; and the reason for this is, the cleaner the zinc plate is kept, the less is the amount of "polarization," or local action upon the zinc plate itself, due to the local battery formed by the oxide of zinc, and the zinc itself. So far as the zinc itself is concerned, the ideal working condition is obtained, when the oxide and chloride of zinc are dissolved in the liquid in which the zinc is immersed, as soon as they are formed. If no deposit is allowed to remain upon the zinc plate, the resistance between the zinc and the liquid is the lowest possible; while every molecule of zinc chloride or zinc oxide that is deposited upon the zinc, tends to increase the resistance to the passage of the current from the zinc to the liquid. It may be mentioned en passant, that a dry battery is not really a dry battery; it contains liquid; but it is in such a form that the cell itself can be transported without any of the attendant troubles, slopping the liquid, etc., that are usual with wet batteries. It will also be found that all the troubles that are met with in connection with wet batteries, are reproduced in dry batteries, and with the addition that there is very little liquid present to dissolve any salts that are formed.

And now as to the quantities, etc. One point that is of the very utmost importance, and which has the most definite bearing upon the working capacity of any cell, is the quality of the oxide of manganese. As the office of the oxide of manganese is to deliver oxygen, it will easily be understood that one pound of the mineral containing 95 per cent. of pure oxide, will have a very much larger quantity of oxygen to dispose of, to deliver at the call of the hydrogen gas, than a mineral say having only 30 per cent. of pure oxide. And this is not the whole story. With a mineral containing 25 or 30 per cent. only, the remainder of the volume is made up of foreign substances, dirt practically, that are not only of no use for oxidizing the hydrogen, but that give rise to considerable trouble in the working of the battery. Further, the foreign matter itself will offer a considerable resistance to the passage of the current, and it may easily happen that there is an electrical couple between some of the foreign matter and the pure oxide of manganese, or again between some of the foreign matter and the carbon. In any case the result of employing a mineral containing a low percentage of oxide, is that the battery will only do a very small amount of work. If a very large cell is made, with a very low grade mineral, a small current may possibly be taken from that cell, for certain work; but the large cell will only perform the same work, as a cell a fraction of its own size would have done.

The porous cell of the wet Le Clanche is filled in with a mixture of oxide of manganese and crushed carbon. For ordinary bell, signal and telephone work, the usual proportions are, equal volumes of

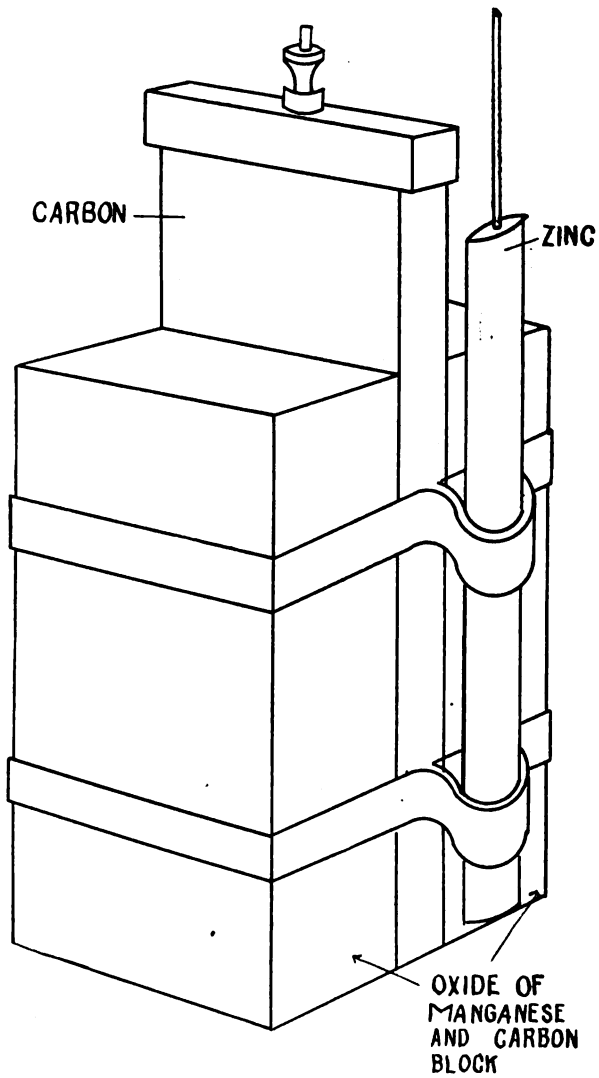


Fig. 9—Zinc, carbon and oxide of manganese and carbon for agglomerate Le Clanche cell.

oxide of manganese and of carbon, both being crushed to about the size of a pea, or of a lentil. About the size of a pea is the best, say ⅛ in. across the largest dimension. The reason for the admixture of carbon is to reduce the internal resistance of the cell. Oxide of manganese has a very much higher specific electrical resistance than carbon; and a cell therefore made up of only oxide of manganese would furnish a comparatively small current, though its staying power would be high. The resistance offered by the mass of granules of oxide of manganese would so increase the total resistance of the cell, that the current would be considerably reduced.

On the other hand, it is of the utmost importance that the proportion of carbon to oxide of manganese should not be too high. It is quite possible to reduce the resistance of the cell by increasing the propor-

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tion of carbon, and also to reduce the cost of the cell, because crushed carbon is much less expensive than oxide of manganese. But cells so made, while they would furnish a larger current than others of the same size made with the proper proportion, would have less staying power. It may be taken that the smaller the proportion of oxide of manganese to carbon, the greater would be the current furnished, and the less the staying power.

Another point is the matter of the dust of both carbon and oxide of manganese. In preparing the material for the cells, the dust from both of these should be carefully sifted out. Another point that is of importance in the Le Clanche cell, is the size of the carbon plate. The larger the carbon plate, and the larger its surface, the better is the staying power of the cell. The carbon plate itself has a certain dissipating effect upon the hydrogen and ammonia gases; and it also has a certain ability to absorb those gases in its pores. It follows therefore, that the larger the plates, for both reasons, the better is the cell. The mistake must not however be made of providing a large plate at the expense of the oxide of manganese. There is a certain proportion between the two, that manufacturers of cells have discovered in the usual painful and expensive manner.

The carbon plate is porous, and its surface is rough; the secondary salts, oxy-ammonic chloride, and zinc ammonic chloride, are carried by the action of the current when the battery is in use, through the porous diaphragm, and right up to the carbon plate, and if other cells are broken open, it will be found that the carbon plates are filled with these salts; and very often, in old worked out cells, there is quite a smooth skin of the salts on the outside of the plates. The filling up of the pores of the carbon plate, and the formation of this skin upon its surface, tends to reduce the strength of the battery in two or three ways. In the first place the salts mentioned form with the carbon plate a secondary battery of their own, tending to oppose the pressure of the primary battery; and the carbon plate filled with the salts offers a much higher resistance to the passage of the current than the same plate when it is quite new, or quite clean. Carbon plates have been used over again in a few cases, by removing them from the porous cells, and dissolving out the secondary salts. It is rather a troublesome thing to accomplish. Some years ago an eminent professor in London suggested that Le Clanche cells might be renewed by passing a reverse current through them; by connecting them to some source of current, just as an accumulator is, leading the current from the outside source to the carbon plate, and causing it to pass through the cells, in the opposite direction to that in which the normal current passes. The idea was, that electro-chemical action would dissolve out the salts from the carbon plate. The present writer tried this some years ago, and he also tried various methods of getting rid of the secondary salts in the carbon plates, but while the cells made up with the renovated carbons stood fairly well for a short time, they had only a very short life. The renovated carbons were made up with a fresh oxide of manganese and carbon, and the cells in which they were employed were exactly the same in every respect as those in which new carbons were used; but the result was expensive and disastrous.

Another important point in connection with the working of the wet cell is the solution in which the zinc and practically the carbon plate and the oxide of manganese stand. The liquid was not to be saturated with salamoniac, and directions were given that salamoniac was only to be added, and in very small quantities, when it was quite sure that what had been placed in the cell previously had all been used up. In the writer's experience, he found that the best results were obtained when there was always some salamoniac at the bottom of the jar. He found that the cell worked best with a saturated solution, and so when there was some always at the bottom of the jar, the liquid took up what it required from the store there, and maintained its saturation. An important matter that used to be in dispute in those days was as to the question of adding fresh salamoniac to a cell in which the solution was evidently exhausted, or washing out the cell, and recharging it. Where cells had been constantly in use for some time, and it was clear that the solution was thoroughly exhausted, it was sometimes best to throw away the old solution, to wash out the cells, and start afresh with a new solution. In practice, however, it was not always easy to arrange to wash out the cells. Fresh water was rarely obtainable where the cells were in use, and for practical purposes it was found in the writer's experience, that the reserve supply of salammoniac at the bottom of the cell kept everything going as well as it was possible to do. Another important feature the writer found in his experience was, that the larger the amount of solution, the better.

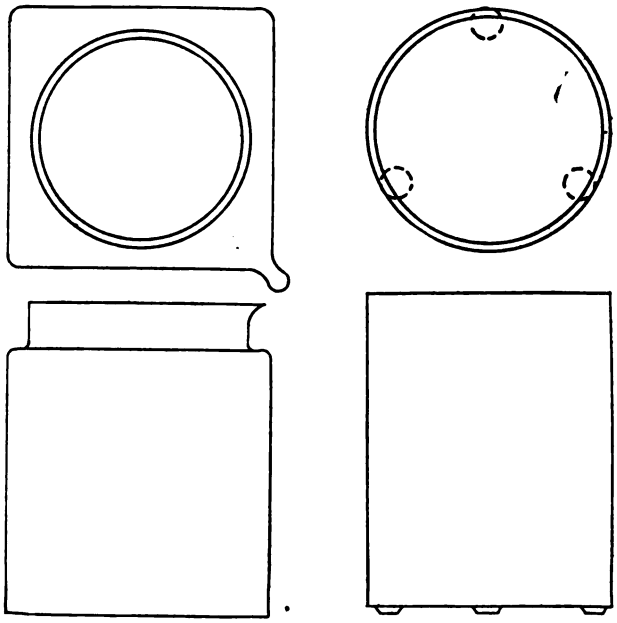


Fig. 10—Plans and elevations of two forms of jars used with Le Clanche cells; the square jar with a lip on the left and the cylindrical jar on feet on the right.

As will be understood, also, the zinc has a most important bearing upon the working of the cell. When the Le Clanche battery was first introduced, it was supposed that it was not necessary to "amalgamate" it; that is to say, to rub it over with mercury; but experience showed that zincs which were "amalgamated," stood up to their work much better than zincs which were not. In the first place it was absolutely necessary to thoroughly clean the surface of the zinc before it would take the mercury, and consequently the oil and dirt that were present upon the surface of the zinc rod, after passing through the

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machine in which they were drawn, was removed; and it was pretty clear that even a small amount of acid, providing it was only a very small amount, left upon the zinc plate, did no harm. The great object to be attained in any primary battery in which zinc is employed, is the constant presentation to the active liquid, the solution of salamoniac in the case of the Le Clanche battery, of a perfectly clean, pure surface; and this was best effected by the process of "amalgamation."

The writer has detailed the construction and work-

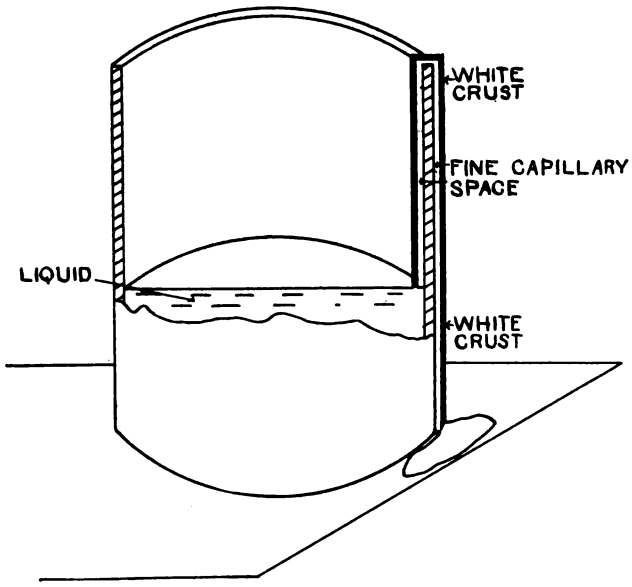


Fig. 11—Diagram showing how the white crust is formed on the inside and outside of Le Clanche cells and how it empties the jar of liquid.

ing of the wet Le Clanche cell, because it has a very exact bearing upon the working of the dry cell. He has sketched the difficulties in the way of the preparation of wet cells, in order to lead up to the question of dry cells. The same difficulties arise with dry cells, but in a very much more acute form; and in his opinion the success which has undoubtedly been obtained with dry cells, is due to the close following of the principles in connection with the wet cells. Purity of all the materials is perhaps the most important of them all. A point that should perhaps be mentioned here is, one effect of the crystallizing out of the secondary salts mentioned above, the oxyammonic chloride and the zinc ammonic chloride. They expand in crystallizing, with the result that porous cells have frequently been burst. In the old days, men who did not understand batteries, used to look upon a burst cell as a bad one. As a matter of fact, bursting the porous cell often gave it a fresh lease of life. In the development of the wet Le Clanche cell, there was another form introduced, which led indirectly up to the dry cell. What was known as the agglomerate cell was introduced, to overcome the troubles arising from the presence of the porous cell, the crystallizing out of the salts in the pores, etc. The "inside" of an "agglomerate" cell, the carbon plate, and the agglomerate blocks is shown in Fig. 9. It consists of a carbon plate similar to that which was employed with the porous cell, and two blocks of crushed carbon and manganese, that have been squeezed together by hydraulic pressure, and with the aid of some glutinous material, have been formed into blocks. The process is of course similar to that of making briquettes from coal dust for boiler firing, etc. In the agglomerate Le Clanche cell, the carbon that would have been placed in the porous cell in the form of small pieces about the size of a pea was crushed to a fine dust, and the oxide of manganese was also crushed to the same consistency. The two were thoroughly mixed together, in the same proportions as with the porous cell, viz., equal quantities by volume were mixed together; and the blocks were moulded in a die, in the same manner as bricks are made, with the aid of some glutinous substance. The blocks were held to the carbon plate by a couple of india rubber rings, and an eye was formed in each rubber ring as shown, for the zinc plate. The agglomerate cell furnished a larger current, it did more work, but it had not as long a life as a well made porous cell Le Clanche. The same trouble that has been mentioned above, in connection with the secondary salts, interfered with the working of the agglomerate cell. The secondary salts were deposited upon the surfaces of the agglomerate blocks; and the glutinous substance that was employed to hold the dust together, was attacked by the secondary salts, and as a result, the resistance of the cell as a whole increased very much, and the agglomerate blocks were rendered useless in a comparatively short time. The agglomerate blocks might be resuscitated by washing in hot water, so as to dissolve all of the secondary salts, but apparently they found their way right in between the pores of the block. At the finish, it will be remembered that the block would be porous to a certain extent, and that as the glutinous substance that was employed to hold the dust together was dissolved out, or pushed out, the secondary salts would find their way into the spaces vacated by the glutinous material. The result was that the agglomerate cell was not very satisfactory. No attempt was made to use cylinders of zinc enclosing the agglomerate blocks; it was found that the zinc rod was quite sufficient.

Problems in Constructing a Dry Cell.

The writer has gone very carefully into the details of the working of the wet cell, in order to lead up to

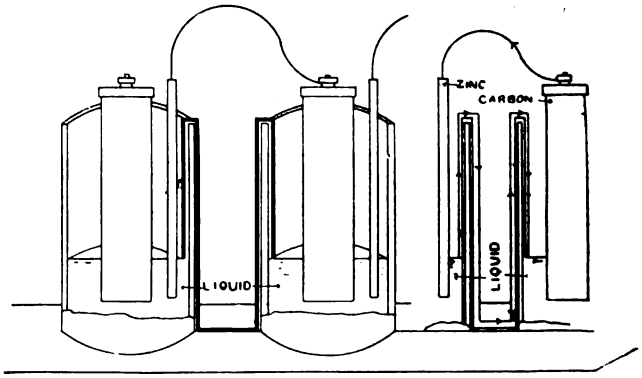


Fig. 12—Diagram showing how the white crust shown in Fig. 11 and the liquid in the capillary space inside the crust form a path for a small leakage current between adjacent cells.

the problems involved in the building of a dry cell. The first dry cell was introduced some 30 odd years ago. It was hailed with delight by a number of electrical engineers, but unfortunately it was a failure, because the inventor apparently had not had sufficient experience with the wet cell; he did not fully realize the difficulties in the way of working the wet cell, and how much they were increased in any form of dry cell. It was obvious, when the dry cell was first introduced, that it would be an enormous advantage to have only dry cells. The wet cell, though it did its work very well, providing that

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its size was sufficient for the current it was to supply, often gave a considerable amount of trouble from causes over which it was difficult to exercise control. It was necessary sometimes to place the battery in a warm atmosphere, say in an engine room underground, where radiation from the cylinders, and occasional steam leakage rendered the atmosphere warm and moist. The result was, that the battery box became moist to a certain extent, and the salammoniac in the cells evaporated, and was deposited upon the outsides of the jars. Two forms of jars were employed with Le Clanche cells, shown in Fig. 10. A square glass jar, with a recess at one corner for the zinc. This recess facilitated the connections between adjacent cells. There was also a lip to the jar as shown. The other form was a plain earthenware jar. In one form, which the writer

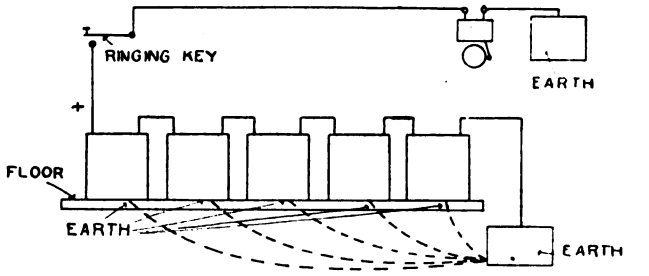


Fig. 13—Diagram showing path for leakage current from the battery to the ground.

very much favored the earthenware jar had three feet underneath the bottom, which raised it slightly above the bottom of the battery box. The feet were merely lumps of clay, roughly hemispherical, dabbed on when the jar was spun, but they had an important effect as will be seen later. The evaporation of the salammoniac solution from the inside of the cells went on continuously; it was deposited upon the outside of the jars, in the form of a white crust, the outsides of the jars being comparatively cool; and it gradually found its way to the bottom of the box. When the outer crust reached the bottom of the box, a syphon was formed by the capillary space inside of the crust on the outside of the jar, and also on the inside of the jar; and as the longer leg of the syphon was on the outside, the inside of the jar was gradually emptied. This is shown in Fig. 11. A further result that followed was, a path was formed for the current by way of the liquid salammoniac deposited upon the bottom of the battery box, and a leakage current was passing continuously from the carbon plate of one cell, to the zinc plate of the one to which it was connected in the ordinary way, as shown in Fig. 12. The quantity of current passing out from each individual cell by this leakage path was small, but as it was always flowing, it reduced the available capacity of the battery very quickly. The oxide of manganese was subject to a steady drain of oxygen, and the salammoniac in the jar was also subject to a steady drain; while the liquid in the jar was being steadily decreased. The result was that batteries in positions like the above, took a great deal of looking after. The difficulty was partly met by the three feet mentioned above, and shown in Fig. 10, upon which certain earthenware jars rested. It was also partly met by greasing the lips of the jars well, particularly the glass jars; but nothing of this kind appeared to be permanent.

Another trouble arose with wet cells in a battery box; it was often necessary to place the battery in a wet position. The box got very wet, there was the same leakage path for the current from cell to cell, as described above, and shown in Fig. 12; and there was also a leakage path for the current sent out by the whole of the battery, as shown in Fig. 13. It will be seen therefore what a boon the dry cell was looked upon, when it was first introduced. And so much was this felt, that long before it reached its present condition, it was largely used for telephone bell and signal work, notwithstanding the fact that the dry cell as a whole had to be renewed fairly frequently.

(To be continued.)

BATTERY CHARGING.

Something That Requires Care, Close Attention and Knowledge of Conditions.

The common lead accumulator, secondary or storage battery, as it is variously called, consists of two or more "formed" lead plates immersed in dilute sulphuric acid as electrolyte. Lead is chosen as the plate material, since the electrolytic action takes place readily, and, further, may be almost indefinitely repeated without serious loss of efficiency, the electrodes, lead peroxide, and spongy lead also yielding a fairly high pressure, namely, from 2 to 2.2 volts.

When accumulator plates are properly formed and the cell has received its full charge the whole of the lead sulphate that has formed on the positive plate during a discharge, as far as the acid has access, is changed into lead peroxide, while the negative plate is reduced to pure spongy lead.

On discharge the process is exactly the reverse, and the plates lose their sharp color and become flatter in appearance, the color of the plates becoming more alike, which in itself is a good indication as to the condition of the cell. It is necessary to understand that, when the positive plate appears flat and brownish in hue, lead sulphate has coated the active material and the cell has done all its available work. If allowed to remain on the plate, or if the charge be neglected, this sulphate will permanently affect the positive; it is important, then, to charge fully as often as required.

The decrease in density on discharge is due to the production of water in place of some of the acid in the electrolytic, the reverse proceeding, of course, taking place on charge.

During discharge the materials on both plates expand greatly, and if the expansion be not allowed for, the plates will break up or buckle. Such action tends to make the active material leave the plates, and in addition to the danger arising from possible short circuits, the capacity of the cell is much reduced. On this account it is necessary to design the plates in such a manner that the expansion is fully allowed for, and to prevent short circuiting by the installation of efficient separators. In addition, a "mud" space should always be provided at the bottom of the cell in order that any material leaving the plates may settle without risk of short circuiting arising.

During the charging process a gradual change takes place in the active material on the plates, the lead sulphate coating the plates, when the latter are in a discharged condition, being converted into lead peroxide on the positive, and spongy lead on the negative when the charge is complete. At this stage

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"gassing or boiling" sets in, due to the gas formed bubbling through the liquid. Charging should always be continued until the cells gas freely—until the plates have given back all the acid to the solution, and the charging current causes no further rise in the density of the electrolyte.

This condition is easily observed when the battery is being charged apart from the car, but when otherwise, the driver must in general rely upon his voltmeter indications to furnish him with particulars of the state of charge. With the engine running and the dynamo charging, 2.5 volts per cell may be taken as an indication of a complete charge, the charging current, of course, being normal. Thus, 15, 10, 7.5 volts for a 6, 4, or 3 cell set will mean that the batteries are fully charged.

A further test may be made by switching the lamps on to the battery only, when each cell should yield a pressure of approximately 2 volts. The brightness of the lamps during this test will also be an indication of the state of battery as regards charge. When the charge is complete, switch off the dynamo, but always switch on again when the lights are in use.

The maximum current rates during charge, according to one authority, should not exceed 8 amperes per square foot of positive plate area, although in exceptional cases as much as 12 amperes may be allowed. This allowance, it should be noted, refers to plate area, so that both sides of the plate must be included. It is quite a simple matter to ascertain the area of the plates if the cells are assembled in celluloid boxes, for the number of plates may readily be counted and the total area ascertained. A charging rate is recommended of about two-thirds of the maximum stated by the makers. A good rule is to allow one-tenth of the stated capacity of the battery in ampere hours, a 60 ampere-hour accumulator requiring a charging current of some 6 amperes.

To test the agreement of the various rules a 60 ampere-hour battery was examined. Six positives were found to be fitted each 15 square inches in area. The total plate area was thus equal to 90 square inches (one side only), or 180 square inches reckoning both sides of the plates. Applying the first rule and taking 8 amperes per square foot as the charging rate, the latter is found to equal 10 amperes maximum, two-thirds of which gives a normal charging current of approximately 6 amperes. The second rule gives 9 amperes maximum, or 6 amperes as the normal charging rate, while one-tenth of 60 gives 6 amperes for the third rule. Thus, to avoid unnecessary trouble, if one-tenth of the capacity be allowed the charging current will be correct.

Danger of Too Large a Current.

Too large a charging current causes rapid boiling of the electrolyte before the charge is complete, the surface of the plate being insufficient for the current to act upon. The current is wasted, simply decomposing the electrolyte and heating the liquid, while if the paste on the plates is at all loose the rapid boiling of the electrolyte and the intense agitation may cause much material to be removed. Buckling is very likely to ensue, especially if the positive be in a bad state, when loss of paste and short circuits may result.

The motorist should, therefore, examine his battery, and having ascertained the correct charging current, compare this with the value shown by the ammeter when the car is running and the cells being charged. Variations in the charging current are an indication of an unusual occurrence, and should be inquired into immediately.

A low ammeter reading is an almost sure sign of a slipping belt, while a fluctuating reading may result from a belt, which, although too slack, drives correctly at low speeds but slips at high ones. Worn brushes may result in a decreased dynamo output, and they should be examined if the belt be found in order. The setting of the brushes should, however, never be interfered with, for in many machines the setting is vital from a regulation point of view.

If badly installed, the batteries may jump about when the car is in motion, with the result that a connection may become loose or broken. This condition will be indicated by an incorrect ammeter reading or by violent fluctuations in the light intensity. The car should then be stopped and the connections attended to. If a short circuit occurs the fittings to accessories should be disconnected in turn until the trouble is located. The discharging current, as mentioned previously, is limited by the lamps, etc., installed.

The normal discharge rate should, as far as possible, equal that employed during the charging process, but, of course, in starting batteries this is an impossibility. A starting battery is subjected to very severe stresses when in service, and it should be used as sparingly as possible, and an inquiry instituted if the engine fail to start almost immediately. Cases have occurred, for example, in which the battery has been ruined through the driver neglecting to turn on the gasoline, and it is therefore, more than ever necessary to keep a watchful eye upon the installation.

For ordinary purposes a maximum discharge of two or three times the normal charging rate may be allowed. Haphazard charging and discharging frequently results in the ultimate destruction of a battery, for the cells, although receiving numerous small charges, may be continually worked in a partially discharged state and then left like this for lengthy periods. The condition of the cells should, then, be ascertained before starting out, and then, if necessary, they should be charged up fully or until the voltmeter registers 2.5 volts per cell.

Care of the Belt.

From N. G. Near, New York.—The belt used for driving the fan or pump is a thing the average automobile driver overlooks—perhaps because belts seem to be such simple things. Well, they are simple enough, but they nevertheless require a little care. Don't allow them to become dry and hard. Keep them just right in tension—not too loose and not too tight. It is all right to put a little castor oil or neatsfoot oil on once in a while to keep them properly moist and slip proof. Better still, use a regular belt preparation, but rather than use nothing at all I recommend one of the above named oils. Don't use too much.

The same applies to leather universal joints, such as are now coming into common use. Apply oils or belt treatment with a brush, let it penetrate into the leather, and the leather will thereby be toughened, enlivened, and made more durable.

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GARAGES AND REPAIR SHOPS.

Buildings, Lighting, Heating, Pits, Machines and General Arrangements.

From "Automobile Repairing Made Easy," by Victor W. Page. Published by The Norman W. Henley Publishing Co., New York.

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As an example of the amount of space allowed in a building devoted to both a garage and repair business the floor plans of a garage located in a city of forty thousand inhabitants is presented at Fig. 1. This building has a frontage of 74 feet and is 150 feet deep. The front faces a main street and is occupied by a sales room 30 feet square in one corner and a main office of the same size in the other corner. The sales room has an attractive show window across the entire front and the other departments are also liberally provided with windows. The plant has five entrances, the main entrance at the front, which is 14 feet wide, two to the repair department, one at the rear to the main garage and one in the room set apart for the demonstrating car. All entrances measure 14 feet across and are amply high to permit the entrance of the largest motor truck. The building is of brick and concrete construction and is two stories in height at the front. The second floor front is occupied by the tire repair department and the stock room. Skylights over the repair department and the garage proper furnish plenty of light from above.

The floor space on the main floor, back of the office and sales room is therefore divided into three sections. The repair department is 30 feet wide by 120 feet long and is situated to the rear of the office. The garage proper is to the rear of the show room and is 44 feet wide and 120 feet long. The repair department is sufficiently large to employ 18 men. The building is heated by steam which is furnished by a heating plant in the basement underneath the main office.

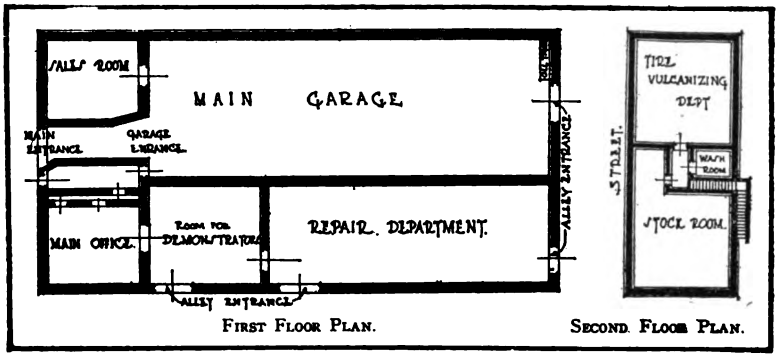


Fig. 1—General Plan.

The floor plan at Fig. 2 is that of a small building devoted exclusively to repair work and is suitable as a design for a shop to be placed at the side or rear of a garage. This building not only offers ample room to work on seven large cars but also provides for a complete machine tool equipment and ample space for office and stock room furniture. There is but one entrance, that being located at the front of the plant. The dimensions of the building and the arrangement of the various departments are so clearly shown that further comment is unnecessary. Floor plans are also given at Figs. 3 and 4 for a medium size service station, while a large departmentized repair shop is shown at Fig. 5. A medium size repair shop having a commendable arrangement of machinery and still leaving ample space for work-

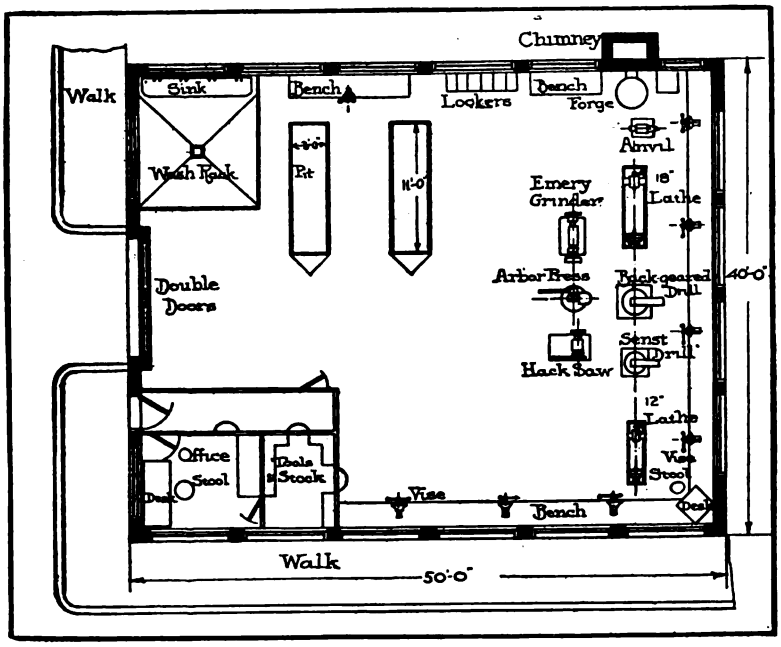


Fig. 2—For Repair Only.

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ing on a good number of cars is shown at Fig. 6. In many large cities it is necessary to use buildings having more than one story on account of the value of land in business or manufacturing sections.

A typical arrangement of a converted factory building that has worked out fairly well for a service station is shown at Fig. 5. This is operated exclu-

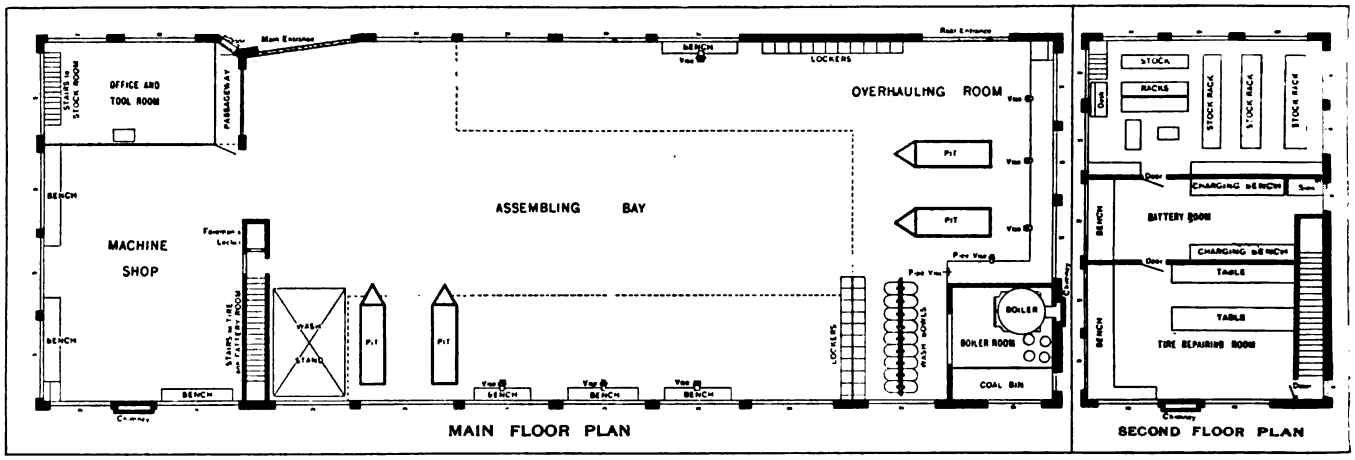


Fig. 3.

sively as a repair shop and has complete facilities. The building is of brick and while not as well adapted for motor car repairing as the specially planned structure at Fig. 6 is, it has been remodeled to good advantage. The building is 165 feet long and 36 feet wide inside the walls. Considering that the building is an old one built before the days when an intermediate room 28 feet long into which the elevator leads that is also used for assembling and overhauling purposes. The remaining small room on the ground floor which is 25 feet long is divided into three parts, one being used for an office, the others for stock and tool rooms, respectively. Nine large pits are provided on this floor and there is also ample bench room. This ground floor assembly department is devoted to work that does not involve taking down a car to any extent such as fitting various accessories, tuning or adjusting engines, repairing clutches, brakes, axles, etc., and other work that will not lay up a car for more than a few days. There is a large door at one end to permit cars to enter

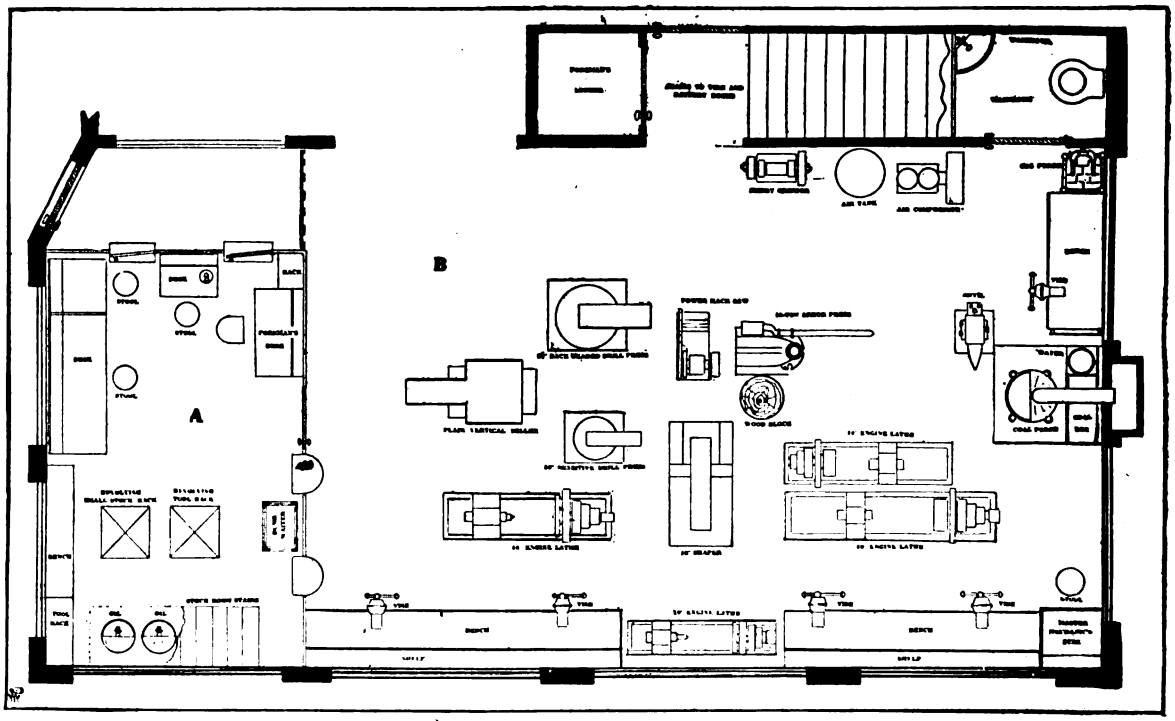


Fig. 4—For a Medium Size Station.

the provision of ample light was considered one of the essentials, it is fairly well lighted during the day as the walls are pierced with many small windows. At night a large number of Tungsten lamp groups of high candle power furnish the general illumination. Both floors are divided into three rooms, the largest 104 feet long being used as an assembling and storage room on both floors. On the lower floor there is directly from the street and a smaller entrance at the other leading directly into the passageway in front of the stock room counter over which the patrons are served. There is also a large door opening into the rear of the elevator, permitting cars to run on the elevator when this is in its lowest position either from the shop interior or from the street.

The upper floor is divided in much the same ma-

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ner as the lower one, the largest room being used for overhauling purposes, the 36 by 28 feet room is used as a machine shop while the small room over the office and stock room is used as a forge and tinsmith shop. A large skylight in the roof of the blacksmith shop gives much needed light on the anvil and bench. There are no pits in this floor but as is the case with the one below, there is an overhead track extending the full length of the room for traveling chain falls attached to the ceiling. The equipment of the machine shop is very complete and enough tools are provided so that it is possible to duplicate any part of any automobile. The equipment shown at Fig. 6 is also very complete.

Lighting and Heating.

It is apparent that any system of illumination that involves the use of a naked flame introduces an item of fire risk that is very undesirable in a building where the fumes of gasoline are present. Electricity

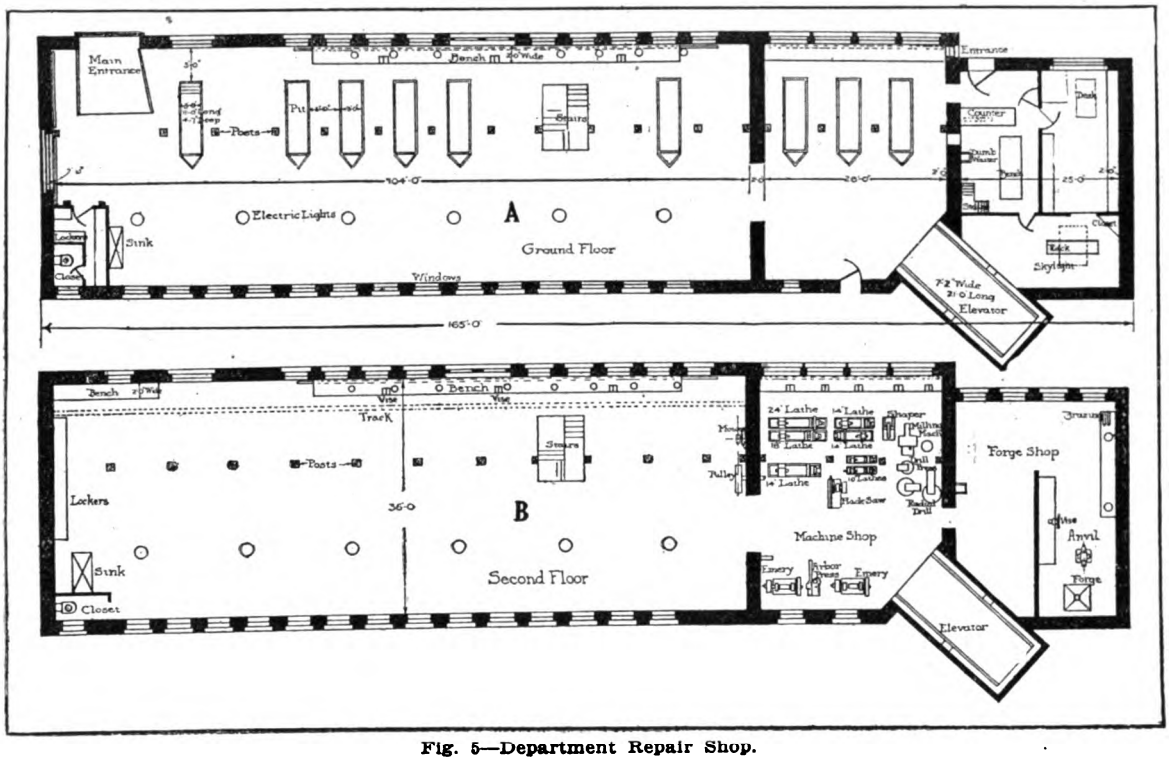


Fig. 5—Department Repair Shop.

is not only the safest method of lighting but the Tungsten lamp is the nearest to sunlight of the artificial radiants. Where electricity is available it will be poor economy to use other means of lighting, except for general illumination as by groups of incandescent mantle gas lamps. For individual lighting the electric lamp is the most suitable because it is safe, compact, clean, does not give out much heat, is portable and can be used in any position. There is no other means of artificial lighting that permits one to obtain all of these desirable requirements in combination.

It is very important that the workrooms should be kept at comfortable temperature during cold weather. About 75 degrees Fahrenheit is usually considered correct, though it may be lower than this if the men are engaged in active labor. In the machine shop where men must stand quiet much of the time, the temperature should be higher than in the erecting room, where they are constantly moving around and handling parts, this tending to keep the blood in circulation.

The back shop shown at Fig. 3, A, has two pits, three and one-half feet deep, four feet wide and 14 feet long. The edges of all pits should be sharply defined by a surrounding frame of two by four scantling, this being a guard to prevent the wheels rolling into the pit while manoeuvering a car about it.

Machinery for Small Shops.

The amount of machinery used in repair shop equipment will depend entirely upon the size of the shop and the character of the work it caters to. The requirements of the average small shop will be met very well by the use of a 16-inch screw-cutting lathe, a sensitive drill press, an emery grinder or twin wheel stand, and a forge outfit. If all classes of work are to be attempted, a small shaper will be found very useful, as much of the work that can be done on a milling machine can also be accomplished on the shaper, which is a less costly machine tool. In all repair shops, irrespective of size, the lathe is really the most important tool, and one good size machine of this kind should be included in the equipment of any repair shop worthy of the name, no matter how small. Practically all classes of machine work may be done on a lathe, as very efficient at-

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tachments may be obtained on the open market that will enable a machinist to do milling, gear cutting and grinding on this universal machine tool. Drilling may be done without changing the lathe in any way. About the largest part to be handled in any repair shop would be an engine flywheel, as far as diameter is concerned, and the longest piece would probably be a six-cylinder crankshaft or live axle. It is not necessary to install a lathe capable of swinging 24 inches in order to have a tool available for work that would be unusual, as very effective results may be obtained by using a gap bed lathe which can be purchased at but slight extra cost over that of the regular tools. The advantages of this type of lathe will be considered in proper sequence. A lathe that will swing 16 or 18 inches will be sufficiently large for most shops, though it can be supplemented by a smaller size adapted for lighter work if the funds permit. In buying lathes, especially for a small shop where the machine tool equipment is necessarily limited, it is well to remember that small work can be handled in a large lathe much easier than large work can be turned in a smaller one, and where it is imperative that but one tool be purchased it will be the best economy to install a substantial machine. If a drill press is included, one that will swing 24 inches has been found large enough to handle nearly all parts of automobiles. The sensitive drill press is used for drilling small holes, and should have a capacity so that it will handle drills up to half inch diameter, at least.

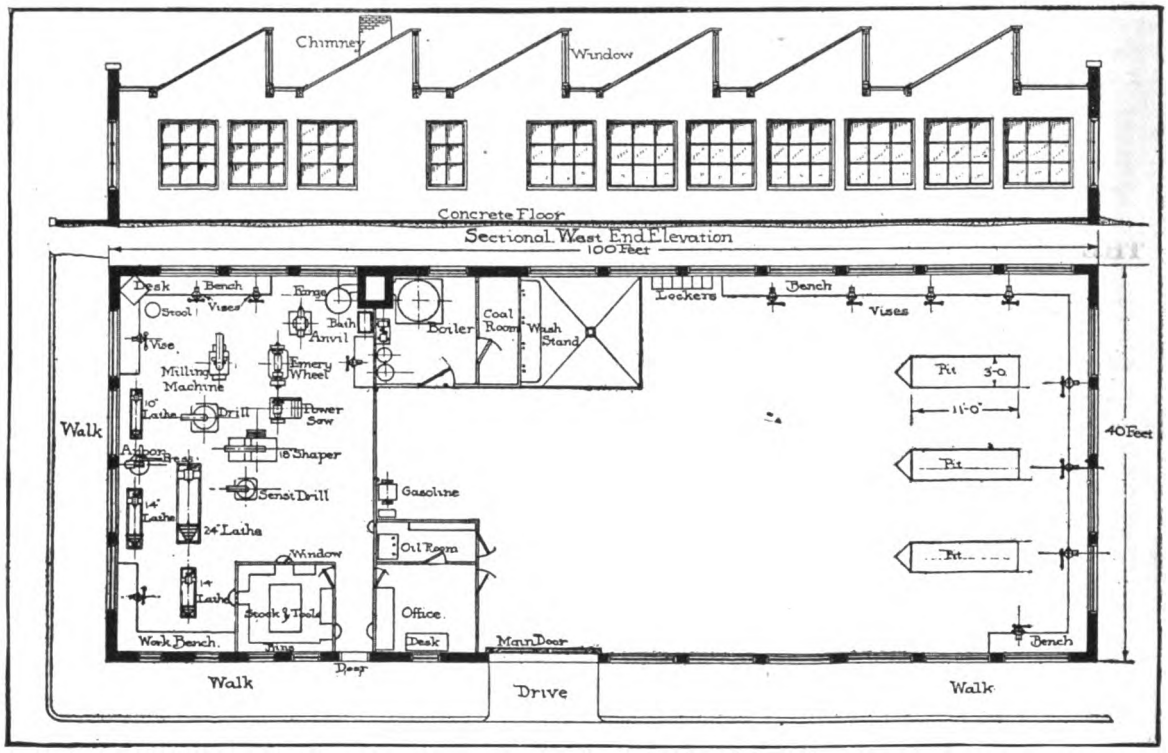


Fig. 6—Another Arrangement.

Equipment for Complete Repair Shop.

An unusually complete machine tool outfit is shown in the shop plans at Figs. 5 and 6. With an equipment of this nature all kinds of repair work may be accomplished economically and, in fact, the outfits shown are sufficiently complete so competent mechanics will be able to build an automobile without outside assistance. As the lathe is the king of machine tools, the major portion of the equipment consists of these useful machines. Seven lathes are provided, two being ten inch swing, three fourteen inch swing, one eighteen inch swing and one capable of handling work up to twenty-four inches in diameter. A universal milling machine upon which a wide variety of work may be done is a useful adjunct to the lathe. A milling machine can finish flat or irregular surfaces which a lathe cannot do unless fitted with a milling attachment. It will make Woodruff keyways or straight splines, it can cut gears, cams and do a variety of other work that cannot be done on the simple lathe.

A small shaper having about sixteen inches stroke is also useful, because it will do much of the work done on a milling machine and require simpler tools. While a milling machine has a greater range of work and will do it more economically than the shaper, the latter can be used to advantage in many cases where the cost of milling cutters would be much more than that of making the shaper tool and doing the work besides. Both milling machine and shaper should be provided, if possible. Three drilling machines are provided, one a sensitive drill for light work, the intermediate size, a back-geared drill press, and for extremely large work, such as drilling frames, boring cylinders, axle housings, etc., a radial drill is very useful, as it will handle any part of a motor car irrespective of size. A power hack saw, two emery grinders, one used for roughing purposes and the other for tool grinding, and an arbor press complete the equipment of this machine shop.

Power for the Shop.

Just as electric current is superior for lighting, it also has many advantages as a source of power. The electric motor is an ideal power generator, because it is clean, efficient, economical, easily started and stopped, compact and capable of standing considerable overload. It makes possible individual motor equipment of machine tools in large shops and can be used very effectively for driving the line shafting

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of the smallest establishment, because it can be suspended out of the way on a platform hung from the ceiling or in the smaller sizes placed on a shelf attached to the wall or some convenient post. Where electric current is not available and where it is not profitable to install a generating plant, the gasoline engine is an economical method of supplying power. The marked advantage of electric current is that it may be employed not only for lighting, but for operating various portable drills, polishing machinery, air compressors, etc., and it also has a great advantage of generating current that can be used for charging storage batteries, which are now included in the equipment of all up-to-date automobiles, as a source of current for the electric self-starter and lighting system. Where electric current is not available from a municipal central station, a garage or repair shop of any size will find it more economical to install a generating plant and make its own electricity for lighting and power than to use a steam or gasoline engine which can only furnish power and then depend upon kerosene and acetylene lamps for lighting, which naturally increase the fire risk.

THE LEGAL SITUATION.

Things Car Owners and Drivers Are Advised to Read and Remember.

Liability of Owner for Defective Brake.—In an action by a chauffeur against his employer for injuries caused by the defective condition of the brakes of the car, it appeared that the chauffeur knew of this defective condition and that the car was liable to start itself at least two weeks before the accident occurred. The plaintiff was an experienced chauffeur. He had been engaged in operating automobiles for upwards of five years and the one in question for three or four weeks. If he knew that the brakes were defective, and by reason of that fact the machine liable to start of its own motion, then it was for the jury to say whether, by placing himself in the position which he did immediately prior to the time he was injured, he did not assume that risk. The jury found for the plaintiff. It was held on appeal that the verdict was against the evidence, and it was set aside. There was held to be another reason against recovery. In a populous city like New York, where thousands of people are in the street at all hours of the day and night, an experienced chauffeur, unless it be under exceptional circumstances, who runs an automobile in the street, knowing that the brake is defective, ought to be estopped, as matter of law, from recovering damages against his employer for injuries occasioned by such defect.—Marks v. Stolts, New York Appellate Division, 150 N. Y. Supp. 952.

Injury by Collision—Evidence of Intoxication.—Under New York Highway Law, Sec. 290, Subd. 3, the operation of a motor vehicle by a person in an intoxicated condition is expressly prohibited, and an innocent person injured in consequence of a violation of this statute is entitled to his civil remedy for damages. In an action for damages to a taxicab from the defendant's negligent operation of his automobile, it was held that evidence that the defendant was intoxicated, was admissible, and improperly excluded, especially when a disinterested witness testified that the defendant's car was going in a wabbly condition at 55 or 60 miles an hour, that the taxicab was struck by the automobile when near the center of a street which it was crossing, and that no collision would have occurred if the defendant had directed his car to the rear of the taxicab.—Lincoln Taxicab Co. v. Smith, 150 N. Y. Supp. 86.

Validity of Village Speed Ordinances.—By section 288 of the New York Highway Law, village authorities are authorized to limit the rate of speed to 15 miles an hour only upon the public highways, and then only by passing the requisite ordinance, posting signs conspicuously on each main public highway and filing a copy of the ordinance with the Secretary of State. In proceedings for running an automobile through a village at the rate of 23 miles an hour, in violation of an ordinance limiting the speed of vehicles "within the corporate limits of the village" to 15 miles an hour, it was held that the ordinance was unauthorized. The village had no legal right to so ordain. It was limited by the statute in this regard to supervision of the public highways.—People v. Bell, 148 N. Y. Supp. 753.

New York City Regulations.—In a prosecution for driving a motor vehicle at a speed exceeding 20 miles an hour in violation of the ordinance which took effect June 1, 1913, (Section 1), regulating speed in the city of New York, the question arose: What is the lawful rate of speed at which an automobile may be operated in the City of New York in a developed and closely built up section? The court construed the section as follows: It is permissible to operate any motor vehicle in a developed and closely built up section of the city, at a rate of speed not exceeding 15 miles an hour. If any of the vehicles are operated at a rate of speed exceeding 15 miles, and up to 20 miles an hour, such rate of speed shall constitute prima facie evidence of a rate of speed and manner of driving prohibited by the section. If a person is arrested upon a charge of driving any of the vehicles at a rate of speed exceeding 15 miles and up to 20 miles an hour, such person may rebut the presumption that he drove the vehicle recklessly or negligently or in a manner so as to endanger the life or limb or property of any person. Upon establishing this, the defendant should be discharged. The driving of any motor vehicle at a rate of speed exceeding 20 miles an hour constitutes a violation of the section, and a person charged therewith cannot be permitted to offer any evidence or rebut the presumption of reckless or negligent driving. As the defendant operated the automobile at a rate of 23 miles an hour in a developed and closely built up section of the city, he was held properly convicted of a violation of the section of the act.—People v. Reutiman, 148 N. Y. Supp. 612.

Violation of Speed Ordinance.—Section 2 of the New York City ordinance in relation to speed regulations contains two separate and distinct offenses, one forbidding the turning of corners at a greater rate of speed than four miles an hour, the other forbidding the passing or approaching within eight feet of a street car which has stopped to take on or discharge a passenger. It is held that the owner of an automobile, while riding therein, is responsible for the act of his chauffeur in committing either of these offenses.—People v. Colon, 148 N. Y. Supp. 321.

Liens of Conditional Vendor and Repairer.—In the sale of an automobile the purchase price was represented by two notes, each of which contained a stipulation retaining title in the machine to secure

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payment. Possession passed to the vendee. Repairs being necessary, they were made by a mechanic, who returned the car to the vendee. On default in payment of the first maturing note the vendor repossessed himself of the machine by replevin. The mechanic brought suit against the vendor to enforce a mechanic's lien on the car for the repair bill, under the Tennessee Mechanic's Lien Statute of 1909. It was held that the mechanic's lien was subordinate to the lien of the conditional seller of the car. The court reasoned that placing the car in the possession of the conditional buyer should not be considered as a consent in advance to the subordination of the title retained for security for the payment of the purchase money, and the seller's intent, if any, to permit repairs and a consequent lien attaching to his interest should be manifested in the note contract, as otherwise the reservation of title would be deprived of a considerable element of marketability.—Shaw v. Webb, Tennessee Supreme Court, 174 S. W. 273.

Signalling Automobile Driver to Stop.—Missouri Motor Vehicles Law of 1911, Sec. 8, requires the driver of a motor vehicle on signal by raising the hand from a person riding, leading, or driving a horse or horses or other animals to bring such motor vehicle immediately to a stop. The driver of a team of mules attached to a wagon called to an automobile driver to stop, and a person riding in the wagon raised his hand as a signal to the automobile driver, but the driver of the mules did not signal by raising his hand. In proceedings for violation of the section it was held that the automobile driver was not criminally liable for failure to stop. The statute does not require the automobile driver to observe signals from persons other than the driver of the animals, and the statute, being both penal and criminal, must be strictly construed in favor of the defendant and cannot be extended beyond the plain meaning of the language employed.—State v. Wilson (Mo.) 174 S. W. 163.

Insurance Against Theft.—In an action on a policy insuring against loss of an automobile by theft by persons "other than those in the employment, service, or household of the assured," it is held that the insured had the burden of showing that the automobile was stolen by some one not in his employment.—Kansas City Regal Auto Co. v. Old Colony Ins. Co. (Mo.) 174 S. W. 153.

Fiscal Court's Authority to Purchase Automobile.—The Kentucky Court of Appeals holds that the fiscal court of a county which without authority purchased an automobile could not keep the machine and at the same time sue to recover the money paid therefor, but was bound to offer to return the machine to the seller. The court having no authority to purchase an automobile, it was held it had no authority to hire one, and could not become liable for the depreciation in value of one purchased without authority or the value of its use while retained by the court.—Miles Auto Co. v. Dorsey, (Ky.), 174 S. W. 502.

Representations in Sale of Automobile.—The buyer of an automobile is justified in relying on the seller's representations as to those parts not open to inspection, but not for misrepresentations as to visible defects. Under this rule he would be entitled to rely on representations that the machine had been rebuilt.—Morbrose Inv. Co. v. Flick, (Mo.), 174 S. W. 189.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1663 Faulty Ignition.

From W. E. Morain, Illinois.—I have a 1912, 4-cylinder Mitchel automobile, with low tension Splitdorf magneto and coil, 1913 make, and a Stromberg carburetor. I crank on the batteries and when I switch from the batteries to the magneto the engine will stop every time unless it is running at high speed.

Reply.—As the same make-and-break mechanism, secondary distributor, coil and wiring are used in both battery and magneto systems, it is plainly evident that the magneto does not generate sufficient current except at high speed. Such a condition is most likely due to a partial demagnetization of the magnets, or it may be that the primary magneto wiring is defective. In any case the proper proceedure would be to send the magneto to your nearest Splitdorf Service Station, which is in Chicago at 64 E. 14th street.

1664 A Hum in the Gearing

From Frank Revelette, Jr., Kansas.—I have a B 37 Buick touring car, 1914 model, that has a hum in some part of the gearing and I haven't been able to locate where it is. I wrote the Buick people about it and they told me it was in the differential; that it was a sprung gear and that I would have to get new gears, but I took the rear axle out and found nothing wrong with it. I keep it well oiled. Then I was told that it was my cam gears and that they were dry but I have kept plenty of oil in them, and to satisfy myself I put a lot of heavy grease in them, but it made no difference. It sounds in the transmission, but I have kept plenty of oil in it. In fact, I have had it running out around the propeller shaft so I know that it has plenty. Now, the way it does it is like this: When I drive about 8 miles an hour in high with the regular load you can hear it, then if I speed up it goes away until I get to 18 miles, then you can hear it again, then faster than that you cannot hear it. It is a growling hum and sounds only when in high gear. Now if you can give me any idea what the trouble is, it will be greatly appreciated, and I thank you in advance.

Reply.—We think that the Buick people were probably right when they told you that the trouble was probably due to the fact that the gearing had been sprung in some way. As to the humming or grinding occurring at a low speed and then going

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away until you drive at a very much higher speed, this is due to what is termed by scientific people as "mechanical resonance." If you have a water faucet in your house you may notice that when you turn the water on slowly there is likely to be a vibration, which will stop when you turn it on more and perhaps resume when it is turned on full force. This is because the vibrations are what may be termed in unison when at a certain speed and are not in unison when it is at another speed. We do not suppose there is any way to stop this noise, except to first find exactly where it is and then purchase new gearing in place of it.

1665 **Magneto Trouble.**

From H. P., Delaware.—I have a 1913 touring car, which has been run about 6,000 miles. It has a Schebler carburetor and a Remy low tension magneto and coil. About four months ago it began to miss while running on the magneto at low speed and finally at times would not run at all on the magneto, but would run on the batteries. A repairman told me that the magneto was dead and would have to be remagnetized. I sent it and the coil to Philadelphia and they overhauled it and it has worked all right until a few days ago when the same trouble started again. At real high speed it will run on the magneto all right, but when I come to a road that is heavy enough to make it slow down, it starts to miss on all cylinders. If I switch onto the batteries then it runs all right in any speed. The cylinders have been taken off and new piston rings put on the pistons. Also the valves have been ground. If I come to a hard pull while running on the magneto and it misses, I can switch over even at slow speed and it takes right hold. If you can throw any light on my trouble it will be greatly appreciated.

Reply.—The magneto with which your car is equipped, is not a low tension magneto, for the coil is only used when ignition is by battery. Magnetos generate a stronger current at high than low speed. The strength of the current is also affected by the strength of the magneto magnets. In your case the magnets themselves may be at fault or there may be some other reason why they should become partially demagnetized twice within two years. There are two courses for you to pursue, have the magnets themselves renewed or have them remagnetized once more. In either case we advise that you carefully observe the ground wire leading from the switch to the chassis frame, and see that a good metallic contact is at both ends. The reason for this is that when the switch is in the "Off" and "Bat" positions the magneto circuit should be closed absolutely. Batteries sometimes discharge through the magneto wirings and if the flow is opposite to the direction of flow during the charging of the magnets, the result is trouble.

1666 **Coil Trouble.**

From Walter N. Lawson, Indiana.—Is there any way to tell if a coil is broken down without the use of another coil?

Reply.—You can usually tell when the condenser is perforated by the fused condition of the contact points. The only simple and absolutely sure way would be to try a known good coil, or try the coil in another car.

1667 **Moisture for the Fuel.**

From A. A. Kitto, Colorado.—I am interested in an attachment for carrying a quantity of moisture into a carburetor. It acts as a humidifier. What is your opinion regarding the introduction of moisture into a carburetor? Any space you can give to this question will be appreciated.

Reply.—If the moisture can be regulated to the speeds and needs of the engine it is an aid to carburetion. Its action is to make the pressure in the cylinders following the explosions more elastic, by slightly lengthening the period of greatest effectiveness. As a result moisture in the explosive charge should be more effective at low and intermediate, than at high speed. Large stationary gas and oil engines practically always employ water or watery vapor in order to be able to properly advance the spark without accompanying pounding. You will find that moisture taken in at the carburetor, however, will soon clog the air opening with frost, hence the custom to introduce it as near the cylinder inlet valve chests as possible, to prevent the formation of ice particles.

1668 **A Slipping Clutch.**

From A. U. Burque, New Hampshire.—The multiple disc clutch in my Hupmobile car slips once in a while, more so when warm. The clutch is in the case with the transmission and runs in medium oil—the same oil is used for the transmission gears and clutch. Will you tell me how to remedy the trouble?

Reply.—If your clutch has been giving good service for some time and now suddenly develops a tendency to slip, we would advise you first to drain out the old oil and inject a pint or more of kerosene. Then close the opening to the casing, start the engine, and with the gear in neutral position operate the clutch pedal so the kerosene may be thoroughly distributed. This will rinse and clear the mechanism of old and sticky oil. Then flush it out once or twice more with fresh clean kerosene and refill to the required amount with clean oil. If the clutch still slips after this treatment, an increased spring tension may be required. This can be obtained by tightening all the adjusting studs evenly all around.

The proper way to adjust this type of a clutch is to screw the studs back, or release them entirely from contact with the plate or mechanism inside the clutch casing, then screw them up carefully with the fingers until each one just begins to touch, which is indicated by an increase in the effort required. When each screw or stud has been turned up so that it just begins to touch the plate or mechanism against which it bears on the inside of the clutch casing, then with the aid of a wrench, give each screw a half turn forward and repeat, until the proper adjustment is obtained. The object is to give each screw the same number of turns and at the same time have them all move forward at practically the same time. If one was to give one screw five or six full turns and proceed to the next one and give it the same number of turns, etc., until all had been turned up the same amount, the same results might be obtained; but it is most probable that the job would not be successful, and perhaps damage to the internal mechanism of the clutch would ensue as a result of possible binding or cracking. On the other hand, if the studs were screwed alternately, little

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by little, but no care given to the relative number of turns given to each, the springs or operating mechanism would most likely bear unevenly upon the disks, and a jerky, grabbing or slipping action of the clutch would result.

1669 **Irregular Running.**

From E. E. Shockey, Missouri.—I have a Studebaker "25" which is giving me a great deal of trouble. It will missfire and run very irregular on all speeds, first one time then another. It will run good for a short distance on high then all at once will commence missing, then perhaps will run O. K. again. It does not seem to miss on the same cylinder all the time. It also seems to do better with the throttle partly open than when the throttle is fully open. The engine runs very irregular at high speed but seems to pull very well at times. Have been having this trouble since last December, have had the engine overhauled, doing no good, new spark plugs, doing no good, and rewired entirely. Car has been run only 6,000 miles and has had excellent care at all times. An excellent garage man has been doing all the work on this car and he fails to find the trouble.

Do you think this trouble could be in the carburetor? Am pretty sure that it is not in the ignition system. It is a Holly.

Reply.—We are sorry for your sake as well as for other owners of Studebaker "25" cars, that you did not give us sufficient information from which to be able to give you desired help and assistance. There are many possible causes for erratic running, such as you describe, both in ignition and carburetion. If with the throttle fully open the result is too much gasoline, it looks as if the Holly carburetor needed attention, adjusting, or replacement. Late models of Holly carburetors are decided improvements over earlier models. You give us absolutely no information as to which model you have on your car. If, as you say, your garage man is unable to locate the cause of the trouble, and he is up-to-the-minute in mtaters pertaining to carburetion, he should be able to do better than we could be expected to do at "long range" with practically no information. It should not take a practical automobile mechanic very long to derive the cause of the trouble, providing he has the car before him.

1670 **Two Good Ignition Systems.**

From R. P. Johnson, New York.—Which would you advise me to install on my Ford car, an Atwater-Kent or Bosch magneto, to replace my present flywheel magneto?

Reply.—You are taking us at a serious disadvantage when you propound this query. We advise you, if you have not already done so, to write to the Atwater-Kent Machine Works and to the Bosch Magneto Co., for full information of their respective ignition systems for use on Ford cars, and incidentally tell each that you are undecided as to which will give you the better service. In both instances you will doubtless receive instructive replies and possibly they may be of value in determining for yourself.

1671 **B. Was to Blame.**

From G. S. C., New Jersey.—Will you kindly give me in your next issue your opinion of the following accident, which occurred recently on Asphalt State Road, in New Jersey?

A. & B. were traveling in the same direction, A. in the lead. In front, at their right, on the side of the road, a car was standing, headed in the direction they were traveling. As A. came almost alongside the standing car, the driver started up, and turned toward the middle of the road, thus partially cutting A. off. A car was rapidly approaching in the opposite direction. A., seeing that he had no room to pass, jammed on his brakes, bringing his car to a dead stop, thus avoiding a head-on collision; but he had no sooner stopped than he was run into by B., whose left headlight struck A's left rear tire. B's headlight was broken, while A's tire burst, and his left spring was bent, besides other minor damage done. B. said that A. was at fault, because he should have raised his hand, to indicate his intention to stop. A. said it was an emergency, and that his hands were fully occupied in bringing his car to a stop. A. claims that B. was at fault, because he was following too closely. B. stated that he was traveling 8 feet behind A's car, and could not see the car coming in the opposite direction. They both agree that they were traveling 12 to 15 miles per hour. Now, A's top was down, and A. thinks that B. had no right to be traveling as close behind him as 8 feet, or where he could not see what was coming in the opposite direction. Can one traveling 12 to 15 miles per hour be sure of stopping in time, in an emergency, if he is traveling only 8 feet behind another car?

Reply.—B. was clearly to blame. He should not have kept his car within 8 feet of A.'s car. The rule to not follow a car too closely is one of the oldest of automobile road rules. The car in front may be obliged to stop suddenly and without giving a signal, and if so an accident is almost certain to follow. In the case stated, the front car was obliged to quickly stop without giving a signal, and the inevitable accident followed. In traveling not more than 12 to 15 miles an hour, cars should not get nearer than 16 or 20 feet from one another, and in case of more rapid speed the distance should be greater. Although it is not so stated, we trust that before attempting to pass the car standing at the side of the road, A. sounded his signal. If he did not, he has no grievance against the driver of the car which cut him off and caused him to stop suddenly.

1672 **Passing Trolley Cars.**

From R. E. Schuman, Delaware.—To settle a controversy will you please decide the following: A claims that it is a violation of the penal code in some States to pass a trolley car being operated on a double track by turning to the left, while B claims that a trolley car should be passed by turning to the left just the same as one would pass a heavily loaded truck or other vehicle. They have agreed to abide by your decision.

Reply.—When one comes to consider that heavily loaded and slow moving vehicles are supposed to keep close to the right hand curb in thickly congested streets and that all vehicles except trolley cars, are supposed to turn to the right to pass to their left, it is not surprising that this controversy should arise. In some cities, New York for one, the police officers permit passing trolley cars by turning to the right, when it can be safely done, while in

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others even if it were possible to do so without endangering anyone, the offender would be fined if apprehended. The proper side to pass a trolley car, if there is room, is by turning to the right, providing the track is not a single one, of course.

1673 **Regrinding Cylinders.**

From V. E. Harrington, New Jersey.—What would you call a fair charge for regrinding the four cylinders and fitting new pistons and rings of my 1913 Overland?

Reply.—Firstly, we do not want you or any other car owner to use this reply as a whip over any garage owner or car repairer, for we know by experience that it would be well nigh impossible, under present service conditions, to set a fixed or empirical rule over such repairs. There are manufacturers and others fitted up to grind cylinders and fit pistons and rings, who advertise to do this work for $10 per cylinder. This price, however, could not be approximated even, unless one were equipped to do the work and it would not include disassembling and reassembly.

1674 **Advancing the Timing.**

From M. L. Mead, Maine.—I have a Cadillac 8-cylinder car, new last February, which has been run between 12,000 and 13,000 miles. I have removed the thermostat governing the water circulation, advanced the timing one tooth of the timing gear, and never since have I had any trouble from overheating. The contact points in the ignition timing head are about burned out. 1.—What I would like to know is why advancing the timing tends to keep the motor cool? 2.—How long should a set of contact points last? 3.—How can I increase their life of usefulness?

Reply.—1.—You did not so state, although it is probably true, that advancing the timing by changing the meshing of the timing gears has decreased your fuel consumption, and probably has slightly reduced the power of the engine at ordinary running speed, and increased it slightly at high speed. The effect of opening the exhaust earlier would be to get rid of the hot products of combustion before so much of the heat could be radiated through the cylinder walls to the circulating water. We believe the regular setting of the valves in this model to be in the line of maximum efficiency at ordinary, rather than abnormally high engine speed. 2.—Very hard to calculate the expected length of life of usefulness. The manufacturers of the car should be able to approximate the total mileage. You should remember that for every mile traveled on high gear it takes approximately 10,000 revolutions of the engine, or 40,000 sparks. 3.—You could probably increase their life by occasionally changing the direction of flow of current. If the current flow is always in the same direction it carries the metal of the contact points from one to the other. In the operation of marine engines using make-and-break ignition changing the direction of flow is sometimes made every day in order to keep contact points from burning out too rapidly. Of course the waste from this source is much reduced if the condenser is ample to prevent arcing at the contacts as the circuit is broken.

1675 **Two and Four Cycles.**

From Byron Weems, Saskatchewan.—As a matter of fact I desire to know whether a two-cycle motor car engine ever has been manufactured which would show a range of speed from low to high to compare favorably with four-stroke design, and if not, why not?

Reply.—We do not believe that any two-stroke-cycle automobile motor ever has or will be produced, which can compare favorably, in fuel economy or speed flexibility, with ordinary four-stroke-cycle engines of modern design and construction. In the two-stroke-cycle the four separate functions, viz.: intake compression power, and exhaust are performed practically entirely during four separate reciprocations or strokes of each piston, which allows of a much longer interval of time to overcome the inertia of the explosive mixture and burned gases. In the two-stroke-cycle engine the exhaust opens very much earlier in order to get any power at all at even 1,200 r.p.m., and much earlier if the speed were to approximate four-stroke-cycle construction. The earlier the exhaust port has to be uncovered the greater the waste, not only of power but of escaping explosive mixture at low speed. Answering the stereotyped inquiry as to why so many motor boats are successfully powered with two-stroke-cycle engines, we have to say that owing to their low engine speed, low rated power, and designed to run always at the same maximum power developing speed, heavy fuel consumption at normal running is not so noticeable as it would be were variable speeds necessary, as in a motor car.

1676 **As to the Number of Cylinders.**

From P. B. Hughes, Vermont.—1.—Which should give the more power; a four-cylinder engine 4-inch bore and 5-inch stroke or a six-cylinder 3½-inch bore and 4½-inch stroke? 2.—Which would make the best hill climber? 3.—What ought the fuel consumption be in each case, how many miles to the gallon?

Reply.—1.—The piston displacement of the four-cylinder would be 1,005.31+ cu. in., while that of the six-cylinder would be 808.17+. At the same number of revolutions the four-cylinder should be the more powerful, while at the same piston speed the power should be nearer the same. If the six-cylinder is designed to run at a higher piston speed, as most of them are, it should be more powerful 2.—There are so many other conditions than power to consider that we would not even hazard a guess. 3.—For reasons explained in our reply to the previous query, we could not tell without much more definite information.

1677 **Economy in Fuel.**

From R. O. Sylvester, Pennsylvania.—Why is a six-cylinder engine more economical than a four? I understand that the twin-six is said to be the most economical in fuel.

Reply.—It is fully recognized by automobile engineers that a properly designed four-cylinder engine is more economical in fuel consumption than a six-cylinder of the same developed horsepower at the same speed. Adding to the number of cylinders does not make for fuel economy, but for greater speed, flexibility—good pulling power at lower speed than possible in four-cylinder design and construction—and at the expense of heavier fuel consumption. And while on this subject it might be well to add that the fuel consumption per horsepower delivered will be

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very much higher as the engine speed is reduced. From this it should not be inferred that it would take more fuel to drive a car at half speed over a certain distance, but it would take more than one half as much fuel.

1678 ... His Car Stops.

From F. E. Kneeland, Iowa.—I have a Marion car and it not only starts hard, but it will then run but a short time when it will stop. The carburetor must then be primed again before it will start. Will you tell me something about setting the fuel nozzle of the carburetor? I am afraid I don't understand it.

Reply.—Inexperienced car owners have trouble with the carburetor, and a very common one is that

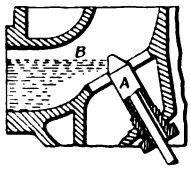


Fig. 1.

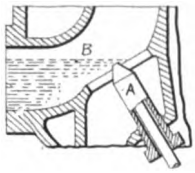


Fig. 2.

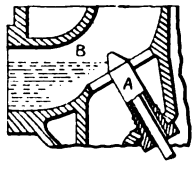


Fig. 3.

of the jet nozzle, so that the fuel level, as fixed by the float, does not result in the proper flowing of fuel into the vaporizing chamber. Drivers who have trouble with this are frequently puzzled by it, because they assume that the carburetor is properly adjusted before leaving the factory. If spray nozzle A, shown in Figs. 1, 2 and 3, has been lowered, the engine will not get enough fuel at slow speeds and on hills. By raising this slightly, the engine will be able to suck up more fuel. In making this change be careful not to lower the nozzle too much at once, as the effect then is just as bad, the carburetor flooding at the slightest provocation. A better way is to lower the nozzle a very slight amount. Try this level out and when you are satisfied that it is not right, alter the level once more. The experience that you will get during the process will be worth all the time taken up in the series of successive adjustments. In referring to the illustration, Fig. 1 shows the correct location of nozzle, A, Fig. 2 shows the nozzle too low. This will cause the engine to flood. Fig. 3 shows the nozzle too high. Located at this height, the engine will starve. At B, is shown the level of the gasoline. Better send to the manufacturer of your carburetor for a book of instructions.

1679 **Short Circuits, Starter and Electric Troubles.**

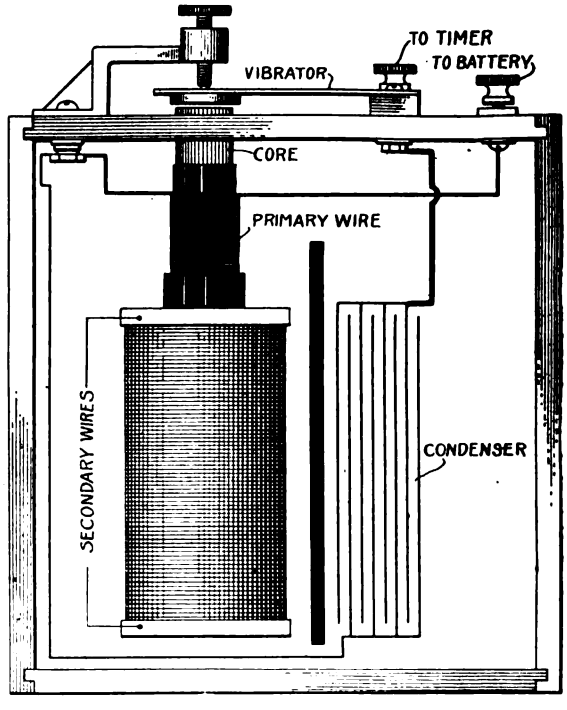
From George E. Wakeman, Indiana.—I noted your answer to L. C. H., Vermont, in the August number. I am in a Buick service department and will say that his quotation from the book of directions should be changed to "remove the wing plug on the right side of the motor and put in one-fourth ounce of oil." This correction was given us by the Buick Co. Also, his short circuit, I think, was in his horn. I have had two instances which were similar. One of them where the horn started to blow and would not stop, and the other like his. I found that an insulation on a bolt inside the horn was punctured, which grounded the circuit. In the first instance the ground was where the current left after forcing through the horn, and in the second, where the current came to the horn. The cracking noise indicates a ground at all times. I do not see how the trouble could be in the timer, unless the resistance unit was shorted out, in which case he would soon have trouble with burned Tungsten breaker points.

If R. E. Ingalls, Washington, will cut the brass strip connecting the large terminal and the small terminal on his Delco Junior starter generator and connect his ammeter to the two terminals, he will get both charge and discharge. The brass strip may be on the inside. If so, he will have to remove the armature to cut it.

I would like to hear from Foresman & Lowe, Indiana, as to how they came out with the electric trouble on the Maxwell specials.

1680 **Motorcycle Ignition.**

From Gustave Berke, Wisconsin.—I should like your advice about a motorcycle which I have been trying to fix up. I am not a professional repairer, having a small shop on my farm. I do a little automobile work. This motorcycle when it came to me was missing badly, so I took out the spark plug and wired the threaded part to the frame of the machine and worked the circuit breaker by hand. It would miss about half the time. I tried other plugs; result the same. I also tested the battery. It gave 18 to 20 amperes with no short circuit. I filed the points on the breaker but all this did no good, so I put on one of the coils of my Ford car and it would spark every time. I told the owner his coil was bad; perhaps the condenser was broken down, but as I am no expert I advised him to take the machine to town and have it examined, which he did. The motor-



Showing Coil and Condenser.

cycle man told him he never heard of a condenser and that coils never broke down. He adjusted the carburetor, but it missed the next day again. The machine is an Excelsior, single belt drive, Schebler carburetor, single spark ignition, three cell battery. Sometimes it runs pretty good and again very bad. Should not the spark plug spark outside of the cylinder when it is connected to wire, the threaded part touching the frame?

Reply.—It seems to us that you have shown good

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judgment and a proper understanding of the troubles of the motorcycle. The spark plug should certainly give a spark outside the cylinder when connected as you describe. If the motorcycle man you refer to says he never heard of a condenser, and that coils never break down, he certainly shows a lack of knowledge concerning ignition devices. We illustrate herewith a jump spark coil, showing the location of the condenser. An ordinary dry cell, used in automobile work, gives a current of from 20 to 30 amperes. It may be possible that your battery has run down, but there is still greater probability that something may be the matter with the coil. For ignition, after an engine has started to run, the dry cell is a rather poor generator to use, for it becomes exhausted in a short time. If we are not mistaken, most motorcycles now use magentos instead of batteries. Judging from your letter, and what you say you have done, a new battery and coil would put the machine in good running order. Many users of motorcycles do not put the attention they should to straining gasoline before using it. We have found, in several instances, dirt in the gasoline has made motorcycles run badly or intermittently. The gauze strainer in the carburetor becomes choked, or there is some obstruction in the supply pipe, and, of course good carburetion cannot be expected in these cases.

1681 A Creaking Sound.

From G. L. Gardner, Long Island, New York.—Will you kindly tell me how to overcome a very annoying creaking sound which is in the right rear wheel of my car, which is a Cadillac, 1914 model. I have changed the rims (tires) but that doesn't seem to stop the noise.

Reply.—Before prescribing the remedy it is first best to locate the cause of the creak, whether in the brakes or axle bearing. Cadillac cars have good, serviceable brakes and when applying them they are liable to squeak pretty loudly. If the trouble is in the brakes, due to dragging of the shoes against the drums, a little adjustment should remedy the difficulty, but if in the axle bearing it means disassembly of the entire axle, and immediate attention at that. It is possible that you have allowed it to remain in this condition so long already that a heavy expense will result.

1682 Ford Car Ignition.

From John A. Brown, Rhode Island.—I would like some advice now about my Ford car, which I bought new last October (1914). I was foolish enough to believe some acquaintances who said the Bosch magneto would make my car run better and more economically and I had a Bosch put on, and it is gear driven. I was not aware when the Bosch was put on that there was no provision for connection of batteries. Now what I would like to know is the best way to make my engine start easier, as it is very much heavier to start than with the Ford system of the K. W. coils and the flywheel magneto. I am told that batteries will be necessary to start on easily. I have a Sanbow mechanical starter on my Ford car and sometimes I pull the starter 8 to 12 times to start the engine, and sometimes I have to prime each cylinder to get started at all, but after the engine is hot it usually starts on the first or second pull of the cord. Now, because my Metz car starts very easily on the Bosch magneto, I can't see how or why the Bosch should be so different on the Ford, if it is properly installed. Please let me know how many and what kind of batteries I had better get to start on. Also if I must have some kind of a coil to go with the kick switch from the batteries to the magneto. The Bosch magnetos may be and probably are all right, but I would be better satisfied if I had the old Ford system back again, because of the starting only, as after starting the Bosch seems to work perfectly satisfactorily.

Now a word about those Metz cars which bob up in your magazine now and then, and claiming to climb hills like a Ford car. I will say if you have any friends who are after a car, say Ford quick for any hard and continuous work.

Reply.—The Bosch Magneto Co. manufacture a good many different models, some like yours not adapted for use with batteries while others of the so-called "dual" type permit the use of either battery or magneto current at will. The flywheel magneto which is standard equipment with all Ford cars, owing to the fact that it necessarily employs a vibrating coil, is not so efficient as an ignition system, either battery or magneto, which gives an absolutely correctly timed single spark, rather than a succession of sparks such as produced by a vibrating coil. We know that many Ford cars are starting easily and giving excellent service and satisfaction to their owners following a change to Bosch ignition, and we feel quite positive that your magneto is not properly installed, or that there is some cause other than suspected for your car not starting as easily as before. Your plug electrodes may not be close enough together, or your make-and-break contacts may not be properly adjusted. It is also possible that the timing may be a little later than will give best results. This is a case where it would be absolutely necessary to view conditions before making a positive diagnosis of the trouble. Of course there is always a possibility that hard starting may not be due to imperfect or faulty ignition. On your Metz car the Bosch magneto has fixed timing, unless adjustable timing has been added to it since it left the maker's hands. You cannot add battery ignition to your present Bosch equipment, nor will Ford design and construction permit two separate and independent systems, battery and magneto. We note what you say about Metz cars. This is not unusual, for we hear Metz owners talk just as extravaganetly of their own cars.

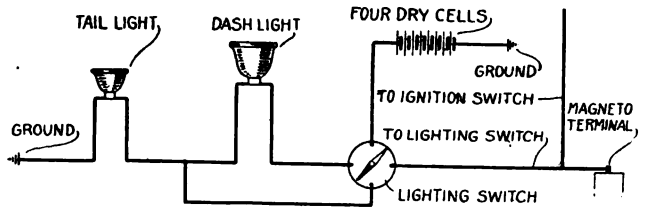
1683 Connecting a Magneto for Wiring.

From W. T. K., Connecticut.—1—I would like information as to how to connect up with a Ford magneto a tail light with a dash light, so the dash will indicate when the tail light is out, and yet have the tail light so it could be lighted with dry cells with dash lights out of connection. What voltage could be used with these lamps so 4 dry cells would work the tail light and how to arrange so it would not burn out with the magneto, or cannot it be done practically at all? 2—I find by disconnecting the secondary wire from the spark plug and placing within ⅛ of an inch of the engine, using 4 dry cells over 20 amperes, I get a flash spark on first turning on the switch of the master vibrator, but there is no spark without bringing the contact nearer the engine though buzzer continues. Does this indicate that something is wrong with my coil? What length of space should the spark jump in the open with 4

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dry cells and 20 amperes? 3—Have the courts ever passed on the question whether a car standing on the side of the road, not moving (with or without the engine running) is a car being operated on the public highway, and must carry lights as such?

Reply.—1—Wire the tail light and dash tell-tale lamp in series, running a wire from the wire which is connected to the terminal on top the magneto to one terminal of the dash light, another from the other dash light terminal to the tail light, grounding the other tail light terminal to the metal frame. These two lamps should be six-volt. You can use a two-way switch in this circuit. The diagram illustrates the method of wiring. The switch you will note has four contacts. When the circuit from the magneto is completed the two lamps are in series and when the battery circuit is completed only the tail light is in the circuit. You can use a small double throw double pole knife switch if preferred. In this case you would connect the two terminals of the hinge base and use the two pairs of end terminals for completing the two circuits. The circuit



Wiring Diagram.

would then be completed through one knife blade and then through the other, one pair of terminals being used for magneto and the other for battery. 2—It is much safer to try out coils, etc., by means of a spark plug, than by holding the end of a wire at a distance from the engine. It is this curiosity to see how far a spark will jump, which ruins probably 90 per cent. of all spark coils. If the plug gap is too wide you probably know from experience that ignition will not be regular. Just consider what the result would be with plug gaps ⅛ inch wide. You should not expect what you know to be impossible. 3—A car standing at the curb must display a red tail light only. If the engine is running it must show at least one white head or side light, provided only it is one hour past sundown or one hour before sunrise. Plenty decisions back this contention.

1684 Ignition Trouble.

From J. F. R., Indiana.—1—I am having some trouble with my magneto, which is a Remy on an Overland car, of 1911 model. I crank and start the motor on the battery very readily, but if I advance the spark more than 1/3 the quadrant, the motor will stop, unless I run it long enough to warm the motor up good. Then when out on the road I can gradually work the spark up to the highest point O. K. I think the trouble is probably in the platinum points. I don't know much about the mechanism or wiring of the magneto, but find considerable oil around and over the magneto at times, when I wipe it off. Also on the distributing wires from the magneto to the spark plugs, and on one of the distributing wires, just where it passes over the head of the cylinder, I find an exudation of melted rubber, oozing out and dropping down on the cylinder head, which is probably ½ an inch distant. Is this causing any trouble? I have shown this to several garagemen but none of them considered it serious enough to replace this distributor, or recommend a new one put on. 2—The car smokes considerably when the motor is running idle, and just upon starting out for the first half mile or so. I always fill the crank case till the pet cocks drip a little, using Polarine, medium, and sometimes Peerless, medium, but it sometimes carbonizes the cylinders quite badly at times, although I have only had the carbon removed four times from the cylinders and valves, and the car has run 8,000 miles. 3—What brands of oil do you consider give the least carbon trouble and what weight or grade is best for a car that has run so long as this? Would the heavy be all right for summer and winter running? 4—Feeling that my worst trouble is in the platinum points, will you please describe in full detail the Remy magneto of the 1911 make—just how to dissemble and clean the oil and dirt from the inner side and also how to replace new platinum points, and how many points or platinum springs there are to replace with new ones.

Reply.—1—This type of magneto is of the induction type, the windings themselves being stationary and the alternations occurring twice as often during a complete rotation of the rotor as are produced in models using wire around armatures. We believe you should send the magneto to the nearest service station of the Remy Electric Co. for overhaul and probably remagnetization of the partly demagnetized magnets. The manufacturers will probably be able to furnish you with a leather cover which will protect it from the flying oil which a motor five years old is more likely to throw than would one of later design and construction. The dropping of melted insulation could not cause the trouble you are experiencing. 2—Smoking is to be expected from a car which has been run as many seasons as has this one. You will probably only be able to remedy this by regrinding the cylinders and fitting new pistons and rings. Possibly a thicker oil might help a little. 3—We, for well recognized reasons, could not recommend any brands of oil. Old motors seem to give best results with heavy oil in hot and medium in cold weather. 4—Our reply to your query No. 1 should be sufficient reply to this one. There are so very few motors at present using 1911 Remy magnetos that such a description of a very old type of ignition device could hardly interest even a small portion of our readers. The manufacturers, provided they have descriptive advertising matter on hand, would no doubt be glad to send it to you for the asking. We would have to send to them for it in order to reproduce it in these columns.

1685 Engine Information.

From W. J. Tremaine, Ohio.—Will you please explain through the Automobile Dealer and Repairer (1) wherein a high and low speed gasoline engine differs. I have a motor built by the Ferro Machine and Foundry Company, L shape and 4 cylinder 3½ inch bore, 5 inch stroke, ⅝ inch offset crank, valves 1¾ inch in diameter. 2—Is this a high or low speed motor? 3—About what would be the maximum speed of this motor? 4—What horsepower should it develop at that speed? 5—What compression in pounds should each cylinder have? 6—Would you consider this engine large enough for a roadster weighing 2,600 without passengers?

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Reply.—1—A high speed engine is designed with greater care in the matter of the weight and balance of the reciprocating parts, pistons, rings, wrist pins and connecting rods, as well as valve area, lift, timing, etc. 2—High speed. 3—Probably greatest horsepower would be reached at from 2,000 to 2,500 r. p. m. The manufacturers should be better qualified to tell you at what speed maximum horsepower could be expected. 4—Probably 30 to 40 h. p. We believe the manufacturers are prepared to guarantee the horsepower. 5—Probably about 75 pounds gauge. 6—It should be if geared sufficiently high.

1686 **The Engine Misses.**

From F. C. Bauer, Ohio.—I have a 1912 Little car in my shop for repair. The car has been to three other garages without success. The engine skips and it has done that for the last year and a half. I installed a new high tension magneto, K. W., model J, and tried the engine out but it still skipped just the same. I tried all manner of adjustments on the carburetor. The magneto is timed all right too, but no results. Then I installed model L 2 Rayfield carburetor, with hot air stove, and tried all manner of adjustments but without success. Will you give me some light on the matter that will solve the difficulty.

Reply.—You have proven to our complete satisfaction and probably to your own that the fault is not in the ignition, and probably not in in the carburetor. If your pistons, rings and cylinders are in proper condition, and your valve stem guides are not so badly worn that air leaks at these points are not present, your engine should run without missing explosions. You must remember that the engine is nearly four years old and a good many motor car engines of this age are of little real use except they are thoroughly overhauled and worn parts renewed.

1687 **Carbon Cleaning and Piston Rings.**

From F. Conklin, New Jersey.—My car seems to have lost power. 1—Which is the most effective method of cleaning cylinders of carbon? 2—Is oxy-acetylene good, or which method can you recommend? 3—Also, which piston rings give the best satisfaction?

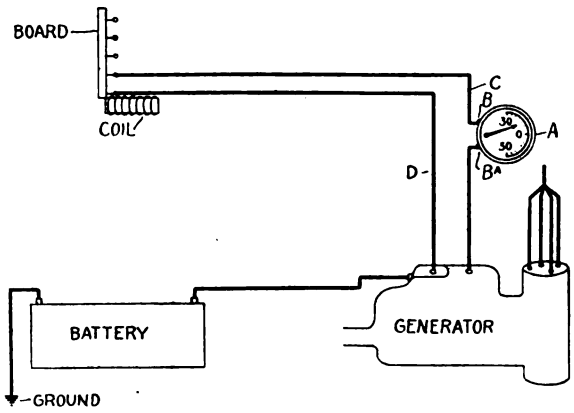
Reply.—1—Burning with oxygen is probably the most popular method at present in use. It should be done by one who really knows how. 2—Oxy-acetylene should not be used. 3—Those piston rings give the best satisfaction which permit the least loss of compression and which cause the least loss of power from friction. Manufacturers of motor car engines are not all agreed as to the best type, model or pattern. We are frank to tell you that we ourselves do not know. It would be poor policy for us to express any preference for any motor car, part or accessory, or to in any way or manner seek to influence the use or sale of any such particular device or improvement when there may be others equally as good and equally entitled to favor.

Good But Others Pass It.

From George S. Boucher, Virginia.—I notice an article in your June issue from M. A. Foster, of Arizona, concerning the hill climbing qualities of the Ford car. Also his statement, that the larger and heavier cars cannot climb with the Ford. If this means only in Arizona, I have no comment whatever to make, but this certainly will not apply to the mountains of Maryland, Pennsylvania, West Virginia and Virginia. I really feel as though I am lowering the standard of some of the larger cars, in comparing them with the Ford. I am aware of the fact that Mr. Foster can pass some cars on hills, while there are many others that can very easily pass him. I am the owner and driver of a car, which, however, is not a "Metz," which I have driven 8,000 miles, and the only Ford cars that have ever passed me were going in the opposite direction, and on a recent trip between Baltimore, Md., and Uniontown, Pa., and return, I passed a great number of Ford cars. While these hills are not 20 per cent., some of them are steep and very long, and I passed dozens of Ford cars, grinding up these hills on low gears, while I was going at my leisure, from 20 to 30 miles per hour, and my six-cylinder motor was playing a tune that had the "Sextette from Lucia" beat to a frazzle. The Ford car is absolutely all right in its place, which necessarily means behind the modern six-cylinder valve in the head-motor, and, on the square, Mr. Foster, you are not "motor wise," if you are not aware of this fact.

For R. E. Ingalls, Washington.

From J. N. Bagley, Nebraska.—As Mr. Ingalls is having trouble with the ammeter burning up when



Wiring Diagram.

the starter is used on his car, I will try and make plain the method of installing the ammeter so that it will not burn up or be affected by the excessive amperage of the battery. In the drawing we have the generator wired to the battery, and also the wire leading to the board from the generator. Mr. Ingalls has evidently connected the instrument into the wrong line, or line D, as it were, for in this instance when the starter switch was closed, the entire output of the battery would flow through it. Now by placing it in line C, as shown at A, it will only show the amperes given off by the generator and the amperes consumed by the lights, etc., when in use. If after installing the instrument it should show charge when it should discharge it is an indication that the wire connected at B should be taken to BA and vice versa.

Clutches and Coils.

From E. H. Metcalf, New Hampshire.—In inquiry No. 1638, concerning the Flanders 20, section 2 concerns the clutch grabbing. This trouble has been mentioned before in the department, but has not been fully explained. The gradual engagement in this car is secured by a piece of rubber tube put around the clutch under the leather. The ends of it

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are held by being passed through holes where they can be seen between the arms of the clutch spider. When the rubber has lost its elasticity, the clutch grabs. If Mr. Pierce wants to fix it, he will have to remove his clutch facing, and put in a new piece of tube. The facing can be used again, although after treating long enough with machine oil, it would not be worth while.

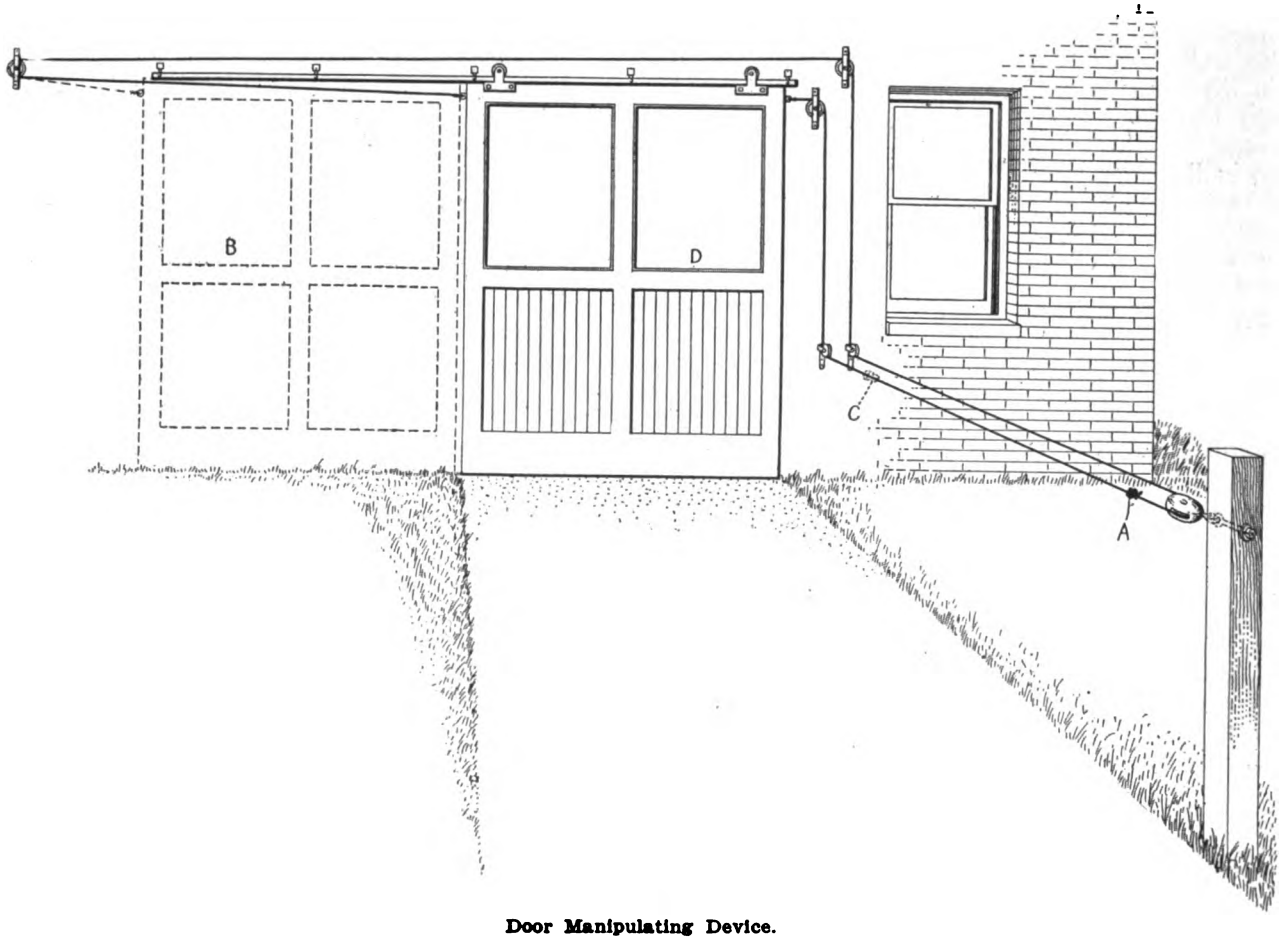
While on the subject of Mr. Pierce's troubles, I would offer a guess that his intuition as to the trouble being in the magneto is wrong. With Splitdorf ignition the trouble is usually in the coil. As Mr. Pierce apparently likes to tighten wires when the ignition gives out, it is just possible he may have twisted off a wire to one of the binding posts inside of the box, so that it gives an intermittent contact. I had one like that which gave the same symptoms. The jar of throwing the switch or rapping the coil would often start it. Buy another coil and don't feel obliged to get one made by the same people who made the magneto.

Opens and Shuts the Door.

From N. G. Near, New York.—Most automobile drivers consider it somewhat of a nuisance to have to jump out of the car every time they are leaving the garage for the mere purpose of closing the door. And it is just as vexing to be compelled to get out and do the same thing on the return from a long, dusty trip that has tired one to near exhaustion.

A Connecticut farmer has arranged a scheme for opening and closing his door without getting out of his car. The arrangement is shown in the sketch herewith. It is very simple. He catches hold of a knot, A, in the rope (shown in the sketch) while going in and the door opens as at B. On the way out he catches hold of the same knot, shown in dotted lines, C, and pulls the door shut as at D. This, of course, is done at a low speed, although it is never necessary to stop the car.

A method of this kind is particularly interesting for those who own their own sheds and who do not have to lock and unlock the door every time the car is taken out.



Door Manipulating Device.

Jacking Up Tires.

The Palmer (England) Tire Co.—There is no material advantage to be obtained by jacking all four wheels clear of the ground when a car is merely used during the week-ends. The object of jacking up the wheels when a car is to be laid up for several months is not so much to relieve the tires from local strains at the points where they would be in contact with the ground, as to guard against the almost invariable occurrence of one or more of the tires becoming entirely deflated during such a period. In such a contingency the tires are certain to sustain damage through being pinched between the rims and the ground. If the pressure in the tire is maintained during the whole time the car is idle, we do not consider the tires would suffer in any way. The pressure exerted on the tread of the tire at the point of contact with the ground is not considered sufficient to have any detrimental effect, neither does the slight flexing of the walls, notwithstanding that the balance of the stresses is necessarily somewhat interfered with—by comparison with the stresses set

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up in a tire fully inflated but supporting no weight. It is obviously much safer, and, in the majority of cases, more simple, to jack up the wheels rather than be bothered with the periodical inflation, of tires. We always recommend jacking or supporting the wheels clear of the ground when a car is going to be laid up for a period extending over a month. The week-end motorist will do more to prolong the life of his tires by seeing that they are properly inflated each time the car is put into service than by jacking the wheels when re-garaging it.

The Roads of New Hampshire.

From R., New York.—Some years ago the writer had occasion to criticize somewhat severely the roads of New Hampshire. He stated that his experience had been that New Hampshire enjoyed the distinction of having the worst roads in the United States.

Recently I had occasion to travel 150 miles or more over New Hampshire roads and can say that the improvement has been very marked. From Ashland, N. H., through Plymouth and the Franconia Notch, up to the White Mountains, the roads leave very little to be desired. From the White Mountains down to the Crawford Notch they are equally good for a portion of the way, and are being rapidly repaired and rebuilt where not already reconstructed. It is a pleasure to observe, too, that somebody of intelligence seems to have laid out these roads, to have constructed them, and to be in charge of them.

A dirt road, made of the proper material, probably of fine gravel and a little clay, makes a better and more lasting road than macadam.

One of the faults that existed some years ago when macadam roads were being built all over the country was that they were almost universally neglected, until they were worn out and had to be rebuilt.

New Hampshire is taking care of its roads. I noticed evidence of that everywhere. Little piles of gravel are deposited at intervals along the main roads, and apparently it is somebody's business to see that the ruts and holes are filled up as fast as they develop. Of course this is the proper plan to pursue everywhere.

Some time or other the State and local authorities will wake up to the fact that it is cheaper by far to keep a road in repair after it has been built than it is to neglect it and then have to rebuild it every few years.

I am glad to say that I can honestly take off my hat now to the principal roads of New Hampshire. The unimportant highways, of course, have not yet been developed as much as they are likely to be in the future. It has been found, no doubt, in New Hampshire, as it has elsewhere, that good roads bring business. The main road running from Nashua up to the White Mountains has been extensively traveled this summer by automobile tourists.

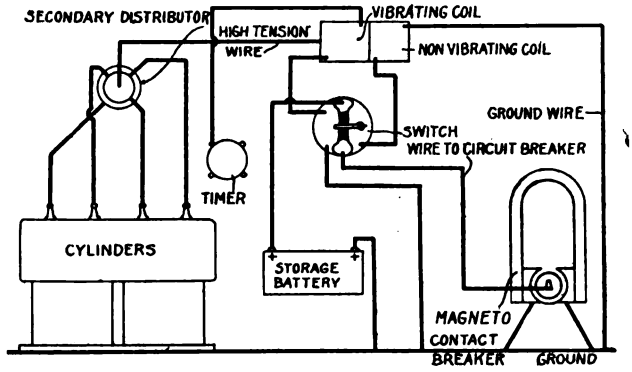
Ever Hear of the Motor Ear?

Thousands of persons are gradually and insidiously becoming deaf with a lessening of efficiency and of mental activity that may have the most serious consequences, says Dr. D. Harold Walker, of Boston, in a paper in the current Journal of the American Medical Association. Another doctor says: "Motoring has become so general that a 'motor ear' is of common occurrence. This condition is caused by the abnormal speed through the air and from the irritation of dust. The use of a little simple oil in the nose before going out and a plain saline wash after returning is good."

The automobile has been accused of about every evil under the sun, but this is the first time we have ever heard it charged with the responsibility of making one deaf. Perhaps some of our physician readers may know whether or not this charge has much basis of fact.

Method of Connecting Magneto in Short Circuit.

The diagram shown in the illustration is for connecting a magneto for short circuit when using bat-

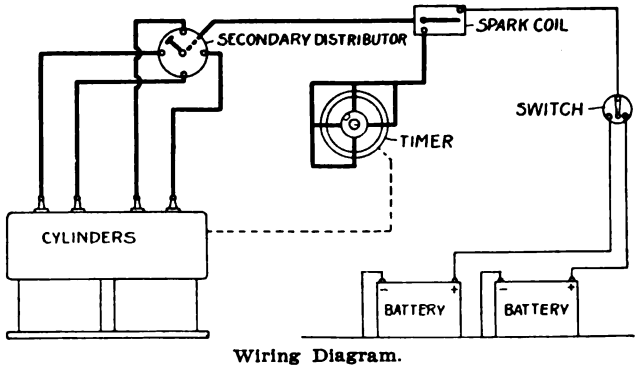


Wiring Diagram.

teries, as when running a magneto on an open circuit it demagnetizes very rapidly. For this reason the wiring should be as shown, when another source of current is used. A magneto gives out current the strength of which is dependent upon its speed of rotation. At high speed it would give a current altogether too strong for a vibrating spark coil and the vibrator would stick on the core.

Wiring Four Cylinders With One Spark Coil.

The illustration shown gives a simple method of how a four-cylinder engine can be wired up, using



Wiring Diagram.

only one spark coil, by having a secondary distributor. This method of wiring has its advantages, some of which are synchronous ignition, reducing the number of electrical connections, and only one coil to adjust.

Before taking the car out of the garage inspect the tires carefully, and if tread cuts need repairs, put on the spare tire in place of the injured one while repairs are being made.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, SEPTEMBER, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

WHAT THE AUTOMOBILE DOES.

June 30, 1915, was the end of an automobile year as far as statistics are concerned, and during the previous twelve months automobiles to the value of nearly $525,000,000 were produced and sold. It is safe to say that accessories to about the extent of $100,000,000 in addition must have been disposed of, for these apply to all of the 2,000,000 cars before in use in the country as well as to the 665,826 sold during the year. If we add to this $50,000,000 as a fair expense for up-keep, we have one of the biggest industries of the entire country, involving the use of something like $700,000,000.

"And what has become of the money?" is asked. Why, most of it has filtered down through millions of fingers into homes of toil, and from thence back higher up until it will again reach the hands of the capitalist who will soon be looking for a chance to invest it, and thus the operation of diffusion and a recurring concentration will be repeated. For that is business and industry.

But suppose this automobile business—which the short-sighted claim is an extravagance and a menace to prosperity—had not existed? How would this immense capital and energy have otherwise been employed? "In producing something more useful," we hear some one say. Well, what more useful?

Mention a single thing in the line of necessities or luxuries that cannot now be easily procured and at a fair price, provided the would-be purchaser has the means to purchase it.

Let it not be overlooked that the need of business and industry to-day is not producers but consumers, and that the automobile business has increased the consuming power of thousands where it has not increased the producing power of tens.

During the past ten years the automobile has been the salvation of business and industry. When it finally becomes fully developed and supply is required for replacements only, some other great industry must arise to give investment to capital and employment to labor or dull times will be a reality and not a false claim.

SECOND-HAND CAR PRICES.

It is singular that high priced cars are offered at a greater per cent. of reduction in price when second hand than low priced ones. The reverse should be the case. A car that sells for five or six hundred dollars deteriorates faster by use than one that sells for two thousand dollars or more.

For illustration, at a garage visited by the writer not long ago, where a number of second-hand cars were on sale, a 1914 Ford touring car with no self-starting and lighting system was priced at $285 while a 1914 touring Buick with self-starting and lighting system was offered at $500. Allowing that each had seen about an equal amount of service the Buick was a far better bargain.

In another instance a 1915 Chevrolet touring car was valued at $640, while a 1915 Oldsmobile touring car was priced at $800. Allowing that each was in about the same condition, the Oldsmobile was the cheaper by some hundreds of dollars.

HORSES IN CITIES.

An ordinance which will remove all horse-drawn vehicles from one of its principal streets is being considered in St. Louis, Mo. If the ordinance is passed it will be watched with interest by other cities.

In any event, a mandate of this kind should give time for owners of horse-drawn vehicles to get rid of their teams and purchase automobiles or it is liable to work considerable hardship.

It is safe to assume that it will not be many years before there will be no horses whatever in cities, although the change will come gradually. In the case of express companies and department stores which now use large numbers of horse vehicles, it will be necessary to get rid of them by degrees, either by sale or by wearing them out to uselessness. As for horses, the demand has not been so great for many years, but this is owing to the European war which has destroyed hundreds of thousands of fine animals. If the war should suddenly end the army horses now in the field would be turned back to farm or other business uses, and this would quite likely congest the market for a time and make sales more difficult.

At any rate, it will be a blessing to both man and horse when horses are no longer used in cities. The sooner that time comes the better.

THE PROPER SPEED.

The claim made that a car two years old should not be driven at a greater speed than 30 miles an hour admits of qualifications. It depends upon the road, the car itself and how it has previously been used, and more upon these considerations than upon the broad statement itself. It is true that materials "get tired," as is shown in the crystallization of steel but they do not crystallize from a two year usage. If a car finally breaks down after but two years' use

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it is more likely to be due to some imperfection in the material or construction in the first place.

But except in case of imperative necessity, why drive either a new car or an old one more than 30 miles an hour? Twice that speed is as fast as railway trains are speeded, and yet these are driven on private roads, with steel tracks and flanged wheels that are unlikely to leave them. The drivers or engineers are familiar with every foot of the way, and in case of a curve of the track it is graded so that overturning is impossible.

Although not every automobile accident is due to driving at high speed, no accident ever occurred where the speed was not too high for that place and that occasion.

A RARE GIFT.

Joaquin Miller was right when he said of the rich man lying in his coffin, "and all he held in his cold dead hand was what he gave away." Posthumous benevolence of those who when alive would part with nothing is of no great credit to them, although we would not go as far as Mr. Carnegie and say that a man who dies rich dies disgraced. Indeed, benevolent as he undoubtedly is, Mr. Carnegie is likely to refute his own assertion, for he will not by any means die disgraced even though he is likely to die rich.

But when a man of forty years, in good health, shows such appreciation of his fellow-workers that he makes them a present of $100,000, it is enough to make one "sit up and take notice." This is what P. W. Litchfield, factory manager of the Goodyear Tire and Rubber Company has done. He has been manager of the Goodyear factory for fifteen years, and by way of celebrating this event, and to show their appreciation of him, his fellow workmen recently gave him a dinner. And he, to show his appreciation of his fellow workmen, presented them with a check for $100,000, as a general welfare fund.

In giving this sum he said: "This fund is given with the idea of sharing with my co-workers a part of the savings which I feel they have shared in producing. Its continued existence in considerable amount should tend to unite Goodyear workers, and give them a sense of responsibility, educating them in business methods, promoting thrift and saving, developing loyalty, efficiency and co-operation, and cause them to feel that they have something saved up for their use in order to tide them over the emergency of a 'rainy day.'"

A GREAT REPROACH.

The greatest reproach upon twentieth century civilization is neither inhumanity nor selfishness, nor wickedness of any form, nor crime of any form, nor indolence, nor ignorance. There are less of any of these to-day than at any other period of the world's history.

By far the greatest reproach upon twentieth century civilization is the need of so much charity and benevolence. This is expressed in the so-called "minimum wage" laws, in the almost innumerable things that poor people now have done for them by the State—in free hospitals, free school text books, free dentists for school children, free old folk's homes, free pensions, free baths, free places of amusement, free churches and free what-nots of never ending and fast increasing numbers.

Of course, you understand us. We say the *need* of so much benevolence is the reproach, and not the benevolence itself. Having the need of it, it is to our highest praise that it is not withheld. But the need existing, and being generously supplied, it is bound to increase and grow broader and deeper, like a noxious weed or a contagious disease. For the end is not yet, and no one can foresee the end.

Why not more justice and thus have less need of benevolence? This is an automobile periodical; we do not intend to get into the domain of political economy, but if the foregoing leads some one to indulge in the luxury of independent thinking it will have answered its purpose.

ROAD TAXES.

To make automobile owners bear the brunt of the cost of improved highways when such improvements add more than their cost to adjoining land or farm values, is unfair.

Most of the abandoned farms one may see here in the East are the result of their being cut off from the markets and their isolation from the social and other amenities of civilization. Good highways are of more value to the farmer than to any one else, and they are of more value whether he wants to sell his farm or till it and take its products to the market with some degree of economy.

It is true that automobiles injure the roads if driven rapidly; and on the other hand, if driven slowly they are a positive benefit to them, pressing the roads down much like a steam roller. In fact, the effect of automobile driving depends so much upon speed that if absolute justice were practical or possible, the slow driver might well be rewarded and the fast one punished.

When all their varied ramifications are considered, good roads benefit the entire community, residents and non-residents, property owners and wage workers. And the entire community should pay for them.

We know of no better theory of taxation than that laid down by Adam Smith 150 years ago or such a matter. It was that all individuals should contribute to the expenses of government as nearly as possible in proportion to their respective abilities. It is true, that in this way, some will get greater benefits than others for a given amount of taxation. but the principle itself is the only practical one that will work out satisfactorily.

A COMPARISON.

Automobiles are like human beings; those which make the most noise do the least and the poorest work. And the quality of an automobile can be determined by the character of the noise it makes while running, just as the quality of a man can be determined by the character of the noise he makes while working.

The automobile that can be depended upon to take you there and back, runs quietly and with a purr or a hum rather than a rattle and a bang. So it is with the man.

The well made and efficient automobile needs little attention; neither does the man.

And finally, the value and service of an automobile should depend upon its cost, but this is not invariably the case; neither is it so with the man.

That venerable critic, William Winter, says: "Half of the activity commonly called work, consists of parade and pother. The actual work of the world is done silently, by the minority, and usually it does

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not occupy all the time or exhaust all the strength." The fact is, one can make hard work easy or easy work hard, but the best test of efficiency is lack of "fuss and feathers." The efficient automobile passes on the road so silently and easily that one is scarcely aware of its presence, and so it is with the efficient man.

THAT POISONOUS GAS.

The instructive article by Dr. E. H. Van Patten, of Washington, in relation to the danger of poisonous gas in closed garages or other rooms, needs no amplification, and mention is made of it here merely to call our readers' attention to it as something that should be carefully noted.

The only way to ensure safety from the effect of this poison is to see that the garage is invariably well ventilated. Probably this poisonous carbon dioxide is slightly heavier than air, and if so, there should be free circulation low down in the room if possible.

In any event, now that we know the nature as well as the cause of the poison, a little care will avert the effects or recurrence of it, and Dr. Van Patten has performed a real service to our readers by his timely article.

NOT BECAUSE IT IS "CLASS."

Some denounce the taxing of automobiles on the ground that it is "class legislation." But the fact that it is class legislation does not make it unjust. Class legislation is either good or bad according to its effect upon the public welfare, just as all other legislation is either good or bad according to that standard.

Class legislation that promotes the public welfare is good; class legislation that does not promote the public welfare is bad. The simple fact that it affects certain individuals and not others is of no consequence one way or another. But the fact that it achieves what all laws should achieve, the advancement of the public weal, is of supreme importance. The idea of opposing a law because it bears heavier on one individual than another is no longer defensible; the public weal is the goal of all legislation and whether it hits a few individuals only or many is of no consequence compared to the larger and correct view.

The singling out of automobiles for taxation any more than any other vehicles or property, is unjust simply because it tends to hinder and obstruct the public welfare. There is no better form of taxation than to simply tax all kinds of property alike.

LET IT ALONE.

If your car runs properly and quietly, do not attempt to improve it unless you are an expert. Frequently, readers come to us with statements of how they have tampered with their car in attempts to improve it, and possibly when just out of the factory. Invariably, they have come to grief and wish they had not meddled with it.

It is a rash thing to attempt to improve upon the manufacturer's design and construction which are usually the result of long study and experiment. The car of to-day is really the result of the experience of thousands of car owners and designers, and the purchaser may be sure that if there were any way to make it better with slight additional expense, the manufacturer would be the first to adopt it. As in the case of anything else, "let well enough alone."

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Grade Crossing Accident.—Near Medora, Ill., a little girl was killed and her mother injured, when in approaching a grade crossing the mother who was driving failed to see the oncoming train, as the crossing was obscured by an embankment covered with weeds. When she saw the train upon her she quickly turned the steering wheel in an effort to avoid the track, but the machine was struck and the child was killed.

At a Sharp Turn in the Road.—A driver was rammed against the steering wheel and pinioned beneath his machine when it turned twice over near Sabin, Minn., and death soon resulted. Although it is stated that the car was not going at an excessive rate of speed, the party were all in high spirits and intended to be in a higher one in an hour or so.

Warning Remark Confused Driver.—A man was instantly killed near Glenwood, Col., when in crossing a bridge in a car he had just purchased, he lost control of the machine and ran into a post, then plunging to a rocky creek bed below, carrying the occupants with it and pinning them beneath. It is stated that just before the accident the driver was told to be careful of an abrupt bank on the opposite side of the bridge, and it is thought that the remark somewhat flusterated him and caused him to lose control of the car.

Engine Died on Hill.—Six people were injured and buried in a swamp near Elkhart, Wis., when in climbing a steep hill the engine died and the driver was unable to set the brakes so they would hold. The car started down hill, shot over a steep embankment and overturned in a swamp, burying the occupants beneath it.

Failed to Shift Gears.—At San Jose, Cal., a man had his chest crushed when in shifting his gears to make a steep grade he failed to engage the cogs and the machine started backing, going off the road before the driver could set the brakes, and down a precipice.

Grazed Another Machine.—Two young men were killed in an automobile accident at Galion, Ohio, when the car in which they were riding rubbed against another in passing, throwing it out of its course and against a large tree. One of the young fellows was killed instantly and the other died in about twenty minutes.

Bee Causes Wreck.—A bee was responsible for the wreck of a touring car near Allentown, Pa. It appears that a bee lighted on the chauffeur's neck. He brushed it off and it landed on the lap of one of the lady occupants. The driver then gave it a swipe and in doing so lost control of the wheel and the car collided with a bridge abutment. Two of the passengers were cut by broken glass and the car was a wreck.

Caught Between Two Trolley Cars.—In an effort to cross the trolley tracks upon which two cars were traveling in opposite directions, near Waterbury, Conn., an automobile was caught between the cars and crushed. One little boy was fatally injured and his sister and parent badly hurt. They were all

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taken to a nearby cottage where a doctor took charge of them.

Emergency Brake Failed.—A young man and woman died in a hospital as the result of an accident, near Pinal, Tex., at the foothills of the Pinal Mountains. While ascending a hill the engine died and the emergency brake failed to work. The car rolled down hill, struck a rock and turned over and the man and girl were pinned beneath. Dripping gasoline set the car on fire and they were terribly burned before assistance came.

Street Car Light Causes Collision.—Blinded by the headlights of an approaching car in East Plato Center, Ill., caused a man to miscalculate the distance from the oncoming car and to drive his machine directly in its path. A collision resulted in which he received a broken arm and a badly bruised and cut body.

Brakes Fail on Wet Street.—At Chicago, Ill., two women were instantly killed, when in making a sudden turn the machine swung in front of an approaching trolley car. Both the motorman and the chauffeur saw that a collision was inevitable and applied the brakes, but on account of the wet streets the brakes would not hold. The car struck the automobile throwing it thirty feet onto the sidewalk. The women were both dead when picked up.

Fifty Miles an Hour.—A young man was instantly killed near Urbana, Ill., when with three companions in an automobile, going at the rate of fifty miles an hour, it turned over at the foot of a steep hill. The young man was thrown out and his skull was crushed. The others were not injured.

First Ride Fatal.—The first ride in a new automobile proved a fatal one to a woman in Fairfield, Ind., when the automobile was struck by an express car at a grade crossing. The woman and her son were driving and did not hear the whistle of the car until it was almost upon them. It was too late to apply the brakes so he drove ahead and the automobile was hit in the rear, killing the mother and injuring the son.

Hard of Hearing.—Two old gentlemen were instantly killed at Decatur, Ill., when the automobile they were in was struck by a trolley car. They were hard of hearing and a high hedge made it impossible for them to see the car. The bodies were so badly torn that they could not be recognized.

Too Much Confidence.—A woman was knocked down and dragged twenty-five feet, at South Chicago, Ill., by a driver who after a few instructions felt competent to drive his car himself.

Goat Wrecks Automobile.—A goat was chained to a fence at the roadside near Galeton, Okla., and stood in the middle of the road when the car approached. The car slowed down but not before the chain became entangled in the wheels of the automobile, sending it over an embankment. Two people suffered broken legs and two others were bruised seriously.

Misjudged Nearness of Bank.—Near Colfax, Wash., a man was attempting to pass a team, and although he was driving slowly the car slipped from the road and rolled over and down an embankment 30 feet below. His head and chest over the heart were crushed and he died instantly. The other occupants of the car escaped injury.

SELF STARTERS.

The Subject Concluded with Explanations of Popular Systems and Devices.

BY C. P. SHATTUCK, M. E.

No. 4.

During the past two years the number of automobile manufacturers who have replaced the magneto with the motor-generator having a timer-distributor has steadily increased. As a result makers of lighting and starting equipment have incor-

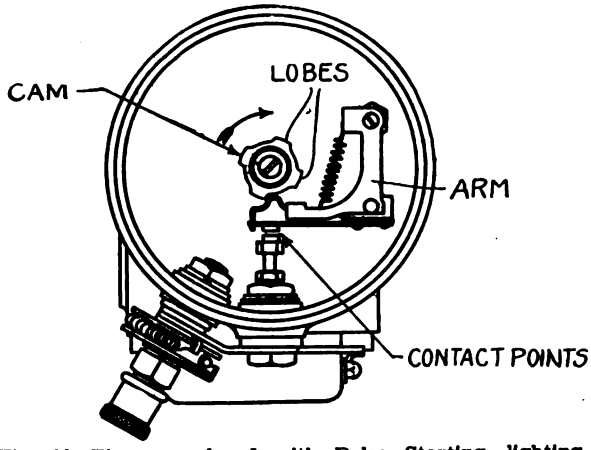


Fig. 32—Timer employed with Delco Starting, lighting and ignition.

porated ignition with their units, relying upon the storage battery charged by the generator or the dynamo itself for supplying electricity. The use of the battery or generator for obtaining current has resurrected the older principle of ignition but in a new form as the timer or interrupter of the primary current is very similar in principle and is held to be as efficient as the perfected magneto.

The Delco system of starting, lighting and ignition, produced by the Dayton Engineering Laboratories Company (the name Delco is obtained by

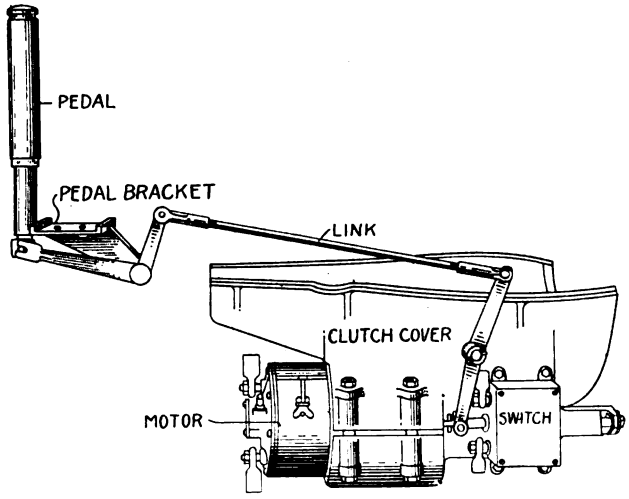


Fig. 33—Illustrating installation of Bijur motor starter on a used car, the Packard.

using the first letter of each word) may be said to be the pioneer system. It was and is to-day a motor generator on which is mounted a timer-distributor and a transformer coil. A sectional view of the unit was shown at Fig. 22 in the July issue, and it will be remembered that the timer and distributor were carried on the front end of the unit, and driven through a set of spiral gears attached to the arma-

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ture shaft. As the timer-distributor is a component of the starting and lighting system a brief description of its construction and operation will be of interest to those motorists owning cars equipped with it.

The Delco timer, shown at Fig. 32, is directly beneath the distributor which is a cap or head of insulating material carrying one high-tension contact in the center with similar contacts spaced equidistant about the center. A rotor maintains constant communication with the central contact. This rotor also carries a contact button which serves to close the secondary circuit to the spark plug in the proper cylinder. The timer differs from the old fashioned commutator in that it is of the contact or make and break type. It consists of a cam, C, which has as many lobes as there are cylinders of the motor, and a movable arm which is pushed outward by the lobes, the action closing the contacts or establishing the primary circuit. The spark occurs at the instant the contact points break, much in the same manner as the points of the circuit breaker of a magneto, and the low-tension or primary current is intensified by the coil, conducted to the central high-tension contact of the distributor and distributed by the button of the rotor. Generally a set of dry cells is provided for emergency, enabling the motorist to reach home in the event of disorder of the generator.

In the wiring plan of the Bijur motor-generator as installed on the Scripps-Booth car the system provides ignition as well. The cable carries the intensified current from the coil as well as the leads from the distributor to the spark plugs. This system is to be changed, the shunt field lead being carried to the starting switch, the frame of the starting switch being grounded and the construction such that when the switch is turned to the "Off" position, the shunt

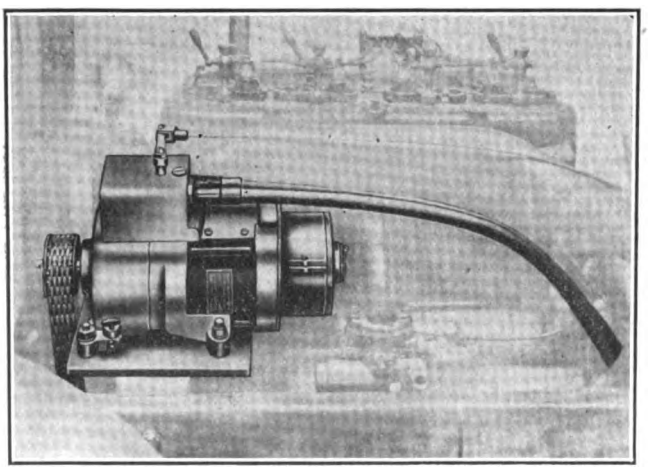


Fig. 34—Application of Jesco Motor Generator to a Continental Motor.

field circuit is opened. The shunt field was fully explained in the first article of the serial.

Motor Starters on Used Cars.

Manufacturers of motor starters disagree as to the practicability of installing a motor starter on the used motor vehicle. The majority hold that it is a manufacturer's problem; that is, the unit must be constructed to meet the requirements of the motor. Other makers hold that the motor starter is adaptable to the used car and in proof of their assertion is the large number of old cars equipped with cranking units.

Those not favoring the installation of a motor starter on the used car take the stand that generally the cost of adapting the unit to the motor involves considerable alteration and expense. And in addition if the system includes separate units, a motor and a generator, the latter being necessary to maintain a battery in a charged condition, the expense will be increased. One prominent maker of starting and lighting equipments states that invariably the motorist will decide upon a system that cannot be fitted to his car without involving considerable ex-

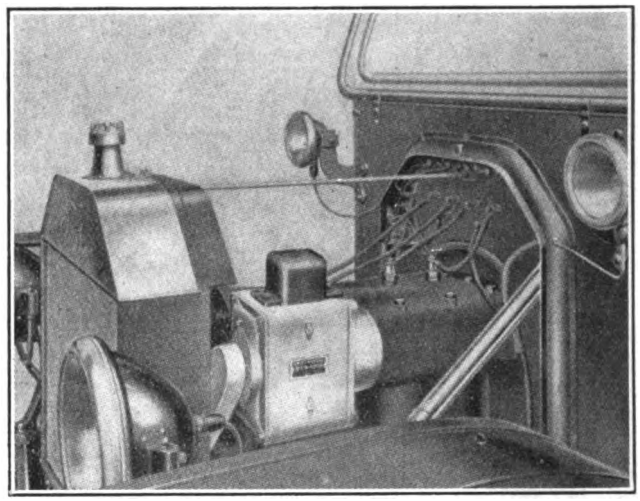


Fig. 35—Gray & Davis System for Ford cars.

pense. The writer knows of several well known makers who always advise an owner of the used car when seeking for information not to attempt to install the system.

This does not apply to a certain number of makes of motor vehicles. A limited number of manufacturers of starting systems have brought out and perfected units that can be installed on certain makes of used cars at a reasonable cost. Among these may be named the Bijur starting system for the model 48, 1912 and 1913 Packard cars. The system is installed by removing the bottom clutch cover, dismounting the clutch, installing a new flywheel and reassembling the clutch. The new flywheel carries a toothed steel ring and a pinion of the motor starter meshes with this large gear. A new clutch cover casting is supplied, and the motor is clamped to the cover by means of bolts as may be noted at Fig. 33, which shows the unit installed. The system includes a switch, linkage, pedal bracket and the starting pedal. A generator or dynamo is necessary and is included with the system.

The most common method of imparting the energy of the motor to the engine and taking the drive for the generator of the motor-generator is by silent chain; that is, when the installation is made on the used vehicle. Fig. 34 illustrates the application of the Jesco motor-generator on a Continental motor. The starter is mounted on the arm of the engine by means of a special bracket and connected to the crankshaft through a silent chain which operates at twice crankshaft speed. These examples are quoted to show that the motor starter can be installed on the used motor vehicle.

Ford Installations.

The contention is further borne out in practice by the successful application and operation of the

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lighting and starting systems built for the Ford car. It was but logical that the manufacturer of starting and lighting systems should produce an equipment for this car as the demand for a cranking unit has been very large. Among the manufacturers building starters for the Ford are: Gray & Davis, Splitdorf-Apelco, General Electric Company, Westinghouse Electric and Manufacturing Company, The Esterline Company, Hartford Suspension Company, Fisher Electrical Works, Kemco Electric Manufacturing Company, Disco Electric Starter Company and several others.

The Gray & Davis system for the Ford car consists of a motor-generator, six-volt battery, battery box lighting and starting switches, regulator-cutout, chains, sprockets and wiring. As a rule the entire necessary apparatus is supplied. The motor-generator, including the regulator-cutout, is mounted on a specially designed bracket bolted to the crankcase and water connections, permitting of removal of the cylinder head when desired. The generator operates as a shunt wound machine when charging the storage battery and as a compound wound dynamo when supplying electricity for the lamps. The energy of the motor starter is applied through an enclosed silent chain to a sprocket on the crankshaft of the engine. The starting switch is located in the floor board.

The Splitdorf-Apelco starting and lighting system for the Ford, marketed by the Splitdorf Electrical Company, Newark, N. J., differs from the system previously mentioned in that it is a 12-6-volt motor-generator. The storage battery is divided into two individual six-volt cells and these are connected in series by the starting switch, supplying a 12-volt current for operating the motor. Upon releasing the starting switch, which is illustrated at Fig. 37, the cells are connected in parallel and charged as a

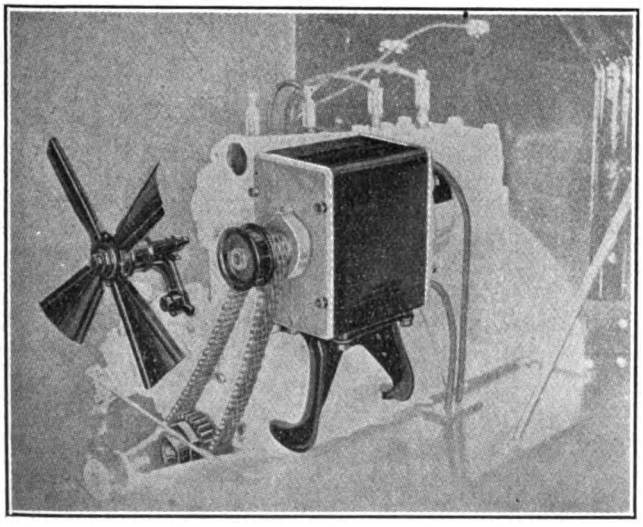


Fig. 36—Splitdorf-Apelco Starting and Lighting System for Ford cars.

six-volt unit. The current supply to the lamps and ignition is a six-volt at all times. The maker states that the use of 12 volts for starting insures sufficient energy to spin the motor in the coldest of weather, makes for economy of current consumption and permits of the use of 6½ or 7-volt standard bulbs.

Energy for starting is imparted through a silent chain to a sprocket on the crankshaft while drive for the dynamo is by a belt. The construction eliminates the necessity for overrunning clutches and for gears, and the armature of the machine has but one set of brushes and but one set of windings. The

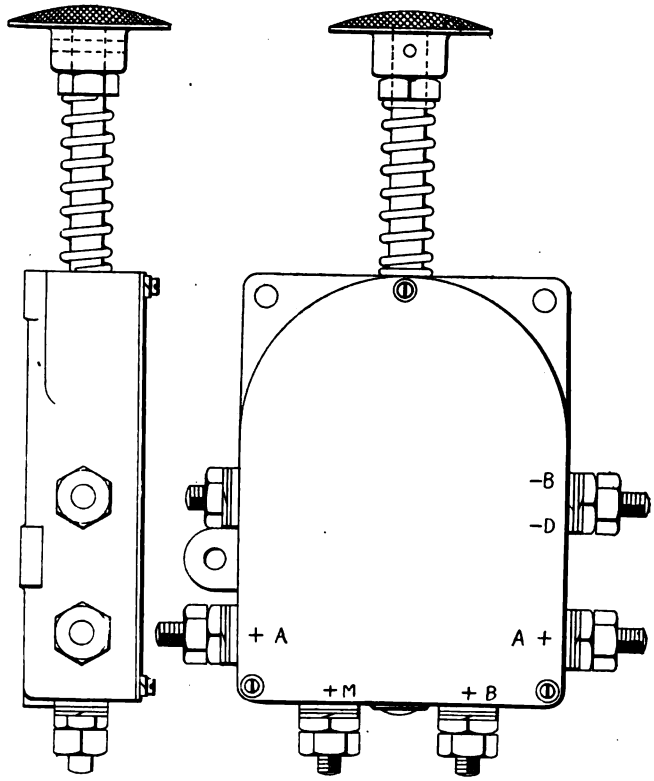


Fig. 37—Splitdorf-Apelco starting switch which connects the cells of battery in a 12-volt circuit when starting.

required reduction between the unit and crankshaft is provided by the sprockets.

Mention should be made of the starting and lighting system marketed by the Kemco Electric Manufacturing Company. This consists of a generator around which is built the fan, the construction replacing the Ford fan. The unit keeps the battery charged for supplying current to the motor starter which is practically of the type made by this company for large cars and which was described in a previous article.

Mention should be made of the heart of the motor starting system, the storage battery. The current supplied by the generator is stored in it and its proper maintenance is an important factor in the successful operation of the starter, particularly in cold weather when the lubricant congeals, the lubricant requiring more energy to overcome the starting torque. Plain and specific instructions are given by every battery maker and these should accompany each car. The instructions as to the use of the hydrometer should be carefully followed.

Car Starts Hard When Hot.

It is not often that a car starts hard when hot. When it does there may be too close an adjustment of the valve tappets when cold, so that when the motor is warm, the valves do not shut tightly. Or the cause may lie in the spark plugs. If these are heavily covered with carbon, the resistance offered by the deposits will increase with their temperature; furthermore, the plugs expand in the heat, which again tends to increase the resistance.

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THE KNIGHT OVERLAND.

Brief Description of This New Engine and Chassis.

The new sleeve valve engine for the Willys-Overland car is receiving much attention both in this country and in England. It will be remembered that this magazine was the first to pay any attention whatever to the silent Knight engine, and to endorse it to the extent that it was something likely to be successful. That view has since been fully proven substantiated.

An important feature of the sleeve valve engine as used by the Willys-Overland firm is that it is one of the lightest of this type yet produced, though it is quite powerful, its actual rating of 40 horsepower being obtained at 1,400 revolutions per minute. The compression is 75 pounds to the square inch when cold, this being fairly high. The cylinders are cast in block. It is cooled by the thermo-siphon system. In connection with the cooling system, the separate aluminium head-plate, which covers the top of the cylinder block, and forms part of the water jacket and also the outlet to the radiator, is a notable piece of ingenious construction. This head-plate is screwed down by four large nuts, which, with the aid of a suitable gasket and packing glands make the necessary watertight joints. With this method of construction it is possible to have the water jackets around the cylinders actually communicating direct with the heads of the cylinders, which are, nevertheless, individually detachable, as in the standard type of Knight engine. This renders all external joints unnecessary, while the actual circulation of the cooling water around the plug seat and in the domed head is ideal. Another interesting feature in the cooling system is the fact that the combustion head is so shaped that the water contained in it siphons out automatically when the water in the cooling system is being drained off for any purpose.

With regard to the actual valve mechanism there is nothing unusual, there being the usual two sleeves surrounding the piston, with a ring joint in the combustion head. Similarly the actuating mechanism consists of an eccentric shaft with small connecting rods which are attached to suitable lugs at the base of the sleeves. The rectangular ports are also similar to known practice, extending around part of the circumference of the sleeves, the cylinder slots being correspondingly proportioned. The vertical movement of the sleeves is 1 inch at, of course, half the motor speed, as the silent chain drive from the crankshaft to the eccentric shaft has, naturally, the usual one to two reduction. When the engine is running, say, 900 r. p. m., the sleeves are only traveling at a rate corresponding to the piston speed at 100 r. p. m.

With this design of engine the valve motion is, of course, entirely mechanical, so that it differs from the poppet valve motor in that the valves are bound to close absolutely as they set to close, instead of being dependent on a spring, the temper of which may vary and thus alter conditions. One of the main claims of advantage in the Knight design is based on this fact. No matter what the speed of the engine, a proper mixture can always be obtained, as the opening and closing of the valve ports are always absolutely positive and in complete synchronization relationship with the piston speed. The exhaust begins to open at 40 degrees before the bottom dead center, and closes 5 degrees after the upper center. The intake opens 6½ degrees after the upper dead center, and closes at 45 degrees after the bottom dead center, consequently one gets the benefit of an important desideratum, namely, the maximum duration of full port area. It will be seen that the exhaust valve is open for 225 degrees of the revolution of the half-cycle concerned, and the intake open for 218.5 degrees. The crankshaft is carried on three main bearings, and is, of course, of the conventional type. The exhaust manifold is a separate casting, there being an individual outlet from each cylinder so as to place the minimum of retarding influence in the way of a speedy exit for the gases. The intake manifold is internally cast, and the carburetor is bolted up directly to the engine.

With regard to the question of lubrication, the keynote of the design is simplicity, the method adopted being a combination of force feed and splash. There is a reservoir at the base of the crank chamber from which the oil is drawn. The action of the sleeves is such that when the oil is thrown on to them it is carried up, and distributed to perfection automatically by the continually varying reciprocating action and the suction effect. There are circular grooves cut in the outside of each of the sleeves. At certain intervals there are ⅛ inch diameter holes in the sleeves, so that the oil spray beneath the piston, while affording the gudgeon pin lubrication, may also pass through these small holes and thus assist in the internal lubrication of the outer sleeve. The quantity of oil in circulation is governed by a by-pass, which is operated synchronously with the throttle, the amount of oil supplied always being proportional to the throttle opening. The construction of the pump is such that its entire barrel oscillates while it is pumping. The starting mechanism is much the same as the Overland, as known and sold at present.

In general terms one may say that the rest of the chassis, and also the body construction, follow standard Overland practice as used on their six-cylinder model. The drive is taken through a leather-faced cone clutch with subsidiary springs beneath the leather so as to ensure easy engagement, and then through a three-speed and reverse gear set to the floating rear axle. The tail shaft, which has its universal joint at the front end, is enclosed within a torque tube which is rigidly attached at the rear end to the gearbox, the latter, of course, as in the standard Overland model, being built up in conjunction with the rear axle casing. Three-quarter elliptical springs are used at the rear of the chassis, and these are of the underslung type. Large brake drums are used and both the brakes operate directly on the rear wheels.

There are many evidences of ability in the design of the engine, especially with regard to some of the details, notably, for instance, the attachment of the combustion head cover plate, which is an excellent example of the designer's art. Not only has he obtained the highest possible efficiency in the work in question, but he has also managed to maintain at the same time a simplicity and neatness of construction which are bound to obtain high commendation.

The oil drop and the dirt and dust drawn in through the radiator by the suction of the fan, combine to make a dangerous accumulation of material in the dust pan.

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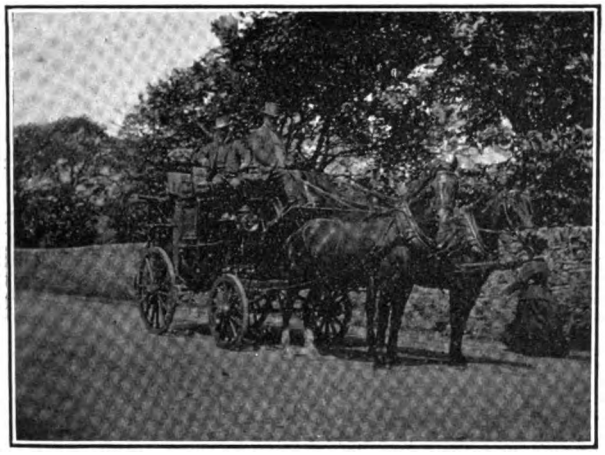
MOTOR COACHING IN ENGLAND.

Vivid Pictures of a Trip Through the Pastoral Shakespeare Country.

From Felix J. Koch, Ohio.—It invariably produces the effect desired. Pretty Mrs. Jack Roosa, returning from a protracted honeymoon, turns to the group of friends gathered to hear all about the journey and remarks, with all the modesty a traveler is presumed to assume:

"Jack and I motored through the Shakespeare country in England, all the way from Leamington to Stratford, stopping off at Warwick and Kenilworth and Guy's Mill, and so on, and to my dying day I never expect to enjoy a more charming trip!"

Whereupon auditors see mental visions of an automobile chartered to the purpose, and remark how lucky was Mrs. Jack Roosa that she could go this wise, instead of being cramped, as were those of the company who had "done" England inside one of the stuffy, old-fashioned stages. Naturally, Mrs. Roosa enjoys this friendly envy of her colleagues, and answers each and all of their questions, omitting only to state that just as she motored through Shakespeare's England, so, that same year, 200,000



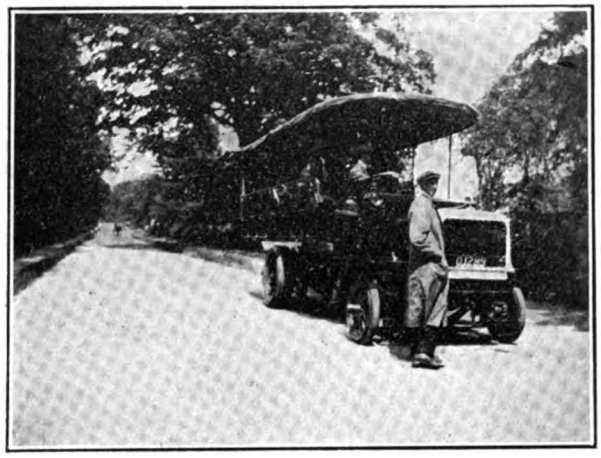
The Old Way.

others motored or "coached," as they call it, and this on a huge motor coach, built for it, and crowded every warm day of the year. Or again, Madam Roosa will speak idly of "coaching through England," failing to add that the old-time stage coach has been expelled by the motor and that the kind of stage coach which her auditors may form in their mind is as great a curiosity in England as it would be here at home.

While the lover of the unique inland travel cannot but view with regret the passing of these old English stages, in which countless generations of tourists were borne through the Shakespeare country, or Wales, there is this to the new order of things, that it is certainly far more convenient that one can make several times the speed on uninteresting stretches of country, that one can keep to a schedule, as you can't with a coach-and-four, and that, in the event of a sudden downpour, you can retreat to cover rapidly.

Most travelers board these motor coaches at Kenilworth. The busses start at Leamington, a center of touristry for the Shakespeare country, but they hardly allow one the time at the old castle he desires, so that he who would do his sightseeing thoroughly prefers to board an early train and come to Kenilworth, explore the route to his satisfaction and then connect with the motor-coach when it comes to this place.

Your vehicle, you discover, is a most substan-



The Modern Way.

tially built motor coach, with an aisle down its center, seats for two at right and left, four such to each side. The far rear and the far front seat are built completely across, accommodating one more tourist if need be.

Soon you are bowling through Kenilworth village. The quaint little brick houses, some of them exceedingly small; old St. John's church of stone, with the clock showing 12:10 now; an array of potatoes and carrots, placed by a housewife before her home, pending use; these, and other similar vignettes of village life in England, whirl past you. Meanwhile, you are taking stock of your companions, renewing acquaintance with a tourist you met in the British Museum some weeks past, and are remarking how very flat, very smooth is the road, and how well kept is the walk just beside it.

The full thrill of pleasure that always accompanies motor coaching is already upon you, as you strike into the open country. There, too, these English roads continue smooth as glass, and on a level with the hay fields, and the broad acres of cab-



A Characteristic Inn.

bage or other vegetables or grain that stretch away as far as the eye can see.

Your seat-mate, a motorist from the States, grows enthusiastic at the fine "black asphalt road," as he

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calls it. Despite the speed at which you are traveling now—well-nigh that of an express train—this man takes snapshots of the fields, of a little brick schoolhouse, and of a wee village of old, thatch-roofed houses, whence the noise of the smith at his anvil seems the only token of life.

Then your attention is diverted by a side-road, leading off to Coventry. Just as you were relating to your vis-a-vis an article you read years ago, of that place, the turreted steeple comes in view on the right, then some homes, with the bricks set in between the old wooden beams, and then a broad oat field gives way to high hedge of arbor vitae.



A Roadside Restaurant.

You dash through a grove, to emerge on a beet field and then stop a moment to note how the hay is cut here. This is compressed and the neatly trimmed blocks are then set one on another.

Somehow, as you ride, you can't help but think of how much more peaceful, more quiet the scenes when the old horse coach plodded here. Then the flock of chickens, among the trees yonder, would not have fled from your path as they do, the lodge in the hedges would not have gone by so quickly, and the oats would have sent a soft rustle to your ears.

But you'd be nowhere nearly so far in such little time. Already they are stopping at Guy's mill; five minutes here to let you see the oldest working mill in all England. Tourists from all the coaches are clambering down, walking down a road between walls overhung by old cedars; cutting through a little vegetable garden, then coming to this ancient mill. Wonderfully interesting that, but a story for other pages. It is these little halts here and there that make the trip so attractive. There is time for them, as there could not be with the horse coach that would bring its travelers in with any reasonable sort of time.

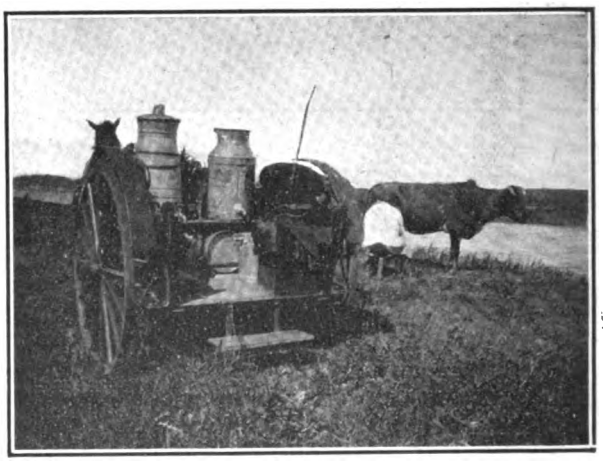
Back aboard, the coach returns to the main road, and on, on you speed. At one side there is an open area of lawn, the width of an average city street—this flanked by forest primeval—which, in its turn, leads off to a house, one of the old English manors, no doubt. Ever lovelier and lovelier becomes this highway! You do not wonder any longer that returning travelers enthuse at the coaching through the Shakespeare country. And it's cheap, very cheap. Just as the camera fiend is snapping the iron fences put round the trees in the meadows to protect them, the fares are taken. Only $1.20 for a ride covering the best part of the day. Again and again you comment on the road, without a speck of dust on it. You pass over a river, on between hedges, and along walks bordered by walls, ivy covered. A postman is busy here, a huge hat box on his arm, showing the use to which parcel post is sometimes put here. Then, a turn, and you are in Warwick village. Once more you've the little homes of brick, trimmed with stone, the neat shops, the buildings coated with the smooth, yellow plaster. Groceries, ale shops, coal dealers' establishments are all here. Then you slow up at the huge stone gate, gray with age, that marks the foot of old Warwick Castle. Queer old buildings, white and black, in turrets of stone, begin to take the notice also. Out before the Parrot Tea Rooms a huge green parrot hangs, and at last, you draw up at the old Warwick Arms Inn.

If only for a taste of life in the inns of old England is it worth the time, the money, the effort of coaching to-day. There is something about the life of these hostelries—the service, the food, the hospitality—that is different from the inns of all other nations. It is refreshing to look back upon for the rest of one's days.

You're to take dinner at the inn. Mine host is already reserving places, but while he prepares for it, you may stroll to Warwick Castle, a landmark well worth your while. Incidentally, of course, dinner is extra. The motor coach will meet you in the inn yard promptly at 2.30 this afternoon.

You loiter down the narrow passage, next the sitting room, to the dining chamber itself. Tables large and tables small, are here, crowded with travelers off the motor coaches. Even as you prepare to eat, another company here, then another and another.

There's a regular dinner served these guests, chicken, cold ham, boiled potatoes, lettuce, then a



Milking for Market.

currant tart. Some folk order coffee or a glass of English beer. The whole, with the tip, will come to perhaps 88 cents. No matter from what part of the States you may hail, the chances are you'll run across some towns folk here—people come and go in such endless numbers. Many of the visitors are off on what is known as the "Shakespeare land excursion," from London to Stratford. They "do" the castle at Warwick, then continue to Stratford that afternoon, and in the night to Leamington and on to London.

Wise travelers, however, do not travel so fast. You'll have come to Warwick and spend the whole

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afternoon there; and so, now, while your seat mates "do" the castle in haste, you can chat with these towns folks or else get at your notes and have them in shape for more when they come. While you write, the odors of the "Rheinweide," an imported plant, come to you, the music of a street piano, or organ on wheels, rather, greets your ear. It is sweltering and the strollers tire easily of walking and come loitering back for the seat in the coach. The display of old pewter, the quaint signs on the walls, or out on the gate post bespeak an England that is gone.

And so with other phases of this cross England motor coaching. Every mile of it has its vignette of charm. Like one great motion picture, rural England goes past you. By and by you recall the bluff



Proud of Their Old Pewter.

Englishman angling in the stream. You remember the dairyman milking his cows in the meadows; you remember the big modern inn with the private auto before. You seem to hear again the clink of the pewter; your wanderlust stirs and you want to repeat the trip so soon as it is concluded. You want to do Wales and then Scotland in these busses. In short you would like to turn nomad and motor to the end of your days.

GARAGE TALK.

A Few Trifles, Neither New nor Novel, but It Is Well Enough to Note Them.

BY JAMES F. HOBART, M. E.

"Say, Bill! Just take a look at these burners, will you? Some of them are almost closed with something like tar. It must be mighty poor gas they are giving us nowadays!"

"No, John, that's no fault of the gas. It's the man who uses the gas who is to blame this time, and nobody else."

"I don't see how that is. I have been using the gas myself and I have done just as I always do—light it and turn it off when I am done using it."

"That's just the trouble with your burners, John. When you turn off acetylene gas very slowly and let the flame die down gradually, there is apt to be a deposit or collection of the tar-like substance of which you complain, and the deposit seems to be at the opening of each burner—just at the point where the gas flows out into the atmosphere. I don't know just how the deposit is formed, but I notice it where the lights are turned out slowly. To get rid of this trouble, just turn off the gas quickly when you put the lights out."

"Then, if that is the trouble, why don't the burners fill with the tar-stuff when the lights are left turned low for some time?"

"I can't tell you, John, but they don't. It seems only when the flow of gas dies down very slow to nothing, that the deposit forms. It may be due to a condensation of carbon at the instant the flame dies out, as then there is not sufficient heat left in the flame to support it and there must be a bit of heated carbon left which may take a semi-solid form at that instant. Perhaps some of the chemist sharps could tell why it happens, but I can't. Just turn off the gas quickly every time you put out the lights. If the tubing lies so you can get hold of it, and you will pinch it close when you cut off the gas, then there will be no tar deposit in the burners. You will find this deposit worse when you use a generator than when you use gas from the tanks. You will run up against the same thing when you are using the oxy-acetylene welding outfit. There, when the flame 'breaks' at the torch and blows through it with a terrible noise, the operator always jumps for the oxygen valve, which is close to his fingers on the torch, and shuts off the oxygen as quickly as possible. When the acetylene is turned off slowly, the same tarry deposit is found to give trouble, especially when the tubes leading to the torch are large and the acetylene gas reduces its pressure and burns out very slowly. The acetylene welder soon learns to stop all this burner clogging business by giving a puff of air from the mouth as soon as gas is cut off at the valve. This puff blows out the acetylene flame and there is no trouble from deposits of carbon in the burner."

Cylinder Scratches and Graphite.

"What d'ye think, Bill, regarding graphite for scratches in a cylinder? Do you believe a scratch can be filled up by using graphite? It looks sort of fishy to me. What is to prevent the graphite from being blown out of the scratches by the force of compression or of explosion?"

"There is something in it, John, for I know that a long continued use of graphite does smooth up a badly scored cylinder, but it can't be done in a week or in a month. It may take a year to completely fill some scratches, but the graphite will slowly build on the low places in the cylinder which are not touched by the rings as they sweep over the surface."

"But how does the graphite stick there? I should think the force of an explosion would drive out every particle of loose graphite which happened to be in one of the scratch channels?"

"It does blow out most of the graphite. Probably not one particle in a thousand of those placed in the cylinder ever adheres permanently to the surface of a scratch. But, occasionally, a particle may get caught there. It may be blown by the explosion force against another particle with such force that it is fastened thereto, and so it goes for a long time, gradually building up, one particle on another, until the scratches are entirely filled, or the walls of the cylinders are worn down to the bottom of the scratches or both!"

"But isn't there an awful lot of waste of compression through the scratches before they finally fill up?"

"Of course there is, and for that reason I want a

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cylinder reground as soon as it gets scratched. I don't want to lose compression for a year while I'm waiting for a lot of scratches to fill with graphite. Me for the grinder with a scratched cylinder, just as soon as I find out it has got scratched!"

Dimming the Headlights.

"Wot're yer doin' with those two sweeping caps, Bill? Goin' to let yer hair grow long?"

"Those aren't sweeping caps, John; they are covers for the big headlights. I just slip these covers over the lamps in town, and pull 'em off when I get to country roads. You see, there is a stout elastic cord run into the hem of each cover, but I don't expect this will last long because the heat from the lamp will vulcanize the rubber in a short time, then it will be gone. But I have got some light helical springs which I'm goin' to run into the hems as soon as the rubber gives out and that will hold and won't vulcanize as rubber does."

"Say, Bill, I know some who cover the glass with soap in town, and wash it off when they get to the country."

"That's too much work, John. I don't want the lenses of my auto lamps covered with dry soap—too much work to take it off. Just mix a little corn starch and water, or whiting and water, if you want to daub up the lenses of your lamps—which I don't want to do to mine. And I have known some chaps to daub over the fronts of the lamps with the stuff they use to clean the lamps with. That made the glass look as though it was frosted. It cuts off the glare and when they got out of town, a few rubs with a cloth, causes the powder to crumble off the glass, leaving it clean. But you can't get ahead of my 'sweeping caps' for good light dimmers. They'll do for me!"

Cleaning the Engine.

"Why don't you clean up that engine while it is warm, Bill? It isn't much more than half the amount of work to clean an engine when it first comes in, hot, than it is when it has got cold. The dirt and grease come off much easier and the scraper takes hold of hot dried grease much more freely than it does of cold enamel-like coatings of baked oil. Clean her up while she is hot, Bill, and save time and elbow grease. The nuts and pins start easier, ground joints come apart better, and packing and gaskets never tear as badly when hot as when they are cold. It fact, there is every argument in favor of taking down an engine just after it comes in rather than when it is cold. Dip the parts in gasoline and wipe them off right quick as they come from the machine, and the parts are clean in less than no time. Put in a little tank which will hold all the parts of an automobile. Fill the tank with caustic potash dissolved in water, heat the tank boiling hot and dip the engine parts into the tank. The grease will vanish as if by magic! You don't have to put in a heating boiler. Just turn into the cleaning tank the exhaust from the gasoline engine which drives your shop. Or, you can pipe the cleaning tank solution right through the water jacket of your engine. That will heat the potash most of the time, and the exhaust turned in once in a while or in the morning will soon make things hot enough."

"Yes, John, I know you can clean lots of stuff in a potash tank, and do it quick and well, but Bill Smith uses such a tank and he is always spending a whole lot of time fishing in that tank for pieces he has lost in there and can't get out. I'd rather fish in the river than in a potash tank."

"No need of fishing, Bill. Just get a few wire baskets and put all the small stuff inside, then dip the baskets and there never will be any time lost in fishing for lost parts."

A Window Curtain Flap.

"Say, Bill! I wonder why this man has a flap fastened to the back curtain of his car?"

"That? That is for covering the window in the rear curtain when there is a car, or several of them, coming along behind. You see, it this way: With several cars behind, in the night, there is a whole lot of light from the big headlights belonging to the fellows behind, and that light just pours through the window in the rear curtain and frequently blinds the driver so badly that he can't see where he is going."

"But how does a headlight in the rear trouble the driver who is supposed to be looking out for things ahead?"

"Why, the light through the rear-curtain window just reflects from the wind-shield and from its fittings right into the driver's eye. Sometimes the wind-shield acts just like a mirror and the driver can see nothing but this reflected light. It is to cut off this very troublesome light that the flap is attached to the curtain. You see it is fixed so it can be buttoned up out of the way when not wanted over the window."

A Cylinder Tell-Tale.

"John, why didn't they make automobile engines with a pulse, same as a man? Then you could put your finger on the artery, feel the pulse and tell in a minute just what was the matter with the sick engine."

"Don't know about that, Bill. If we couldn't tell any closer than the doctor does, lots of times, I'm afraid your garage-hospital wouldn't have any patients. But let's see if the auto engine hasn't got a well developed pulse of its own which needs only to be felt properly in order to tell pretty accurately what is going on inside the cylinders. You will find it right at the auxiliary air valve. Just take notice of that little joker when the engine is running as slowly as you can make it go. You will notice a pulsation of the valve, which closely resembles the beating of the pulse, only much quicker and faster. Just get down where you can touch the valve lightly with the finger—the same as the doctor touches the pulse. Feel it? There you have it! A regular tell-tale of what is going on inside the cylinders, and if there be any irregularity you can soon detect it by a study of the auxiliary valve action."

Coming Events.

Sept. 24—Indianapolis, Ind., S. A. E. First Section meeting.

Sept. 24-25—Grand Rapids, Mich., track meet; E. A. Moross.

Sept. 27-Oct. 10—Denver, Colo., show; International Soil Products Exposition; Automobile Trades Association of Colorado.

Oct.—Dallas, Texas, show; Dallas Automobile Dealers' Association.

Oct. 1—Minneapolis. Minn.; track race; Twin City Motor Speedway Co.

Oct. 1-2—Trenton, N. J.; track races; Inter-State fair.

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Oct. 2—New York City, Sheepshead Bay Motor Speedway track meet.
Oct. 2—New York, N. Y.; Speedway races; Sheepshead Bay Speedway Corporation.
Oct. 2—Fresno, Cal., 100-mile track race; Fresno Agricultural Association.
Oct. 2-9—Cincinnati, O., show; Music Hall; Cincinnati Automobile Dealers' Association.
Oct. 3-10—Cincinnati, O., automobile show; Automobile Dealers' Association.
Oct. 6-16—New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 7—Grand Rapids, Mich., convention of the Garage Owners' Association of Michigan.
Oct.—St. Louis, Mo., show; Forest Park Highlands; St. Louis Automobile Manufacturers' and Dealers' Association.
Oct. 11-12—Dayton, O., National Paving Brick Manufacturers' Association; annual meeting.
Oct. 16—Chicago, Ill., Chicago Speedway Park Association, 300-mile race.
Oct. 25—November issue of Motorist appears; Brooklyn, New York.
Nov. 18—Arizona, 150-mile grand prix.
Nov. 29-Dec. 4—Electric Prosperity Week.
Jan. 1-8—New York City, Automobile show, Grand Central Palace; National Automobile Chamber of Commerce, S. A. Miles, Manager, 7 East 42d street, New York City.
Jan. 22-29—Chicago, Ill., automobile show, Coliseum and First Regiment Armory; National Automobile Chamber of Commerce, S. A. Miles, Manager, 7 East 42d street, New York City.
March 7-14—Boston, Mass., Automobile show; Boston Auto Dealers' Association, Boston Commercial Vehicle Association.

Home-Made Carburetor Control.

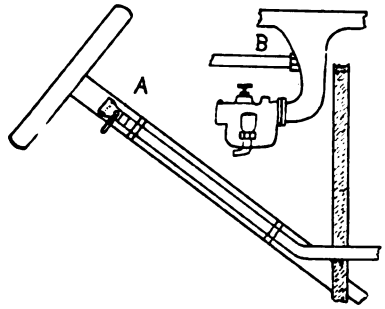
The value of controlling the air admitted through the carburetor is recognized by authorities on carburetion and a dash or steering column control is now included with the modern carburetor. Such an arrangement facilitates starting in that the mixture can be enrichened, and the control of the supply of air makes for economy of fuel in that a more homogeneous mixture is possible.

Cars not fitted with the control can be equipped at a slight expense, and the installation can be made by the average owner. The material required can be obtained at any supply house and generally much of it is stock equipment in the garage. The material consists of a nipple union, suitable length of annealed copper tubing and a petcock.

The installation is shown in the accompanying drawing. The intake pipe or manifold is drilled and tapped to take the nipple union as shown at B. The union has a pipe thread at the end screwed into the intake manifold and a compression coupling at the other end. To the last named is attached the copper tubing which is led through the dash and up along the steering column, as illustrated at A. By employing a coupling the petcock can be easily attached.

The installation illustrated was fitted to a model T Ford car, the steering post of which rotates within a tubing. This permitted of attaching the copper tubing with clips. With steering gears of the opposite type, that is, where the outside tube rotates, the copper pipe can be led to a convenient place on the dash and the petcock attached. By using solderless connections for ¼-inch tubing the joints can be made air tight very easily.

When starting the motor the petcock is closed but after the engine becomes warmed up the petcock is opened and the air supply is regulated according to the mixture and motor speed. The mileage to a gallon of fuel is greatly increased and considerably more power will be obtained as the air in striking the mixture breaks up any particles of fuel that may exist, converting them into a homogeneous mixture. The device is particularly beneficial on motors where the valve stem and guides are worn, admitting extra air, for the carburetor can be set for a rich mixture for low speeds and the mixture controlled at higher ratios. The petcock makes possible the introduction of kerosene and other carbon removing fluids when the motor is operating. It can also be utilized for priming in cold weather.



Steering column control of extra air supplied to mixture, making for power and fuel economy.

AUTOMOBILE LUBRICATION.

Carbon Can Be Avoided by Good Oil and Correct Motor Design.

C. W. Stratford before the New York Society of Automobile Engineers.—Oil for the lubrication of pistons and cylinders is splashed on the lower cylinder walls and from there it is carried upward and spread over the cylinder wall surface by the pistons and piston rings. A certain quantity as well is thrown off the pistons on their ascending stroke and projected onto the entire explosion chamber walls. If the latter quantity is small, and the fuel mixture is set on the lean side, it will be flashed off, leaving no appreciable deposit. But when an overabundance is thrown up, the heat of explosion can only vaporize the exposed surface or outer layers so to speak, of the oil film, because of its poor heat conductivity, and blow it out with the exhaust gases in the form of smoke, leaving behind heavy end-products of destructive distillation. These are rapidly reduced by the intense heat of open-throttle explosions into a cumulative incrustation called carbon deposit in common parlance. The actual free carbon content of this carbon deposit may vary from less than 1 to as high as 75 per cent. Other constituents present are metal oxides, mostly iron, from a trace to approximately 5 per cent., large percentages of inactive earthy matter (road dust) and solid black carbonaceous or asphaltic compounds, according to the oil used. An analysis of crankcase sediment, taken from a laboratory motor, showed free carbon under 2 per cent., metal dust less than 1 per cent., the remainder being nearly equal quantities of carbonaceous matter, (1) soluble in naphtha and (2) soluble in carbon disulphid. And the analysis of deposit taken from the crankcase side of the piston heads showed ap-

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proximately the same percentage of the above constituents, excepting a slight increase in free carbon.

Given an oil of good quality, carbon deposits resulting from its use, up to the point where trouble occurs, can and should be easily avoided between annual overhauls by the manufacturer's proper design of motor parts. While it is a fact that much can be done toward the suppression of mechanical defects, omissions of design and carbon deposits accruing therefrom, by correct oil specifications to suit the case in hand, it is decidedly unfair to suppose that oil alone can satisfactorily replace leaky piston rings, or to burden motor oil with a more exacting task in the cylinders than that of good lubrication with its helpful seal against slight gas leakage.

Below the piston heads, though the heat conditions there are somewhat less severe than above, chemical reactions within the oil are just as inevitable and continuous. No lubricating oil exists that will not undergo a chemical and, naturally, a physical change when exposed to the high temperatures on both sides of the pistons of automobile motors. In other words, there is no motor oil known that will not deposit sediment in the crankcase. A very marked difference does, however, exist in the rate of sedimentation of oils of good and of poor quality, used in the same motor under the same operating conditions. It seems logical to conclude, therefore, that the rate of sedimentation must be a dependable measure of durability and efficiency.

Suggestions Relative to Design.

The maximum mileage per gallon of oil in the best modern automobile motor is rarely above 1,000, as compared to that of the average motor which probably never exceeds 200. Why such a wide difference in efficiency? The answer is not hard to find. An examination of the 1,000-mile motor discloses the use of tight piston rings, large centrifugal rings on the crankshaft where it passes through the case, ample cooling fins in the pistons, vents between the crankcase chamber and the valve enclosures, etc. Briefly put, cooling of the oil in this motor has been properly cared for and leakage reduced to a minimum. The result speaks for itself.

To be specific regarding details of design: Oil surplus can be kept out of the explosion chambers by leaving the lower edge of the piston skirt sharp and by the use of a shallow groove just below the lower piston ring. Small holes are bored through the piston walls at the base of this groove and communicate with the crankcase. The similarity of the sharp edges of piston skirt and piston ring to a carpenter's plane bit makes their operation plain.

Faulty piston rings are not to be tolerated any more than is their careless fitting. Concentric rings are to be preferred with a maximum clearance between back of ring and bottom of groove, of 0.010 inch. The thickness of piston heads should not only be sufficient for strength but also for good heat conduction. If the bore exceeds 4 inches thin cooling webs should be provided in the head so as to fully utilize the cooling effect of the oil. The ideal piston, from the viewpoint of cooling, is of course that made of aluminum alloy.

The cooling of oil in the sump can be accomplished most effectively by radiating fins on its outer surface. The lower crankcase should be fully exposed to the outer air. A settling basin for sediment should be provided, having a cubic content of not less than one-tenth of the total oil capacity. The depth of this basin should be at least 3 inches and its walls vertical to reduce the mixing of sediment with the oil in circulation. The inlet to the oil pump should be near and above the top of the settling basin. Concerning filtering screens there is little to be said, save that their areas should be ample and the mesh coarse enough (one-sixteenth of an inch) to offer no serious resistance to the free flow of cold or heavy oil through them; otherwise the oil in the crankcase may build up above them to an undesirable level. The necessary frequency of draining and flushing out the oil sump differs greatly with the age (condition) of the motor and the suitability of the oil used. In broad terms, the oil sump of a new motor should be thoroughly drained and flushed with kerosene at the end of the first 200 miles, next at the end of 500 miles and thereafter every 2,000 miles.

Now, to answer a leading question that cannot be passed over lightly, namely: "What is the best type of lubricating system for automobile motors?" Without hesitation I would say force feed, i. e., a circulating system with feed under pump pressure to all crank and camshaft bearings. This system furnishes a copious supply of oil for carrying away the friction heat of bearings and for cooling the piston heads. In fact, the large body of oil in constant circulation offers the best conveyance for surplus heat to the outer air. Once the oil sump has been filled, no further attention is required. There is no danger of burning out bearings or scoring cylinders from lack of oil, fouling of plugs or carbon troubles. Furthermore, so long as there is water in the cylinder jackets and oil above the oil pump inlet, no amount of punishment by hard work on the road or high motor speed can injure any of the moving surfaces in contact.

In the early days grease of medium consistency was thought to be the only proper lubricant for use in transmission and rear axle mechanisms, but improvements made in the design of different devices for retaining the lubricants where the drive-shafts pass through the case have fortunately made possible the introduction of more efficient semi-fluid lubricants.

All lubricants possess a fairly high coefficient of expansion and when filled cold up to the center of the shafts will be expanded by friction heat and the level raised thereby to such an extent that the hot air above, also expanded, will force them out, even through tight joints.

As to the necessary frequency of inspecting the level of the lubricant in transmission and rear axles, or of draining and flushing out same, it would be merely a waste of words to give any definite figure. There are entirely too many variables involved. Suffice it to say that reasonably frequent attention should be given to maintain a uniform level in these mechanisms, and to drain them whenever a sample of the lubricant shows the presence of considerable metallic dust when examined by reflected sunlight. A thorough cleansing of the case between every three to five thousand miles will richly repay what it costs in lubricant by the increased life of the parts.

Commercial cup grease of a grade suiting the season should be used, exception being made only of the grease cups feeding the water-pump bearings and glands, where graphite grease gives better service.

The worm and sector in the steering-gear housing require a cup of fiber grease or a heavy gear compound, depending upon the tightness of the housing.

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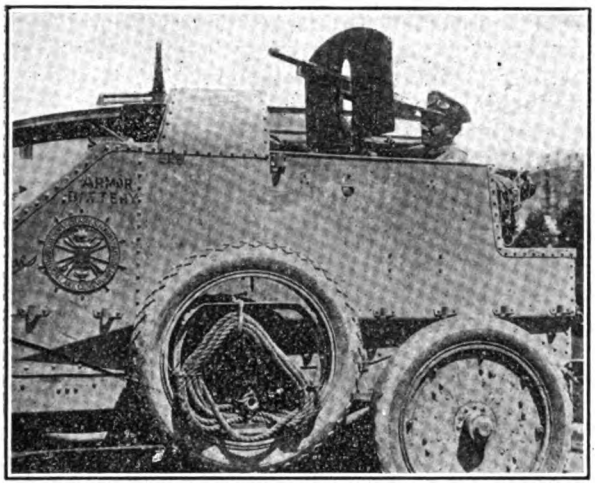
Preference should be given the latter wherever its use is possible.

With anti-friction bearings a medium grade of fiber grease will give entire satisfaction. In case the wheels are fitted with plain bearings a suitable grade of semi-fluid oil should be used.

Armored Automobiles.

From Felix J. Koch, Ohio.—The much-heralded Dixie Highway, the logical gateway between North and South, has given fresh impetus to all manner of matters connected with touring, and not the least interesting among these is the account of eight armored motor cars, which made the long run from North-West Military and Naval Academy, at Lake Geneva, Wis., to the great exposition at San Diego.

The long run, cross-country, was made under the direction of Col. R. P. Davidson, who is now engaged in compiling a report on the trip for the War Department. He believes that the motor car offers great possibilities in modern warfare and the trip of these cars, he declares, will have much to do with the adoption of the armored car by the United States



An American armored car, which mounts a Colt automatic gun, rapid fire. The driver occupies a compartment just in front of the gun and sees the road through a small window in the protective turret.

Army. In the train was eight cars. One is an officers' reconnaissance car, equipped with Rose military rifles, map, tables and periscope for observations behind embankments; indicators, range and elevation finders, and fire-control apparatus. The wireless car contains complete equipment which the boys are able to set up for almost instant use. Another car is equipped with balloon destroying guns. The balloon-destroyer is armored with bullet-proof steel.

Good Service and Good Tires.

How the Goodrich service department relieved a threatened beer famine on Long Island recently was told by Mr. T. A. Aspell, manager of the Truck Tire Dept. of the New York office of The B. F. Goodrich Company.

"We lay as great stress upon the service we give to our patrons," said Mr. Aspell, "as we do upon the the merits of our goods. The other day our service department in New York got a hurry-up telephone call stating that S. Liebmann & Sons' truck loaded with five tons of beer for distribution through Long Island had broken a tire near Greenpoint. This was at 9:15 in the morning. Immediately one of our auto trucks with a man from our solid tire shop was started to the aid of the disabled brewery truck. It is a forty-minute run from our branch to Greenpoint, but we brought the disabled wheel in, repaired the tire, and at 11:50 our truck was on its way back to Greenpoint. At 1 o'clock the five tons of bottled thirst-quencher were on their way to their destinations. Considering the heavy nature of the job, as well as the time involved in going back and forth from Greenpoint, I think this is top-notch efficiency."

AN EXCITING TRIP.

Automobile Driving as It Is in the Wilds of South Africa.

While he was not gunning for wild game, J. W. Kirkland, managing director of the South African General Electric Co., Johannesburg, South Africa, had plenty of opportunity to bag partridges, hares, or, in fact, monkeys, if he so desired, during a record breaking 1,097 mile trip from Johannesburg, South Africa, to Capetown, which he took recently. At one time, in fact forty or fifty baboons crossed the road so near the Franklin touring car in which the trip was made that he had to slow down to avoid a collision.

This was only one of the many interesting incidents that the party experienced in their thrilling trip across deserts and over mountains. The party included besides Mr. Kirkland, a Portuguese army officer and a mechanic.

On the day of the start from Johannesburg they had traveled but 100 miles when they drove into a mass of submerged boulders. They became so firmly lodged that one of the party was forced to walk four miles to the nearest ranch house to find assistance. Five hours later, with the help of two span of oxen and some natives the party were on their way to Kimberly. Swarms of mosquitoes, even thicker than the proverbial New Jersey pests, made sleeping in the open a thing to be avoided.

For days previous to their departure rain had been falling steadily. Just before reaching the Orange River they were advised by some natives that the bridges had been washed down stream by the torrents. After considerable maneuvring around they at last found the only bridge that withstood the rains for miles around, and crossed the river over into Hopetown.

Perhaps the most exciting part of their trip occurred in the Stormberg Mountains. They were ascending the mountain after dark and had reached an altitude of 4,000 feet, when they attempted to cross what they thought was a pool, but which turned out to be a small sized pond.

In order to again gain firm ground it was necessary to enlist the aid of two young Boers, who were found sleping in a dilapidated hut a mile away from the scene of the accident. After producing a shining gold piece as a reward, they quickly stripped to the waist to lend assistance. Needing more help, the young Boers gave chase to two half-wild horses pasturing nearby, finally corraling them in true wild west style. With the combined efforts of four men and the ponies the car was brought back into the road.

In many places Mr. Kirkland experienced roads that were almost impassable, but his car ran right

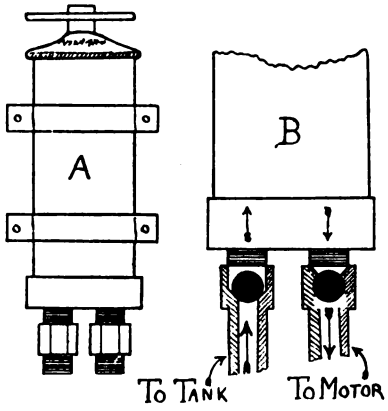
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along without any injury except for some scratches that occurred when going through the Stormberg Mountains.

Although held back many hours as a result of these peculiar incidents, Mr. Kirkland and his two companions established a record in going over the route in 97 hours elapsed time. This trip shattered the former record made by a member of the Transvaal Automobile Club by four days.

Auxiliary Oiler.

The supply of lubricant for motors equipped with the all loss system; that is, where the oil is poured into the crankcase and consumed, requires renewal according to the mileage. On long trips the supply is generous at first but after a number of miles it decreases. As a result the motor is flooded, then started. A reader of the Automobile Dealer and Repairer contributes the following suggestions for installing an auxiliary oiler, one that can be made at the cost of a few cents. It is fully as efficient, it is



claimed, as the manufactured oiler which costs in the neighborhood of four dollars.

The oil pump was constructed of an old tire pump which was cut off about six inches below the handle. The wooden handle was displaced and a metal one fitted as shown in the drawing at A. The bottom of the pump was removed from the tube and soldered very carefully, and the outlet for the air plugged and soldered. Two check valves of the solderless connection type were procured and fitted to the bottom part of the pump as shown at B by drilling and tapping. It is important that the valves be inserted so that they will work in opposite directions. That marked "To Motor" in the sketch allows the oil to be forced out of the pump but will not permit the lubricant to re-enter the pump. The other valve works in an opposite direction, allowing oil to be drawn from the supply tank into the pump when the handle is pulled up, but upon pushing down the handle the valve closes or seats.

The tank valve is connected to the source of supply by copper tubing, and the container may be located as desired and of any practical capacity. The pump was secured to the heel board under the front seat, and enabled the driver to force oil to the crankcase as desired. The entire material will not cost over 40 cents and if properly assembled will work as well as an expensive pump.

CARBON MONOXIDE.

The Deadly Odorless Gas That Is the Cause of Danger in Closed Rooms.

From E. H. Van Patten, Ph. M., M. D., Washington.—I have noticed several articles in your journal concerning the effects of exhaust gases upon autoists, while running their cars in a closed room, and think it might be profitable to have some one explain just what has occurred in these cases. I have had a limited experience in such cases, but enough to justify my study of the causes which are operating under such conditions. It is well known that the natural products of the explosion of gasoline mixed with air in the cylinder of a gas engine, are composed of carbon dioxide, or one atom of carbon united with two atoms of oxygen; together with nitrogen, and some watery vapor. This is what theoretically occurs when the mixture is just right. However, this condition of perfect mixture very rarely is in evidence. If there is too much gasoline for the air taken in at each suction stroke, there will not be enough oxygen to saturate all of the atoms of carbon present in the gasoline, and as a consequence some of the carbon atoms get only a single atom of oxygen, which makes an entirely different gas, and one which is much more poisonous.

It is usual for the carburetor to be set so as to have a richer mixture while the engine is idling, than when running at speed and under load, and this furnishes the exact condition for the production of carbon monoxide, which is the great cause of the danger. This gas, carbon monoxide, that is one atom of carbon united to one atom of oxygen, is a very poisonous substance. It only requires about two per cent. of it in the air to make the air poisonous.

Another thing which adds to its deleterious results, is that when it comes in contact with the blood in the lungs it forms a more stable compound with the blood corpuscles and prevents them from taking up the necessary oxygen. This is why such a small percentage of the gas in the air will cause headaches, and even death. The blood cannot get rid of it readily and the person affected dies for want of oxygen.

Some two or three years ago I was called to ascertain the cause of death in the case of a night watchman, who had charge of a railway gasoline motor car. There was no warm place to keep the car over night and as the nights were cold, there was danger of the water freezing in the radiator or the many pockets in the water cooling system connected with the car, if the engine was not run a part of the night to keep the water warm. The watchman closed all doors, windows and even the ventilators of the car, apparently in order to save the heat from escaping as much as possible. He started the engine slowly, which furnished the exact conditions for the formation of the carbon monoxide gas. The car had run off the track some time before this and without any one knowing it, there had been broken a hole into the exhaust pipe below the engine, where the exhaust gases were escaping. The engine room being sealed almost hermetically and the door between the engine room and the main body of the car being open, the heated gas rose inside the engine room and from thence found its way inside the smoking apartment, where the watchman laid down to rest. He never roused from his last sleep, and when he was found the room was filled with exhaust gases and he

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was rigid in death. The condition of his body showed death from carbon monoxide poisoning.

It is this gas that is so dangerous in running a gasoline engine in a closed room, or in breathing the gas for any length of time. When a rich mixture is being used, as is necessary for slow idling of an engine, the danger is the greatest, and too much care cannot be taken to avoid breathing any air mixed with exhaust gases for this very reason.

This gas is without odor, hence is not noticed in the air until it is too late. The odor of the ordinary exhaust comes from the products of burned cylinder oil, and this must not be confounded with the monoxide gas spoken of above. The exhaust gases ought to be always conducted outside by a pipe in case it is necessary for a gasoline engine to be run in a closed room, and all joints in the exhaust pipe and its connections should be perfectly tight, in order to render it safe.

I hope that I have made it clear why these gases are so dangerous. The least ill effects that may come from the gas is a headache, but when unconsciousness does occur from breathing the gas, it takes a long time to get rid of their effects. Watchmen in these cars of which I have spoken above often complain of headache, and ofttimes they have to lay off for a few days in order to get rid of the gas which has found a lodgement in their blood. The sooner automobilists realize the extreme danger which lies in breathing this gas the better. This is my only excuse for writing this article.

So Mr. Editor, if you think you have space for this explanation, and it serves to warn others of the danger in breathing the air charged with exhaust gases, I will feel amply repaid for writing.

TIRE VALVES.

Their Construction and How to Detect and Cure Valve Leaks.

The valve is a simple but very important part of the tire, and as it does occasionally give trouble its

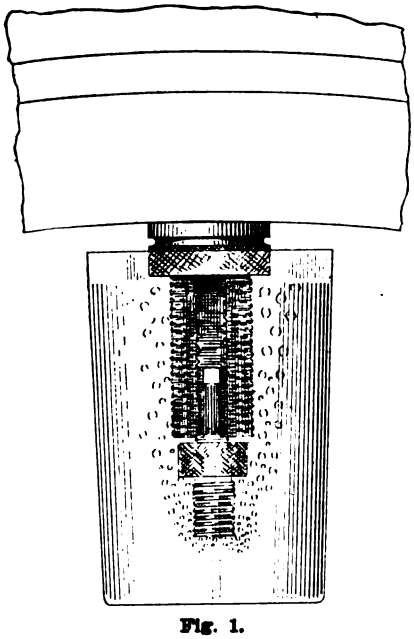


Fig. 1.

construction should be thoroughly understood. One frequently finds that a tire, which is apparently quite sound, will not hold air under pressure for any length of time. In such a case it is well to suspect the valve as the cause of the trouble, and, to ascertain if it be the culprit, the wheel should be turned round until the valve is at the top. Then both the caps should be removed and a glass of water held up to the valve, as shown in Fig. 1, so that the presence of leakage can be ascertained by the passage of bubbles. If a leak occur, the effect of screwing up the milled nut, A, Figs. 2 and 3, should be tried. The valve should then be again tested, and possibly the trouble may have been cured.

If, however, matters have not been improved, the valve must be taken to pieces, a simple matter, and a new washer fitted, also an easy job. A novice may hesitate to take a valve to pieces to remedy the defect, but he will find that the parts are few

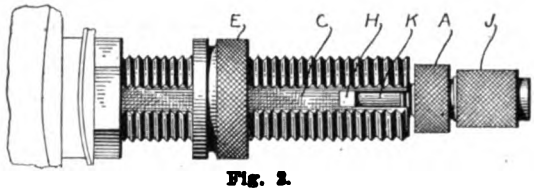


Fig. 2.

and simple, and there is no likelihood of any permanent damage being done.

To take the valve apart the milled nut, A, is unscrewed, exposing the short tube, B. This is then pulled out of the body, C, of the valve, and the needle valve, D, will come away with it. These parts are all shown in Fig. 3. The valve body, C, and the nut, E, are, of course, left undisturbed.

The parts of the valve are now all exposed, and they will be seen to be plain, straightforward elements which should give no trouble. The needle, D, carries a rubber block, F, which is conical in shape. This needle lies inside the tube, B, so that the conical block, F, closes one end of the tube, B, shown in Fig. 3, due to the block, F, not seating properly through the needle being bent or through dirt on the rubber block. Or the washer, G, may have perished.

To ascertain which of the two is at fault, if the cause of the trouble is not obvious, the valve, D, must be put in position in the tube, B, and the tube must be refitted to the valve body, C. To do this the tube must be slipped into the body so that the shoulders, H, lie in the slots, K, and the milled nut, A, is then screwed up tight. The tire should be inflated and the tumbler of water again used. To ascertain if the air leaks past the rubber block, F, the tumbler is so held that the water just covers the end, I, of the tube, B. If bubbles are seen to issue the air is obviously leaking past the block, F, and passing along the tube, B. Next hold the tumbler higher, so that the water completely covers the slots K. If the leakage takes place round these slots the washer, G, is defective.

Practically speaking, this washer and conical block are the only two parts which can give trouble, and they are quite easily replaced. Every tire maker supplies spares, and it is well to have two or three of each type handy. Occasionally, but rarely, the hexagonal nut at the end of the valve body, C, becomes loose and leakage may occur at this point. This trouble is not likely to occur during use, unless the tire is running more or less deflated, but it is always advisable to ascertain whether the nut is tight before fitting a tube, either a new one, a spare,

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or one that is to be refitted. It is obvious that leakage along the tube, B, can be stopped by closing the outer end, I. In the cap, J, is a small rubber block, and as the cap is screwed on to the tube, the block closes the end of the tube, I. The closure at this point is really only a safeguard, and too much reliance must not be placed upon it. The conical block, F, should do its duty unaided, but if it does not seat properly, and it is inconvenient to replace the valve needle, one should see that the rubber block in the cap, J, is in good order, and screw the cap tightly home. The rubber blocks in these caps do not last long; often a leather block gives better service. The sleeve, L, is only a dust cover, and not intended to assist in retaining the air.

If, therefore, any particular tire is found to lose pressure every two or three days, it is well to follow out the treatment mentioned. A rough test may be

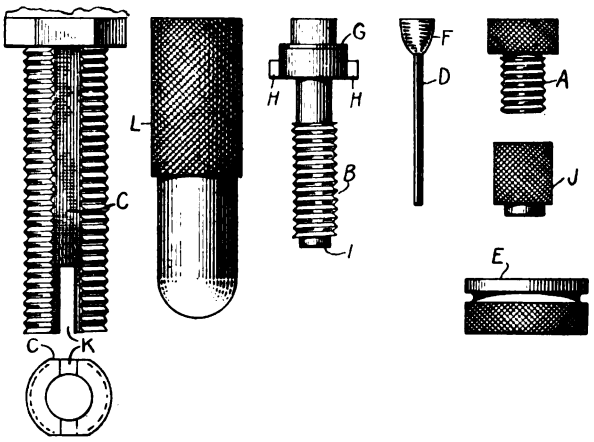


Fig. 3.

made by removing the caps, L, and J, wetting the finger and holding it to the end, I. Bubbles will indicate whether there is any escape past the block, J, but without a tumbler of water it is difficult to ascertain if there is any leakage past the washer, G. The milled nut, A, should be inspected and tightened up occasionally. The valve parts of different makes of tire are not always interchangeable, so it is well to keep the parts of different makes separate.

It is quite possible to tell if a tire cover has been overloaded, that is to say, if it has been used on a car which is too fast or too heavy for the size of tire used. A tire which has suffered from overloading commences to give way in the casing; the threads break all round inside, and if a careful examination be made frayed lines will be seen which, though not very noticeable, yet when once seen can always be recognized.

Poisonous Auto Gases.

From George S. Boucher, Virginia.—I have read with interest your article in the June issue on "Auto Gas Poison," by Lester Curtis, M. D. This is the first article I have ever seen on this subject, and I thought possibly by relating my experience I might save some person's life. In the first place, I have always been very healthy and strong, and the thought of being poisoned by auto gas had never entered my mind. I was working in my own garage and had the motor running part of the time. It being a rather cold day I had all the doors closed, and evidently was overcome by this poisoned gas that the doctor writes of. One of my little boys, who was passing the door, heard me fall, and summoned help, and it was several hours before I could walk. However, I have entirely recovered. The doctor who attended me at the time said it was likely from the exhaust gases from the car, but I do not really think that he was aware of the real poisonous nature of these fumes. I have been in a good many tight places, and had a hard fight with typhoid fever, but in my 41 years I have never been quite as near the "Getting-off-place," as on this particular occasion. I wish to add this to the doctor's warning, that any gases that will put me in the shape that I was in on that day, will seriously interfere with the regular running of that little motor on which each man's life depends.

THE JITNEY BUS FUTURE.

It Will Finally Occupy a Place Between Street Cars and Taxicabs.

From Automobile Chamber of Commerce, New York.—There does not seem to be the slightest doubt that the jitney bus marks the entrance of one of the most wonderful of our modern inventions into a further field of usefulness from which it is not going to retreat even though the surprise to the public that it can be so used is perhaps a little greater than the surprise which has accompanied the several other stages of the automobile's development.

At a five-cent fare or even at a ten-cent fare, the flexibility of service supplied by the motor car and the service rendered to the public during rush hours and over routes not covered by street car lines, counts for its increasing use and the demand of the public that its use be fostered and not hampered by legislation of a confiscatory nature.

The use of the automobile in carrying passengers for a five-cent fare is said to have originated in the West. One story is to the effect that a public driver, while proceeding down town in a Western city, noticed groups of people on corners waiting for street cars, that service having become interrupted. It occurred to him to pick up a load at the same fare as charged on street cars, which he did, going back for other loads. With this start he made a practice of carrying passengers in this way and put additional machines in the service. Other drivers noticing this did the same. The idea spread to other cities and similar service is now in effect at different points throughout the United States and Canada. While there is no definite record, it is known that several hundred are in operation in such places as Los Angeles, San Francisco, Oakland, Houston, Kansas City, Omaha, Atlanta, New Orleans, Birmingham, Philadelphia, Baltimore, Providence and Toronto, Vancouver and Winnipeg. But however interesting the origin of this service may be it is now of about as much importance as the events which led to the discovery of steam. The main fact of interest to the public is that this new form of transportation service is here, and it is the advantages to be derived from it that now demand attention.

While the advent of the jitney bus came suddenly and as a great surprise to most people, and with accompanying criticism and prophecy of failure not uncommon in such matters, it was not equally surprising to those who have been in touch with the development of the automobile industry. We all

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know that the automobile itself was at first looked upon as a freakish sort of thing which pessimists conceded would be well enough as a sport for the wealthy, but those who devoted their time and money to its future development at that time first foresaw a more general use of the automobile and later were ahead of the general public in realizing its ultimate perfection, its further usefulness and necessity and the improvement in manufacture to a point where the public in general could have it at a price within their reach. As these various stages of development were realized in advance by those in touch with the industry, so now the usefulness of the motor driven vehicle in handling passengers regularly at a low fare, is to their minds a certainty, although some people seem to consider that the jitney bus is a passing fancy. The present rather chaotic conditions under which the jitney buses are operating will pass, but undoubtedly there will remain a properly regulated service of this character. Much of the opposition has been of an artificial nature and voiced from a more or less selfish standpoint, but the thing that will determine the future of this new method of transportation in city streets is whether it is a public utility and economically correct, and it is in consideration of these points that it will finally be judged. The public will certainly not permit of its being denied an opportunity to demonstrate its usefulness merely because certain persons or interests are affected. If a new and dangerous competitor of traction interests has appeared, those interests must sooner or later meet this competition; they cannot hope to strangle it any more than trunk line carriers could prevent the final development of trolley systems. Each has finally come into its own portion of traffic that naturally takes to the different channels, and it is certain that a portion of traffic is going to take to the motor vehicles.

Nor is a five-cent fare necessarily a condition under which the automobile must be used in the handling of passengers. Everybody who goes to the theater doesn't elect to pay $2.00 for a seat, although everybody present sees the same show. It is quite possible that there is a middle ground somewhere between taxicabs and street cars that in many localities would result in a line of properly equipped and operated buses doing a good business at a ten-cent fare.

Some city authorities have feared accidents due to the sudden appearance of jitney buses in large numbers, but it is worthy of note that other cities do not appear to be troubled particularly in that respect, and we can see no reason why that sort of thing should continue. It may have resulted at first from a mistaken idea of drivers, possibly not as experienced as they should have been and would be under proper regulations, as to the speed they should make with their passengers, but excessive speed, in the final analysis, is certainly not going to be expected of those vehicles. It would be no trouble for them to cover a given route as rapidly as trolley cars, and their flexibility in handling would seem, in the long run, to argue for greater safety. Certainly, if they pick up a certain percentage of passengers, notably women and children,, at the curb, who now have to go to the middle of the street to take street cars, there is a possibility of eliminating a certain number of street accidents.

Some have expressed the view that the jitney bus is merely the product of a temporary condition whereby the country finds itself with a surplus of second-hand automobiles and thousands of unemployed men. If this is true, let us give one more cheer for the automobile and what it has done for the country. It is needless to recite again the growth of the industry and the hundreds of millions of dollars that it has added to our industrial development annually in its own and allied industries. If it has, at this time of business depression given employment to thousands of unemployed men in a field of individual effort, nowadays hard to find, it is something very much to be desired. But if anybody believes that all of the second-hand automobiles have been put into use and will soon be worn out, let them not forget that nearly 650,000 new ones have just been added to the supply with the close of this year's manufacturing season, and that an even greater number is anticipated for the coming year. A considerable proportion of these machinos is absorbed by persons who have old ones but who can afford to dispose of them to gratify their desire to be in possession of new ones. Whether all of the men who have undertaken to earn a living by buying second-hand machines and carrying passengers are making suitable allowance for depreciation, so as to replace their machines when worn out, is another matter, but it may be taken as a certainty that throughout the country there are automobile dealers and other capable men who will not let the opportunity pass to operate those buses where the business prospects exists, and they will not have to depend on second-hand machines to do it. The industry has reached a point where new cars can be produced at a satisfactory price and so built as to be ideal for this purpose.

Objection has been heard that operators do not give proper consideration to their methods of securing passengers—carrying signs to indicate routes, examination of their vehicles, points at which they stop, and that overcrowding is permitted contrary to the requirements of safety; but it is apparent to any one that these are details for proper regulation and do not affect the final determination of the question any more than improper operation of street cars in similar respects. Others say that the public has taken to the jitney bus merely as a novelty and that the trend will be back to the street car. This may be true to some extent, but of the many who ride for novelty, can it be expected that none of them will continue from preference?

On the whole, those who are attempting to forecast the future of the jitney bus should, to reach a sound conclusion, avoid consideration of many details which will right themselves or be controlled by local regulation. It is going to resolve itself into a straight business proposition, for, so far as the public is concerned, patronage is undoubtedly assured and to a greater or less degree according to the competition which this new service will have to meet in the way of traction facilities, and it must not be overlooked that in many places the jitney bus will supplement, rather than compete with, trolley lines.

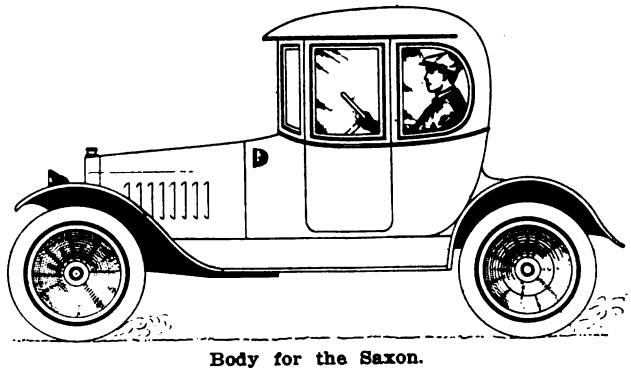
The question is whether automobiles, new or old, and considering also the possibility of equipping old chassis with more suitable bodies, can be furnished at this stage of the industry and operated at a cost that will show a profit, assuming a proper and reliable service. On this depends whether the public will continue to have this service, which it wants,

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and not on any artificial consideration of its effect on the earnings and service of traction companies. If their earnings are impaired, it is only because the public, as a matter of choice, prefers this new method of transportation, and the traction companies will get back their earnings if they are in position to meet the competition; if they cannot do so, their business will suffer exactly as any other business must take its chances with competitors. Interurban trolley systems are to-day existing on business which they have taken from the railroads, and those interested in the jitney bus will see to it, so far as obstructive legislation is concerned, that they are given a fair opportunity to operate just as the traction systems look after their similar interests. To some extent the trolley lines will undoubtedly be able to hold and regain patronage; this will depend on local conditions, but it is certain that in many cases the flexibility of the automobile as to handling any new routes can and will both supplement and compete with the regular trolley lines and in many cases this service will be much preferred by municipalities and the public to a further extension of rails. The matter of license fees, routes, safety of machines and ability of drivers to properly operate them, are details that will be determined and regulated in a reasonable and proper manner.

Design for Saxon Top.

From E. G. B., New York.—The car shown in the illustration is a Saxon, two passenger, with a wheel base of 96 inches. The wheels are 28 by 3 inches, clincher tires, and has a standard tread. The seat is 16 inches deep, 40 inches wide, and 30 inches from heel board to dash. The door of the car is 18 inches wide. This design of top can be mounted on the car, and will be more comfortable in the winter season than the ordinary top. It can also be removed when necessary. In the construction of this top, it has two front window lights, two side or door lights, and two D-shaped windows each side



Body for the Saxon.

of the rear, with an oval window at the back. The top can be held in place with the ordinary fastening devices now in the market. This top can be made of metal, or the ordinary hood material, and will be found a very attractive design.

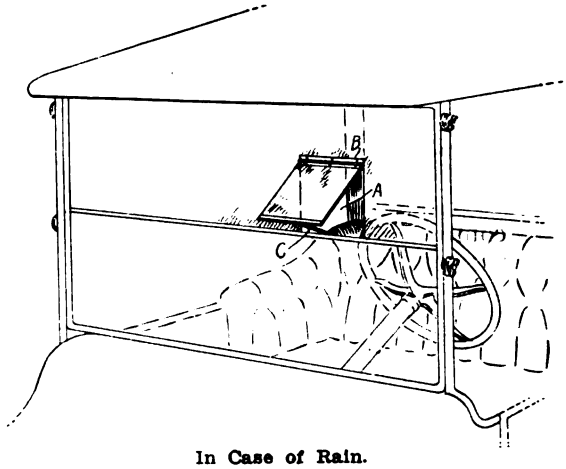
A New Cone Clutch.

One of the few original mechanical features of the new automobile models, now gaining general circulation, is the use in the 1916 Maxwell of a cone clutch, snugly housed and running in a bath of ordinary lubricating oil.

"The best test of our new clutch is the way it has satisfied buyers of our 1916 cars all over the country," declares President Walter E. Flanders. "We have given them something that will add a good deal to their comfort; that was our chief purpose in making the improvement. But we aren't losing sight of the fact that this new clutch is going to prolong the life of every Maxwell car. The clutch that grabs is as hard on the car itself as it is on the passengers. By smoothing the way for both we've done something that pleases everybody in our organization."

A Rain Shield.

From E. G. B., New York.—The ordinary windshield does not give the proper protection to the



In Case of Rain.

driver of the car in stormy weather. When the shield is closed, it is sometimes impossible to see, especially when it snows, and it has been the cause of many an accident. The writer has designed a shield that can be raised, when the main shield is closed. The glass of the main shield is cut to give a 7-inch square opening, as at A. There the 7-inch square piece cut out, is hinged to the main glass by a long metal hinge, B, which is riveted on. The rain shield is held up at any angle by a bar, C, and securely fastened. Miniature working drawings can be had at a reasonable charge, if it should appeal to the reader.

Cost of a Grade Crossing Accident.

Mrs. Elizabeth Warden Pell, who sued the Long Island Railroad Company for $250,000 for the death of her husband, S. Osgood Pell, at a grade crossing August 3, 1913, has won a verdict of $25,000 in the Queens County, N. Y., Court.

In court were Mrs. Bell, Mrs. Nathalie S. Laimbeer, who is suing for $250,000 for the death of her husband, William S. Laimbeer, and $250,000 for injuries to herself in the same accident. Augustus Van Wyck, counsel for Mrs. Pell, asked for an extra allowance of 5 per cent. of the amount as his fee. Justice Aspinall allowed this, amounting to $1,250. It was contended by the railroad company that Mr. Pell was driving recklessly. It is understood the railroad will take an appeal.

Mrs. Laimbeer's suit and that of the widow of Domenico Gambino, the chauffeur, killed in the accident, will be tried in the fall. Since Mrs. Pell's suit began the railroad company has been erecting safety gates at the crossing.

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BEST TYPE OF AXLE.

Claims That the Semi-Floating Construction Has Most Merit.

J. E. Gramlich, chief engineer of the Chase Motor Truck Co. of Syracuse, N. Y., says:

"First of all, let us consider the real difference between the semi-floating and the full floating axle. In the semi-floating type, practically all of the weight of the truck and the pay load is carried on the axle drive shaft and the corresponding bearings. In the full floating type, the weight of the truck is carried on the axle housing, and none of the weight is carried on the drive shafts. In the semi-floating type, in addition to carrying the weight of the load, the drive shaft, must take the driving strain. In the floating type, the drive shaft takes only the driving strain. On the face of it, this appears to be a favorable argument in favor of the full floating type of axle. However, it does not work out this way.

"It is a comparatively simple piece of engineering to design a drive shaft capable of taking the combined bending and torsional moments which occur in the drive shaft of the semi-floating type of axle, and when the shaft is properly designed to take care of this combined load, there is little danger of breaking it due to overloading the truck and causing the axle to bend or break due to exceptional driving strains being put upon it. It is probably no more difficult to design a full floating type of axle, and make the axle sufficiently strong to take all the torsional strains due to driving, and to make the axle housing sufficiently strong to take the bending strains due to loading.

"It is, however, a rather difficult proposition to get the material to make the axle tubing, of which the housing is made of the proper size and material to overcome any bending due to loading or overloading to which practically all trucks are subject.

"This accounts for the necessity of truss rods on practically every type of full floating axle that is on the market at the present time.

"We admit that it is simpler to remove a drive shaft from the full floating type of axle than it is from the semi-floating type, but, properly designed, there should be no occasion to remove the drive shaft, so that this question can be eliminated from the discussion. Occasions arise, however, when it is necessary to remove the rear wheel, and we believe it is simpler to do this from the semi-floating type than from the full floating type, as there are fewer parts to handle.

"In the full floating type of rear axle construction, there are two ball bearings in the wheel hub, as against one ball bearing at the end of the axle housing in the semi-floating type. These end bearings serve a double purpose. First, they must carry the radial load of the truck, that is, the dead weight of the axle, the chassis and the pay load, and, at the same time, take care of the thrust load imposed upon them, due to the fact that the truck will skid and slew. Rough roads and car tracks have this same tendency to put strains on the wheels, pulling the bearings under a thrust load at all times.

"In the full floating type of axle, with these bearings mounted in the wheel rub, itself, the leverage to prevent this bending of the rear wheel, is very slight, whereas in the semi-floating type, this leverage is at one end of the drive shaft, or, in other words, in the middle of the axle housing, and the thrust load is taken care of with less strain on the bearing, than it possibly can be in the full floating type of axle.

"Owing to the difference in construction of the two axles, the semi-floating type is much more simple to assemble and to keep in adjustment, than the full floating type. The few parts in the semi-floating type make it lighter in weight, cheaper in upkeep, and more readily accessible.

"The load distribution is such that it permits of the use of smaller ball bearings, and consequently, reduced cost of upkeep of these bearings."

Starting on Batteries and on Magneto.

From Wm. J. Raeuber, Wisconsin.—I noticed in your last issue an inquiry from Mr. H. D. Pierce of New York about having trouble in not being able to get a spark when his switch was on battery but that he could get his motor to start when the switch on the coil box was on the magneto. I had the same trouble and after going to some expense by sending the magneto and coil box to Milwaukee to be tested thinking that possibly I had short circuited the magneto or coil, I solved the trouble myself.

Shortly before doing this I had trouble in starting or shifting over to the magneto, after the motor was started, and I had to run on battery, but one day I gave a rather strong shift over to magneto and from that day on I could not start the engine with the batteries, just as our friend from New York experienced. Then I sent the whole outfit to Milwaukee and all they did was to change the breaker bar and put on new points, but after I got the magneto and coil back in place I found the same trouble and so I decided to take the situation into my own hands with the following results: In the first place I went over all the wiring and connections and put in new batteries with the same results that I could start on the magneto but not on batteries. Then I took off the round metal cover that holds the switch key, plug and pushbutton in place (first putting the switch on battery to see if the contacts were right), then by taking a screwdriver and trying the circuit I found that all right by getting a spark when I tried the motor but it would not go, so I examined the contact back of the brass lever and found that it did not quite touch the last button to close the circuit for the batteries, and by simply pushing it ahead about 1/16 inch the motor started by simply making and breaking the circuit at the push button. So I had solved the whole mystery, and all it needed was to get another plug that fitted the square hole exactly, as before there was some play, the plug being worn from use, just enough not to allow of the proper contact. I did not get a new plug but took a thin sheet of brass and fitted it around the shank of the plug and flowed some hard solder around it and then filed it down until it fitted the square hole in the switch key exactly, and now it works like a charm. I have no more trouble with either the magneto or battery starting the motor. I hope this information will help the trouble our friend from New York is experiencing with the same kind of automobile.

I wish to say that since I got the switch fixed I took the breaker bar off and put back the old breaker arm just to see how much these experts from Milwaukee knew about it and I found that my old breaker arm and points work just as well as the new ones.

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GASOLINE DANGERS.

The Average Person is Careless in Handling This and Other Oils.

From Oildom.—Gasoline is more dangerous than powder, is more apt to explode than guncotton, and has the explosive power of dynamite.

A recent tabulation made by K. G. Martin, of the Fire Prevention Bureau of New York City, shows that during 1913 in the United States 1,040 persons were burned to death and 3,120 persons injured (a weekly average of 20 persons killed and 60 persons injured) on account of gasoline fires. Surely an appalling number, both in killed and injured. And the injuries sustained from such fires on account of the high burning quality of the oil are in most cases severe and cause serious injuries or disfigurements for life. These accidents do not take into account the great loss in property that accompanies these accidents. Therefore, when we calmly think over these figures as a cold-blooded life and death proposition it behooves the oil man to take the role of an educator and warn the public with some of the dangers connected with oil, and particularly gasoline.

Women Should Be More Careful.

It seems almost beyond belief that women will bring into homes gasoline for cleaning purposes, which is dangerous to use under any conditions, and handle it with even less care than they would an equivalent amount of water. They are not aware that the invisible vapor from gasoline, and similar explosive fluids, will travel great distances and yet retain enough body to ignite in the presence of a spark or open flame and to flash back to the main mass of gas that surrounds the place where the work is being done and the liquid used. In such instances gasoline should be used only by an open window and then only when there is no fire in the room.

As a matter of fact it would seem a splendid policy if each State should pass laws regulating the sale and use of gasoline on the same principle as other high explosives, notably dynamite, are regulated. The public should realize that gasoline is dangerous.

According to the tabulation above quoted, it would seem that many fires originated from the cleaning of silks, due to the generation of static electricity by the violent rubbing of the silk in the oil, which produces a spark and naturally an explosion. Another great source of danger is in the automobile garage by people who feel that gasoline can be handled the same as water, since they fail to understand that the vapor from one pint of gasoline can generate 200 cubic feet of air explosive with a power equal to that of dynamite.

A very dangerous practice is the cleaning of automobile parts with gasoline from an open can. Employees find it easy to clean grease and oil from the motor and other parts with a brush saturated with gasoline. This gasoline is then readily ignited by a spark such as caused by striking two pieces of metal together, a spark from the ignition on the automobile by turning the starting crank or other cause that will create a spark.

In an instance of this kind a nut became obstinate and was struck with a wrench, causing a spark. The car was instantly enveloped in flame. The result was that the man was injured and after the fire was extinguished the car was of no further use. Backfire of the motor frequently results in the destruction of cars.

Oily waste should at all times be placed in a safe receptacle on account of spontaneous combustion. Oily waste will decay, smoulder and in time burst into flame. Sawdust, when soaked with oil drippings, will do the same thing and its use must be forbidden. Sand is the only safe commodity that will absorb oil.

Cause of Spontaneous Combustion.

In the homes spontaneous combustion caused by oily rags and cloths kept in closets is a frequent source of fire. Oil rags are used in rubbing up floors, furniture, ranges and miscellaneous metal work. The recently widely extended use of floor oiling mops has increased this danger to an appreciable extent on account of the comparatively large amount of oil which these mops hold and the considerable friction and consequent heat generated in their use. The oil on and in the fibres of the oily rags and mops, when not of mineral origin, oxidizes rapidly, and, in the confined spaces in which they are kept generates enough heat to ignite the particles of dust and dirt with which they are covered. The best way to obviate the danger of spontaneous combustion is to keep such rags and mops separated as much as possible, to remove all excess oil before putting them away and to secure ventilation for the place where they are kept by keeping the door ajar or by boring holes in the door or sides of the closet. These precautions will lessen the chances of heat being generated and the supply of fresh air will keep the temperature down to a point where combustion is not possible. Even then the rags should be kept in a galvanized iron pail.

Another source of occasional fires is caused by the use of kerosene in lighting fires in the ordinary cooking or heating stove. Kerosene should never be poured in a stove in which there is a spark of fire, neither should it be used in a stove in which the fire is out but still warm. Neither should kerosene lamps be filled while lighted, which, however, is a very prevalent practice through the country districts. Kerosene lamps with metal oil wells are safe and preferred to the ordinary country lamp with glass fonts.

Big Automobile Exports.

Figures for automobile exports from the Department of Commerce at Washington with information compiled by the National Automobile Chamber of Commerce show that for the year ending June 30, American manufacturers exported 37,870 motor vehicles, valued at $60,254,635, with parts valued at $7,000,000, making the total exports of the automobile industry $67,254,635—an increase of more than 100 per cent. over the sales for the previous twelve months, which amounted to $33,198,806.

While the greatest increase has been in trucks to European countries, passenger car exports to Europe show a substantial increase, although there was a falling off to South America and Canada. The United States exported 13,996 trucks, valued at $39,140,682, and 23,880 passenger or pleasure motor vehicles, valued at $21,113,953, with parts valued at approximately $7,000,000, making a grand total of $67,254,635.

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NEW AND INTERESTING THINGS IN MOTORDOM

The Modern Gasoline Automobile.

The publishers have just issued a revised and enlarged edition of this work, bringing the information and improvements in relation to automobiles and their accessories right up to the present time. In this new 1916 edition, the subject of electrical motor starting systems has been considered at length and all leading systems and their components described. A discussion on ball and roller bearing, their maintenance and installation, has also been included, and a number of other features of timely interest such as latest types of gasoline and kerosene carburetors, cyclecar power plants, the Fischer slide valve motor, detachable wire wheels, cantilever springs, eight and twelve cylinder motors, new valve operating systems, Stewart-Warner vacuum fuel feed, Boat type body design, leather universal joints, Entz electric transmission, positive differentials, armored automobile, hydraulic brakes, etc., etc. Entirely new material has been added on tractors in three and four wheel forms, cyclecars and agricultural tractors or automobile plows; combination gasoline-electric drive, front-wheel and four-wheel drive and steer systems and other important developments in power propelled vehicles. The discussion of power transmission methods has been augmented by consideration of the skew bevel gear and two-speed direct drive rear axle, as well as several new forms of worm gear drive, etc., etc., have been added to bring the work thoroughly up-to-date.

The book tells you just what to do, how and when to do it. Nothing has been omitted, no detail has been slighted. Every part of the automobile, its equipment, accessories, tools, supplies, spare parts necessary, etc., have been discussed comprehensively. If you are or intend to become a motorist, or are in any way interested in the modern gasoline automobile, this is the book you cannot afford to be without. The book contains 600 illustrations, 850 pages and 12 folding plates. The price is only $2.50. Address Editor, the Motor Vehicle Publishing Co., 71 Murray St., New York, or the publishers, The Norman W. Henley Publishing Co., 132 Nassau St., New York. Sent postpaid on receipt of price.

A Useful Oil and Gasoline Gauge.

The Charles W. Manzel Co., 309 Beard Ave., Buffalo, N. Y., has placed on the market a device to determine the proper oil level for the lubrication of the engine, and to read the number of gallons of gasoline to fill the tank. It is made especially for Ford cars. The device can be folded up like a jack knife and placed under the seat of the car, and is guaranteed to give satisfaction. Anything of this sort is likely to save quite an expense as it will prevent the cutting and burning out of bearings and ruining the motor by a lack of lubricating oil.

A New Spring Lubricator.

A handy, quick and simple tool for lubricating automobile springs is being manufactured by the Charles W. Manzel Co., 309 Beard Ave., Buffalo, N. Y. The statement is made that it will make a Ford car ride as comfortably and easy as any high-priced car. It injects soft graphite grease between the leaves of the springs and does it quickly and easily. Each application is good for 1,000 miles. The use of thin oil between the leaves of springs is not advisable, for it soon works out and wears away. The Tomahawk spring lubricator is filled with soft graphite grease, and comprises a wedge which is easily pushed between the leaves and the grease thus applied quickly. There is a guarantee that goes with this device of a refund of the purchase price, if it does not do what is stated.

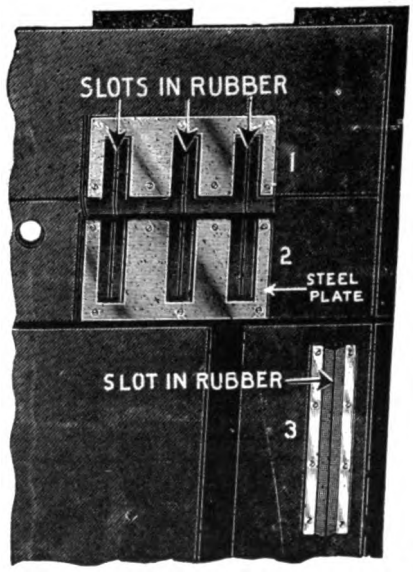
Presto Car Cool.

This device is made by the Metal Specialties Co., 730 W. Monroe St., Chicago. It is made up substantially from sheet steel with slots cut in same to



Face Side Showing Lever Slots. Car-Cool Fastens Under This Plate

match the pedal slots and emergency brake lever slot on the Ford car. Between two pieces of this steel is placed three sheets of rubber, slotted, so as to allow the free action of the Ford pedals and brake lever, but at the same time



Showing the Under Side.

closing the slots automatically, thus preventing the intense heat from the engine from coming up through these slots in the foot boards and deflects the heat down and back under the car. The device is also as beneficial to the driver of a Ford car in the Winter time, as it keeps out the intense cold draughts of air, thus keeping the front of the car comfortable at all seasons of the year. It is durable and is being marketed at a very popular price. The accompanying illustrations give a good idea of its uses. It insulates the floor from the excessive heat of the engine and drives the hot air back beneath the car, closes all the lever slots irrespective of position of lever and in no way interferes with the free action or running of the car or taking off floor-boards. Each part made to fit and marked where it belongs. The average boy can attach in twenty minutes.

Accessories for Ford Cars.

The Goodrich Accessories Association, 302 North Broad Street, Philadelphia, are selling quite a variety of accessories for Ford cars, at very low prices. Among them are rear axle truss rods, break lining and wiring assembly outfits. They are of the highest grade and most approved design, and the prices are so low that they will attract close buyers who need anything of the sort. They sell scores of Ford car accessories and it would be well enough to send for their catalog, because you may find in it something you need badly.

Warm Hands Insured.

The cold weather will soon be here and if you would keep your hands warm on the steering wheel, you should under no circumstances do without the Ieco Steer Warms. They are easily placed on the wheel, and by keeping the hands warm they not only preserve the health, but make driving far safer. They save on gloves, the price is low, and they are guaranteed to do absolutely what is claimed for them. For full information address the Interstate Electric Co., 845 Perdido St., New Orleans, La.

Warner Upholstery Covers.

These covers are very attractive and they add materially to the beauty and attractiveness of the entire car. They also prolong the life of expensive leathers and insure protection to delicate finery often spotted or ruined from sticky oily leather. They also serve to cover worn, shabby upholstery and restore newness to the used car. Ever since the inception of the automobile industry the name of Warner has been connected in a large way with the manufacturing of auto parts and Warner Auto Tops have been used exclusively by some of the world's largest manufacturers. It is expected that there will be an enormous demand for the Warner Upholstery Covers, especially as they are to be advertised on a very large scale. Car owners as well as dealers should write for catalogue and in the case of dealers for samples to the Warner Auto Top Co., 1636 Central Ave., Cincinnati, Ohio.

A Cheap Protection for Stored Cars.

The Kennedy storage cover is made of heavy imported paper, reinforced so it will not tear, and is the cheapest protection that can be secured for cars in storage. It is made in sizes to fit any car. The manufacturers are the Kennedy Car Liner & Bag Co., Shelbyville, Ind.

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A Strong Tire Guarantee.

One of the best proofs of the sincerity of garage men is the readiness with which they are advocating the use of Schofield's Liquid-Air. It not only stops punctures while the motorist is riding, without effort, attention or bother on his part. But it also lengthens the life of the tires. Its effect upon the tubes is such that its sponsors, the Dan Mar Corporation, offer it under a warranty that assures the owner 5,000 miles of service from his tubes.

He does not even have to buy new tubes, if his present ones are of a reliable make and comply with the liberal provisions of the Warranty under which Schofield's Liquid-Air is offered.

On the ground that a pleased customer is the best advertisement, the Company has included in its warranty even a provision covering rimcuts, blow-outs and accidents (though it is not claimed that Schofield's Liquid-Air is miraculous enough to prevent accidents). But the Company feels that it must set the pace in liberality to patrons, just as it is setting the pace in guarantees for inner tubes.

If You Want Rare Spare Parts.

The Ford-Clark Company of Cleveland, an Ohio corporation, have equipped a plant at No. 6536 Carnegie avenue for the special purpose of supplying jobbers, dealers, garage and repair men with parts formerly difficult to obtain in small quantities for repair and replacement purposes. Their line will consist in part of robe rails, springbolts, footrails, windshields, inlet and exhaust valves, hood fasteners, spring oilers, drag links and bumpers. Other parts will be added from time to time. The equipment of the machine shop is especially designed to take care of repair orders.

Starting Troubles Prevented.

The Ieco electric manifold plug, made by the Interstate Electric Co., 845 Perdido Street, New Orleans, La., is guaranteed to enable you to start your motor on the first turn, regardless of the weather. This plug is inserted in the intake manifold, and is connected with the priming cup on the dash. The current from your storage battery heats the plug. This is sure to give hot gasoline for starting and it is claimed to cut down gasoline bills one quarter, and its simplicity will commend it to the users of automobiles everywhere.

A Unique Starting Coupling.

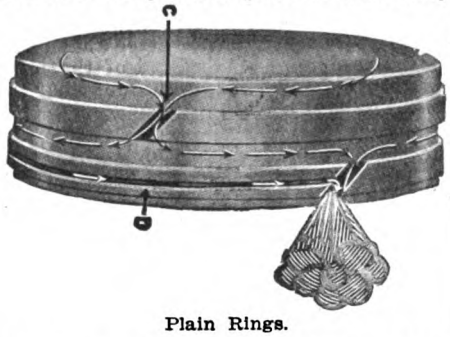
The Swiss Safety Starting Coupling is a device for connecting the magneto direct to the shaft that drives it. Broken arms or sprained wrists are unknown where this coupling is used, as there is no more danger in cranking an engine than in winding a watch. It allows the use of the Swiss single system, high tension magneto, where heretofore it could not be considered. Manufacturers of tractors, trucks and automobiles of any kind, as well as of marine and stationary engines realize its value and many have already contracted to use it. It is made by the Swiss Magneto Co., 3027 S. Wabash Ave., Chicago.

Edison Mazda Lamps.

Thomas A. Edison's dream that the Edison Mazda lamps would give a practically perfect light for automobiles, proved correct. These lamps are directly in line with the improvements which have been made in Edison lamps for the past 36 years, when he first discovered electric lighting. The Mazda lamps are made in different sizes for headlights, and in either 6-7 or 12-14 volt circuits. They are unusually economical and the light they give is as clear, white and brilliant as sunlight. Those interested should address the General Electric Co., Harrison, N. J.

No-Leak-O Piston Rings.

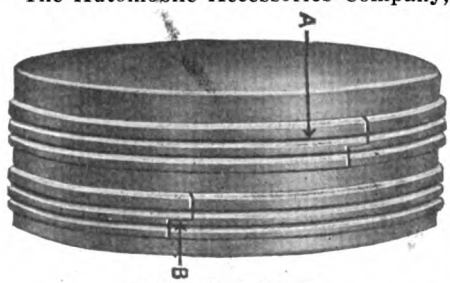
The old-style slanting cut piston rings have stood the test and have made good, but like every other part of machinery



Plain Rings.

improvements are constantly being made and the standard of efficiency being brought to a higher state of perfection. Many different types of piston rings have been brought out in recent years, each one having its special features, some very effective. It would seem that the ideal piston ring should be, first, made in one piece to insure easy installation without breaking, to have body enough to hold its resiliency under heat and not get out of place; second, made to take up sufficient oil from the crank case to lubricate perfectly, to insure long life to both ring and cylinder-wall; third, made so the oil that lubricates will form a seal all around the ring to prevent the escape of gas in order to get maximum power all the time; fourth, made to control the supply of oil so there will be no waste oil, thus eliminating carbon and oil troubles, saving fuel, grinding of valves and other repairs.

The Automobile Accessories Company,



No-Leak-O Rings.

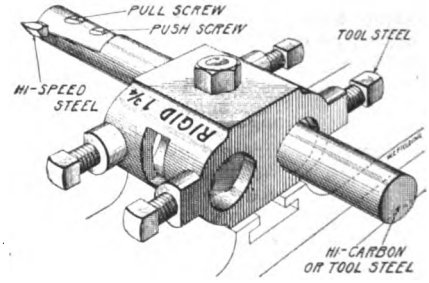
816 West North Ave., Baltimore, Md., makers of No-Leak-O oil packing piston rings, claims the ideal ring, which is explained by the illustrations. A groove in a diagonal cut ring is not very effective, the gas air or steam that escapes through the diagonal cut C will suck the oil out of the grooves D (see arrows). Not so with No-Leak-O rings. The escape is cut off by the lap-point B, the oil remains in the grooves A, which forms a seal, preventing the escape of gas, lubricates and acts as a packing against the oil getting up into the firing chamber.

Oil Grooved Packing Rings.

We wish to call especial attention of our readers to the self-lubricating, oil grooved piston packing rings which are manufactured by the Rittenhouse Fleury Company, 304 Holliday Street, Baltimore, Md. The manufacturers claim that these rings absolutely prevent over-heating, giving better compression, better power, decreasing friction and lengthening the life of the motor, also saving repair bills. Engine troubles, it is claimed, are largely eliminated by the use of these rings. Correspondence from dealers and repairmen is invited as well as from car owners, and this company would be glad to send their interesting free circular to any of our readers who would take the trouble to write for it.

Rigid Boring Tool System.

The boring tool illustrated here and other small tools, recently placed on the market by the Rigid Tool Holder Company, of Baltimore, Md., were designed and originally made by a mechanic in the U. S. Bureau of Engraving and Printing, in Washington, D. C., for his own use. They proved good, and the shops of all the Government departments of Washington, so it is claimed, have either given or promised an order for one or more of them. The tools consist mainly of a special lathe boring bar, in ten sizes; four types of holders therefor, to meet various conditions; a special cutting-off tool, and internal and external thread



The Double Reversible.

tools. The boring bar's cutter clamp power is multiplied five and one-half times by the action of the push screw. The Adjustable Boring Tool fits most any lathe from 12-inch up. All the barports are elongated horizontally. The Double Reversible Boring Tool shown has a one-piece steel holder, and is as rigid as an anvil. It reverses both end for end and upside down, giving four bar-elevations. The Single Reversible Boring Tool has another one-piece holder as rigid as possible and intended for two specified lathes only to which it is fitted. It reverses vertically only. The Tool Post Boring Tool has still another one-piece holder, and is as rigid as a tool post tool can be. The Cutting-Off Tool is obviously very rigid. It is either right or left-handed. U-shaped liners are used for elevating.

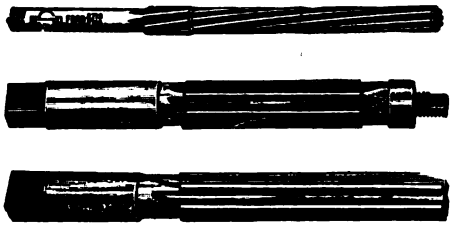
Ignition for Ford Cars.

A. J. Picard & Son, 1720-22 Broadway, New York, now have the sole rights for selling the Connecticut Automatic Ignition System for Ford cars. It gives the motor increased power, greater flexibility, renewed energy for rapid acceleration and puts starting troubles out of existence. The automatic switch, which is a feature of this system, has the same mechanism exactly as on the regular Connecticut system, the only difference being in the shape. For full information concerning prices and details of coonstruction, address the agency as above.

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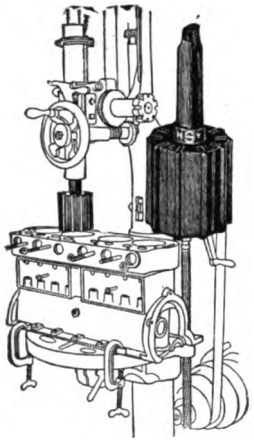
Some Improved Reamers.

The fitting of bushings requires a reamer, and those of the Ford car need special sizes. Stevens & Co., 375 Broadway, New York City, is producing a line of new reamers, the leader of which is the Duplex, which combines two reamers in one by reason of its construction. It is utilized for fitting the spindle body and spindle arm bushings, and provides two diameters. The Duplex is supplied with straight and twisted flutes, the latter being especially convenient for



Duplex, Plain and Expounding Reamers.

split bushings. The plain and expanding reamers are for various bushings, and the latter are ground .005-inch undersize, permitting of their use with worn or refinished parts. The reamer can be brought up to .005-inch oversize if desired. For fitting oversize pistons to the Ford cylinders the trade will find the Stevens cylinder reamer serviceable, as it is constructed with inserted blades with a cutting angle and clearance



Cylinder Reamer.

which requires but little power. The reamer can be used in an ordinary drill press. The maker states that the reamer will accurately ream a cylinder in fifteen minutes. Special body or Morse shank is supplied to order.

"The Best Lighted Car in the World."

At the opening of a fair just held in Fairfield, Conn., a parade was given in which one car was used to light the way for the parade, give light to the musicians in the band, etc. This car was equipped with twenty powerful Newtype Spotlights, each one using argon gas lamps so that the light reflected ahead on the road totaled over 500,000-candlepower. Photometric tests of the power in these lights have been made on the screen, and a 15-candlepower globe properly focused in the parabolic reflector projected 5,000-candlepower at fifteen meters ahead of the screen, and with argon gas globes the candlepower at the same distance was 10,000-candlepower. The great concentration of light projected from this small lamp was shown by a practical test made with one of the Newtype Spotlights used on a Ford car and lighted from the Ford magneto, as follows: A cigarette held in the rays directly in front of the lamp was lighted in less than one-half minute. The Newtype Spotlight locks at any angle desired, and attaches to the side of the windshield, and has the unique and original feature of having a mirror on the back of the light for use in daytime, a requirement now being enforced in a great many cities. Newtype Spotlights are one of the products of the Wood Manufacturing Company, Fairfield, Conn.

New Piston Rings.

P. H. Mish, 1790 Broadway, New York, is making the Eco New Process Piston Rings. These are of the one-piece type, and a special metal is used in making them. Each ring is closed in individually and ground absolutely round. The diameter of each ring is always up to size, and it will accurately fit and fill a cylinder of a corresponding diameter. These piston rings have an unusually high reputation, and those who have used them would not be without them. Over 300 different sizes will soon be in stock, and special sizes will be made to order if desired. For further information address E. H. Mish as above, and it would not be a bad idea to send for the little book of information and price list which this firm has just issued.

Velie Enters a Larger Field.

With the announcement of a Velie "Biltwell Six" at $1,065, the Velie Company entered a field entirely foreign to them, as heretofore Velie cars have been much higher in price and were available only to the limited class of buyers investing $2,000 or thereabouts in a motor car purchase. Now with a light six in the thousand dollar class, the factory is deluged with orders, and the dealer clientele has been greatly strengthened. Nothing has been skimped, nothing overlooked in building the new six. With 115-inch wheel base and 40-horsepower motor this light Velie covers the road in a remarkable manner. Long underslung springs, real leather and deep cushions provide a riding comfort usually associated only with high-priced cars. For over threescore years the Velie interests have been building machinery and vehicles, and their present enormous organization has been built up solely on the policy of making the products all they represented them to be and more. It is made by the Velie Motor Vehicle Company, Moline, Ill.

Portable Garages.

The Wabash Automobile Company, 1311-13 Wabash Ave., Chicago, make portable garages for $55 each and upward. No one can expect a garage cheaper than this, and those needing one should write for a catalogue to the address given above.

A Trouble Finder.

The American Bureau of Engineering, 1526 Wabash Ave., Chicago, Ill., has devised a simple card index system whereby a repairman knowing the symptoms of the trouble can, without hesitating, correct the fault. For example: If the garageman is approached by a Buick owner with a Delco System installed in his car and the complaint is made that the generator will not charge the battery properly, by a systematic method the garageman can find just where the trouble is and correct it. The Ambu, as the system is called, contains upwards of 700 cards, a certain number for each system and for each car using that system, together with blue print wiring diagrams and instruction cards for various systems telling how each unit operates and why it acts so. In all there are twenty-eight starting and lighting systems taken up. Under each of these heads are the names of the cars using it, together with the characteristics of the particular system, so that if an equipment maker builds more than one system all types are taken up. This process of correcting trouble in a systematic way, not only saves time and money, but makes far more satisfied customers because of the exactness with which the work is done. There is a feeling of security on the part of the repairman, because he can tackle any system without the fear of having to



Ambu Trouble Shooter.

say, "I cannot find the trouble." But the repairman can do more than satisfy his customers and get the name of being a responsible starting and lighting man. He educates himself because the Ambu gives instruction on the operation of the various units of each system. Some systems have inherent regulation, others use a slipping clutch, others a third brush, etc. The various types of generators and cranking motors are described under their own names. The blue prints of the wiring systems which are furnished are more than ordinary prints, for they show the various units in their relative position in the particular car upon which the work is to be done. The wire sizes are all in proportion, so that if a meter is on the dash it is placed in that position on the diagram. This makes tracing an easy matter, and any man of ordinary intelligence can follow out any circuit.

Rings at Excessive Speed.

George W. Edgar, Seattle, Wash., has perfected a bell device for attachment to motor cars that can be set automatically to sound a warning when the vehicle exceeds the limit allowed by law. It is operated by a gear attached to the speedometer sprocket, and can be regulated to ring at any speed.

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Two Very Useful Books.

The Auto Electric Systems Publishing Company, of Dayton, Ohio, and 1700 Broadway, at 54th St., New York City, has brought out two unusually interesting and useful books for motorists in what they call their Information Series. Book No. 1 contains general electrical information pertaining to storage batteries, motor generators, simple principles of electricity, and elements of electricity and magnetism, while book No. 2 contains complete authentic wiring diagrams of auto starting and lighting systems used on Delco-equipped cars to date, and it contains thirty complete plates in all, together with full information relative to adjustment and repairs of parts. This information on Delco systems, they



H. G. Grove, New York City.

state, has never before been assembled or published anywhere, and it is particularly valuable to every garage man and mechanic. The price of these books is 40 cents each, and they are well worth the money. The same publishers are prepared to furnish a book covering starting and lighting systems generally, together with a chapter on charging and care of storage batteries, electrical gear shifts, and so forth, and a line of other works pertaining to automobile repairs, carburetion, ignition and timing. Address inquiries to H. E. Grove, Eastern Sales Distributor, 1700 Broadway, New York City.

Heiser Valve Tester.

This is a device to show the motorist the leaky valves and the tight ones. It absolutely shows the condition of the valve stem and the valve stem guides. The intake valve stems and valve stem guides when worn to such an extent that they admit auxiliary air cause erratic running motors, loss of power and waste of gasoline. The Heiser Valve Tester will verify the work of the repairman after it is done, and will give him the necessary assurance that the valves are in proper working condition. This tester is not only for the valves of Ford cars, but a great many others where the valve port does not exceed two inches in diameter. The price of the tester is so low that it is within reach of every motorist, and all inquiries should be addressed to the Heiser Special Tool Company, Dept. A., Kingston, Mo.

Ford Car Starting and Lighting.

A complete, ready-for-installation Splitdorf-Apelco Electric Starting and Lighting System for Ford cars for $65, is the latest offering of the Splitdorf Electrical Company, of Newark, N. J. Absolute utility has been the keynote for the strenuous and exhaustive tests the system has undergone to pronounce its fitness for hard service. In construction and application and simplicity of installation and effectiveness of operation, these outfits hold the palm for lighting-starting qualities and there is naturally a big demand for installation among the thousands of Ford owners.

The Splitdorf-Apelco system consists of a Motor-Generator, Indicating Automatic Switch and Starting Switch, together with a 12-6 volt Storage Battery and all necessary parts for installation. As a generator, it has capacity to keep the battery fully charged, insuring ample current for starting, lights, horn, etc. In combining the motor and dynamo into one unit, a compact design is not only secured, but a design which lends itself to an easy application to the Ford engine. The armature of the machine has but one commutator, one set of brushes and one set of windings.

The use of 12 volts for starting insures sufficient power to spin the motor under normal conditions, as well as cuts down the current drawn from the battery. At the same time, 6 volts for charging makes it possible for the generator to begin charging at very low car speeds, as well as makes the use of 6½ or 7-volt bulbs possible for the various lamps on the car.

Inside Blow-Out Patch.

The Polson Rubber Company, of Kansas City, Mo., is marketing a new inside blow-out patch called the Safety First. This patch completely encircles the tube, and is fastened by an improved self-adjusting strap fastening. It is claimed when the air is applied the patch expands at the ends and tightens in the center, which prevents it from pouching and making the hole in the casing larger. The company recommends it as a positive protection against rim cuts and side blow-outs. It is made of extra



stout white frictioned fabric, vulcanized over molds, fitting perfectly. Has rubber ends as an extra precaution against pinching the tube. Length of all sizes is ten inches.

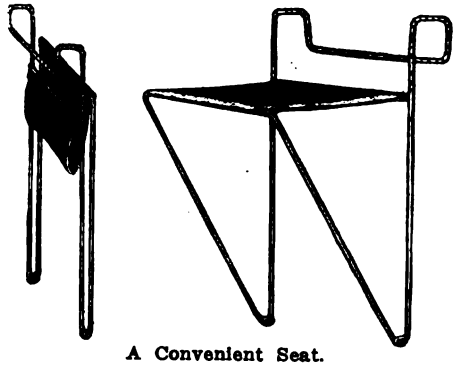
"The Winner."

By William Winter. The Bobbs-Merrill Company, publishers, Indianapolis, Ind. Price, $1.25.

"The Winner" has to do with automobile racing. Perhaps the author had Indianapolis in mind when he described "Centralia," but it might be almost any other American city whose Speedway becomes at stated intervals the scene of international contest and excitement. The intense rivalry among drivers and makers of cars affords rich material for thrilling incident, of which Mr. Winter avails himself with considerable skill. The story seems to possess the qualities of popularity, for what American is not interested in motor cars? The love plot is founded on physical attraction and natural sympathy. The style is smooth and straight. There is no pause here, no returning on the track, and a growing speed from the opening to the end of the spectacular race. "The Winner" deserves its name.

A New Auxiliary Seat for Ford Cars.

The McKinnon Dash Company, of Buffalo, N. Y., offers an auxiliary seat for



A Convenient Seat.

Ford cars. This seat rests on the door sill and hooks over the top of the door, but its weight does not rest on the door. Its frame is made of round, electrically-welded steel, and the door of the car cannot open when the seat is in place. It is called No. 90 seat, and the price is low. Those interested should address the manufacturers as above.

A Speed Crusade.

Following a series of accidents and deaths in July, a clearing house for complaints against violation of traffic ordinances by motor car drivers was formed by the Minneapolis Civic and Commerce Association. Some of the drivers who caused deaths were indicted by the Grand Jury. Three drivers were sentenced to the workhouse for reckless speed and nine jitney drivers were fined or imprisoned. Five complaints were received by the bureau in the first hour. The association sent out investigators. Twenty complaints were received the second day. Passing street cars, while standing at street intersections, overtaking and passing street cars on the left side of the street, speeding, driving without lights and stopping on left side of street were the chief complaints. At the end of the second week none had been killed, and accidents were cut to less than one a day.

Raise in the Price of Gasoline.

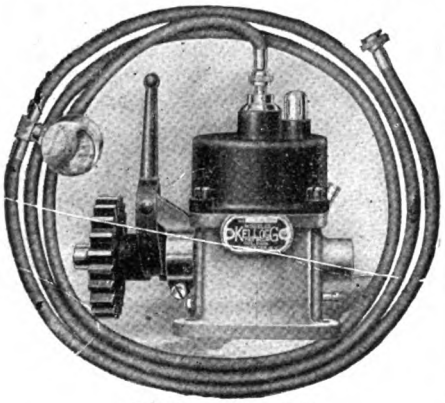
The big oil companies are beginning their annual raising of prices of gasoline. First in the field, the Standard Oil Co., of New Jersey, has announced a raise of one cent per gallon on all gasoline delivered to garages and dealers. The price for the present will be 10 cents a gallon, subject to another raise at short notice. The Atlantic Refining Co. immediately followed suit with a one-cent boost from ten to eleven cents per gallon, delivered to garages.

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Engine-Driven Tire Pump.

The Kellogg Manufacturing Company, of Rochester, N. Y., announce that its different models of Engine-Driven Tire Pumps will be continued in its original design for 1916 because their present models are proving so satisfactory. The cylinders are of finest close-grained gray iron, and pistons are fitted with three carefully ground soft steel rings. Poppet valves are used, and it is due to this that the air delivered by the pump is comparatively cool, and no cooling coil is necessary. Poppet valves can, of course, be ground to a perfect seat insuring maximum efficiency. The bearings in the new pumps will be lined with genuine babbitt, bronze having been used in the past. The system of lubrication is especially interesting because a clever design makes possible an absolute guarantee against oil spray in the air delivered by the pump, even though sufficient oil is carried in the crank case of the pump to lubricate all bearings properly while inflating a number of tires. It is unnecessary to lubricate the pump each time it is used. The Kellogg Company claims



Kellogg Tire Pump.

particular excellence in the fittings furnished for installing pumps. A car owner should use a tire pump once every week at the least. Keeping his tires up to required pressure will give him a surprising increase in tire mileage, and be sure to give him a better adjustment with the tire manufacturer. The most reasonable, convenient and sure way to keep tires up to pressure is to have an engine-driven tire pump on the car. Inflating tires is really the hardest part of tire trouble on the road, about the streets or in the garage. The car dealer who is not selling a good tire pump is missing a good profit that would more than pay the cost of sales work. In fact, the car dealer could help pay the rent by the sale of such an accessory—or put in conveniences without drawing from regular profits. A new booklet describing Kellogg pumps is now ready for distribution. The line of Kellogg Engine-Driven Tire Pumps has been made for seven years. Their present models are all-metal pumps that are furnished for most cars at the low price of $15. Type for the Ford at $9.50; for Dodge, Chevrolet and Maxwell, $10. These prices include air hose to reach any tire, with air-pressure gauge, the necessary bracket and well-made gears and plans for attaching to each different car. These pumps with attachments are carried in stock by distributors all over the country. A list of cars and full particulars can be had by addressing the Kellogg Manufacturing Company, Rochester, N. Y.

The Sears-Cross Spedindicator.

This was one of the speed meters which were the standard equipment on the 1915 Ford car, but the 1916 will not be equipped with this spedindicator at the Ford factory. It is absolutely accurate, easily mounted and can be read easily. It gives the total mileage and the trip mileage at a glance. An agency for this speed meter means a whole lot of good profit to the dealer, and those interested should secure the agency at once. Address Sears-Cross Company, Bush Terminal, Brooklyn, N. Y.

A Fully Equipped Low-Priced Car.

The Princess Motor Car Company, 1315 Belview Ave., Detroit, Mich., has increased its production of the new Princess car since the company settled in its new home, and can now insure prompt deliveries. It is fully equipped with electric starter and electric light, carries five passengers easily, and will be delivered f. o. b. Detroit for $695. This is a strictly 1916 car, and as some of the best agents' territory is still open it would be a good plan for dealers and garagemen to write or telegraph immediately for the dealer's proposition.

Liquid Air Cures Punctures.

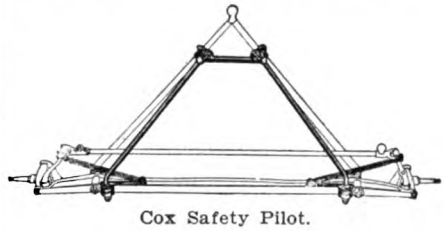
Before offering for sale Schofield's Liquid Air, it was tested for several years in all sorts of climates and in summer and winter. The results were so satisfactory that the manufacturers now guarantee 5,000 miles service for inner tubes of this is used, covering blow-outs, rim cuts and accidents, if the reasonable stipulations are complied with. It stops punctures while the car is in use, and positively prevents slow leaks. Garage keepers should get in touch with the manufacturers and let them show you how they can increase your business. If you are a motor car driver or owner, they can likewise show you how to save money, trouble and disappointment. Address the Dan-Mar Corporation, 1790 Broadway, New York.

The New Series Genemotor.

Among the improvements recently incorporated into the genemotor equipment for starting and lighting Ford cars, is a method of insuring that the battery begins to charge at a lower car speed than formerly. A novel form of cushioned sprocket has also been devised which practically eliminates chain trouble of all kinds. The reduction of speed at which battery charging commences has been effected by changes in the electrical characteristics of the genemotor, and by the employment of an improved reverse current cut-out of simple and durable design. The advantages of this lower charging speed will be particularly appreciated by those who habitually operate their cars at fiftten to eighteen miles per hour or less. The cushioned sprocket which has been so effective during the past season in insuring quiet chain operation without loss of power has been much improved in details of construction. The latest model of this sprocket operates with the utmost smoothness, and remains in adjustment almost indefinitely. It is so constructed that slip is impossible, even when the car is running at very high speeds. These improvements assure a fully charged battery under all conditions of operation. Many minor improvements, all contributing to the reliability of the system and the convenience of the user, have also been added. For description, price and full particulars address A. J. Picard & Co., 1720 Broadway, New York. The genemotor is very extensively advertised, and promises to be one of the "best sellers" among automobile accessories during the coming season.

A Combination Accessory for Fords.

The "Safety Pilot" for Ford cars, made by the Cox Brass Manufacturing Company, of Albany, N. Y., is a front axle and radius rod support combined with an automatic steering device. Equipments of this character have previously been sold separately as entirely distinct attachments, and at a much larger price. This combination attachment sells for only $3.75. The Cox "Safety Pilot" for Fords is a quickly and easily attached accessory which not only prevents the possibilities of the bending out of line of the radius rods, thereby preventing the breakage of the axle under strain and materially strengthens the car, but also, through the steel spring steering device, makes driving at any speed safer and easier on account of the stabilizing springs. The radius rod support is attached to the front axle and clamped to the rods near the apex of the triangle formed by their junction, acting as a



Cox Safety Pilot.

stay or brace against all strains or jars. The automatic steering device is attached just inside the radius rod supports on the "I" beam axle, connection with the clamp of the radius rod, and consists of a flexible and an extremely strong tempered spring. This acts as a stabilizer, prevents the car from swerving on rough or sandy roads, automatically straightens the car and holds it straight, and overcomes the necessity for a continuous tight grip on the wheel.

Horns and Pumps.

Owing to an increase in the volume of business and the addition of new specialties to their line, the Oakes Company, of Indianapolis, Ind., have increased their capitalization from $50,000 to $75,000. The officers of the company remain the same. The Oakes Company are manufacturers of the Beartone Horn and Fan-Horn Pump, license brackets, etc.

Automobiles for Rural Mail.

Two hundred and eight automobile rural postal delivery routes were inaugurated about August 1 by the postal authorities at Washington, with approximately 11,440 miles of roads to be traversed six days a week by this means of conveyance. Other authorizations include eighty-three routes effective September 1 and five more, effective October 1. The routes vary from fifty to sixty-four miles, and will be operated from nine to twelve months a year. Reports received by Postmaster-General Burleson from a special inspection of two experimental routes show that this service is in every way satisfactory.

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Motor for the Trade.

The Weidely Motor Company, of Indianapolis, Ind., has a new "12" motor, from design of George A. Weidely, with a bore of two and seven-eighths inches and a stroke of five inches. The cylinders are cast in threes, but the cylinder heads for all six cylinders of one group form a single casting. Aluminum alloy pistons and tubular steel connecting rods are used to permit of high speed.

An Improved Speedometer.

J. H. Cove, 600 Third Avenue, North, Nashville, Tenn., has invented a new speedometer and safety device for which a patent has recently been issued. It is to be used with the ignition circuit of automobiles or with the motor circuit of electric automobiles. It shows the speed, the season, and the trip mileage and at the same time it will absolutely control the speed of the car. By inserting the key and setting the small hand for any given speed desired, the driver cannot exceed the speed indicated by the hand on the small dial. Then, by setting the hand at the speed limit, the controlling mechanism has no control over the car. And again, by setting the hand at the starting point and removing the key, the car is thereby locked and cannot be moved by its own power. Each machine is designed with a barrel of a different shape, and a key to correspond, so that the mechanism cannot be tampered with. The retail price to consumers will average about the same as the price of other first class speedometers. The inventor has not yet had time to arrange for their manufacture, and would like to get in touch with some reliable manufacturer, with the view of having them made and exploited, either on contract or on a royalty basis.

Deaf Mutes Must Not Drive.

A precedent has been established by the New Jersey Department of Motor Vehicles, which has revoked the driver's license of C. H. Over, Jr., of Asbury Park, a deaf mute. The ruling states that a deaf mute is not competent to operate a car. The use of special mirrors mounted on each side of the windshield of his car, so that he could see cars approaching from the rear on either side, was not sufficient for a license.

Big Studebaker Earnings.

Studebaker earnings for the first six months of this year are being estimated in trade circles here and in Chicago at nearly $6,300,000. The second half should be better, because the plant improvements are largely completed. The corporation requires approximately $900,000 for its preferred dividends. Net earnings, therefore, of $6,300,000 for six months would leave $5,400,000 for $27,000,000 common stock. This is equal to 20 per cent. for the six months, or at the rate of 40 per cent. for the full year.

A Greedy Thief.

Sheriff George Flesher, Bloomington, Ill., has received the following self-explanatory letter: "I want to notify you to look out for a Ford car that was stole from me by Dale Hardy. He also stole my wife and baby. My wife has a small pointed wart on her nose, down on the point of it. She also humps her shoulder when she walks. He also took my wife's suitcase, which has a small hole punched in the side. There is a warrant out for his arrest. Notify Charles Crane, Blandinsville, Ill."

Scripps-Booth Enlarges.

Ground has been purchased and work is now going forward on a new three-story fireproof factory for the Scripps-Booth Company, of Detroit, that will permit an increase in its capacity to 100 cars a day. During the single short year of its existence the success of the company has been remarkable, and has clearly demonstrated the wisdom of its policy of seeking by an exclusive and highly original design to attract to the low-price field large numbers of purchasers.

For Starting With Magneto.

The Eisemann Magneto Company, Brooklyn, N. Y., is placing on the market a device which causes a standard magneto to produce a hot spark, regardless of how slowly the motor is cranked. It is intended especially for heavy motors used on trucks, tractors, etc., though it may be employed on passenger cars as well. The production of a hot spark regardless of cranking speed is produced by automatically compressing and releasing two springs which are part of the driving mechanism and which give the armature a sharp twist and thus cause the spark to occur at the proper moment. At speeds above 120 r.p.m. the device is automatically drawn out of action. The device can be attached to any model Eisemann magneto.

Electric Cars Without Batteries.

The Walker Vehicle Company will sell its 1916 Chicago electric passenger cars with or without batteries, deducting $270 when sold minus the batteries. Arrangements are being made to rent batteries in this city at $20 per month the first year and $16 per month the following years. The concern renting batteries agrees to keep them in repair, and if the battery capacity falls below 80 per cent. it will renew the parts free. This plan may soon become general. It makes it possible for dealers to sell electric cars without battery equipment, and naturally enables them to quote prices all the way from $200 to $900 less per vehicle, depending on the style and size. What the reduction in price will enable the electric car dealer to accomplish and what the battery rental service will do in the way of making electric cars more desirable are at the present time sources of speculation.

Most Cars to Go to Farmers.

It is estimated that 50 per cent. of the 2,000,000 motor cars in use in the United States are owned by farmers, and the percentage is increasing each year. It is estimated that 60 per cent. of the 1915 output will go to the farming communities.

Maxwell Car Oil.

A special oil known as "Maxwell Oil" is being placed on the market by the Wolverine Lubricants Co., 80 Broad Street, New York, under a special arrangement with the Maxwell Motor Co., of Detroit. Each can and package bears the Maxwell trademark. The exclusive right to use the trademark as applied to oils was given on account of the quality of the oil submitted and its suitability for Maxwell cars. The oil is exclusively recommended in the Maxwell instruction book, and is sold only through Maxwell dealers.

Selling Cars on Credit.

Not a few of the buyers who have purchased cars under the deferred payment plan have had to pay almost usurious rates of interest or premiums for the accommodation. The result has been that they have had reason to feel that they paid considerably too much for the car, even considering the fact that part of the payment for it was deferred. On the other hand, dealers have been badly victimized in their deferred payment selling, through being too trusting and through not knowing how to safeguard themselves in a businesslike way. To correct these two evils the bigger companies that have tackled the question are preparing standard forms for the handling of deferred payment sales, and are assisting the dealers either to make satisfactory connections with their local banks or to make arrangements with financing companies organized by the motor car makers themselves. The purpose of the car manufacturers is to prevent the retail buyer being mulcted because he wants time on part of his payments, and also to widen the selling field for the dealer by enabling him to handle the deferred payment trade without loss or too heavy investment.

Carbon Neutralizers.

Alvord's Motor Tablets, it is claimed, have increased gasoline mileage 20 per cent. These Tablets are added to the gasoline in the tank on the machine. They neutralize the carbon and carry it out of the cylinders. They help compression and stop knocks caused by carbon. Keep spark plugs and chambers clean, giving better combustion. They are made by the Alvord Sales Co., 80 Terrace, Buffalo, N. Y.

Automobile Sheet Metal Parts.

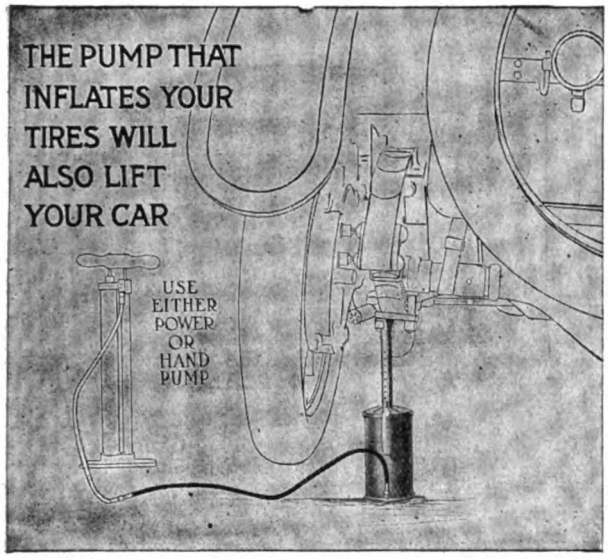
The Clayton & Lambert Manufacturing Company, of Detroit, Mich., manufacturers of the C. & L. patented line of fire pots, torches and braziers, and operating a large plant including foundry, machine shop, stamping, electric welding, plating departments, etc., have recently added a new Sheet Metal Stamping Department. They will manufacture automobile fenders, hoods, tanks and all other sheet metal parts, with the exception of radiators. They are also prepared to manufacture light stampings and to do enameling. In the new stamping department a full line of latest improved machinery and tools have been installed, and it is under the supervision of trained men, expert in this line, and they are manufacturing high-grade sheet metal products and are ready to receive from manufacturers their blue prints for quotations.

Improved Automobile Hood.

The Superior Lamp Manufacturing Company, of 136 West 52d St., New York City, respectfully notifies the trade that a patent has been granted to Harry Futterman on an improved automobile stream-line hood, which patent is controlled exclusively by them. All infringements thereof will be prosecuted. They are compelled to take this course to fully protect their numerous customers and patrons, who have purchased and are using Superior stream-line hoods for Ford cars.

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NATIONAL PNEUMATIC JACK



"JUST WHAT I HAVE BEEN LOOKING FOR"

—Is what people are writing us every day

HERE IS A JACK THAT WILL LIFT THE LARGEST CAR WITH NO WORK, NO DIRTY CLOTHES, NO "GETTING DOWN ON ALL FOURS" (like the man in illustration below).

THE "NATIONAL PNEUMATIC JACK" IS AS FAR AHEAD OF THE ORDINARY LEVER JACK AS THE SELF STARTER IS OF THE OLD CRANK.



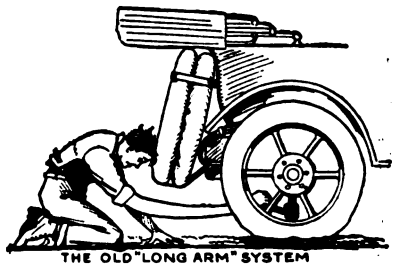
Just slip it under your car, attach either a hand or power pump to the end of hose, and up goes the heaviest car, AND STAYS THERE UNTIL THE AIR IS RELEASED. Has locking device for holding up car in storage. It can't slip. It won't sink in ground on account of its large base. You need not worry about long springs, rear tank, etc., being in the way. Five to ten strokes of ordinary hand pump will lift car. Order one for your old car, or specify that your new car be equipped with it.

Tell the agent he must furnish one with car—and he will.

Ten Days' Free Trial

Will ship one on trial, and if not satisfactory will refund your money. That's fair! Weight only seven pounds. Four inches in diameter, eleven inches high when closed, with six inch lift.

PRICE, by mail prepaid, $6.00

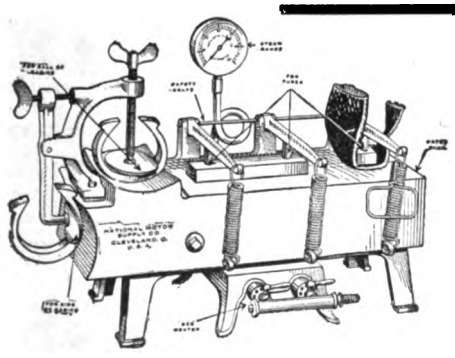


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IS THIS THE WAY YOU WORK?

Garagemen

This is the jack for you. Just stick on air line hose, raising car instantly, with no slipping, skinned knuckles or hard work. Earns its cost in time saved. Nothing to wear out or get out of order.

Get the agency in your town.



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Thousands of garage men all over the world are making big profits with the

NATIONAL GARAGE STEAM VULCANIZER

Vulcanizes three tubes and two casings at a time. Heated by either gas or gasoline. We have made this machine without any change for six years, which shows how satisfactory it is. You might as well have the big profits for vulcanizing in your vicinity. The National is the easiest and cheapest machine to operate on the market.

LIST PRICE, $60.00

Write for full details and discounts. A card will do.

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THE NATIONAL MOTOR SUPPLY COMPANY

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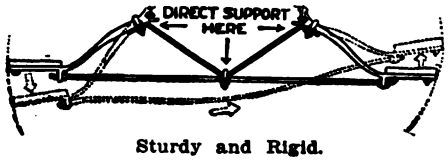
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Casey Running Board Braces for Ford Cars.

With every Ford automobile sold, whether for business or pleasure, it seems to be a dependable certainty that the car will be overloaded sooner or later simply because it is such a faithful little performer in speed, power and endurance. The Casey Asco Manufacturing Company, of Kansas City, Mo., is marketing a new chassis reinforcement of unusual merit, known as the Casey Running Board Brace. This economical insurance against wear and tear from



Sturdy and Rigid.

overloads and strains, while adding but four pounds in weight to a car, will make a Ford chassis as sturdy as a truck, and permanently retain this desirable rigidity. The Casey Running Board Braces, as here illustrated, are a positive and practical remedy for this deteriorating wear, while for commercial uses where Ford cars are put into delivery service, or heavily loaded for touring, etc., these braces are a necessity for safety. The dotted lines illustrate the exact teeter and buckle of chassis as you step on any regular Ford. Just try it on your own. The solid lines show how sturdy and rigid Casey braces will make it, even though you test it by jumping upon the step with both feet. The constructive design is based on the sound principle of three-point structural steel trussing. It is indeed surprising how sturdy and quiet a Ford automobile can be made with this little reinforcement. Casey Running Board Braces will be sent prepaid on all cash orders received within the next thirty days by the Casey Asco Manufacturing Company, 1500 Grand Ave., Kansas City, Mo. Price is $2 per complete set. Can be put on by anyone in a few minutes. No drilling or fitting necessary. All you need is a wrench.

A Nice Dividend.

The Haynes Automobile Company, Kokomo, Ind., has just completed a prosperous year. A 20 per cent. cash dividend for the fiscal year ending June 30, 1915; a 2 per cent. cash dividend for the month of July, and a 100 per cent. stock dividend have been declared, as well as a 1 per cent. cash dividend for the month of August. The company has just filed notice with the Indiana Secretary of State of an increase in capitalization from $600,000 to $1,200,000.

Creditors Get 100 Per Cent.

The Consolidated Car Company, Detroit, Mich., organized to take over the business, good-will and other properties of the Abbott Motor Company and to assume the indebtedness of that company, has just completed payments to the Security Trust Company, trustees of the original Abbott company, covering a full 100 cents on the dollar to the creditors. The creditors' claims amounted to $64,000. Within the past two weeks 44 per cent. dividends has been given the creditors, 34 per cent. in the first instalment and 10 per cent. as a final payment.

No Carbon and More Power.

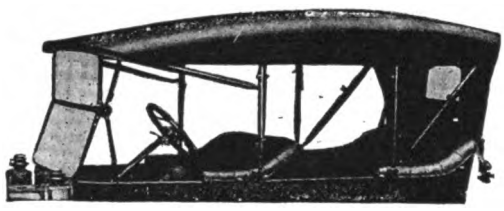
The Noncarbene Company, 1765 Broadway, New York, manufacture a petroleum product containing no injurious substance, which it is claimed will more than pay its cost in the saving of gasoline. In addition to this, it prevents carbon and removes any carbon already formed. It is used by such firms as the Automobile Club of America, of New York, and its cost is little. A booklet of indorsements will be sent upon request. Garage keepers might well get in touch with the manufacturers with a view to selling it.

Pistons for Ford Cars.

Depuy Bros., Canterbury, N. H., make an unusually good piston for Ford cars. It is of soft gray iron, and is accurately ground so that each are of exactly the same weight and size. These rings are sold at a very low price considering their value, and owners of Ford cars would do well to consult the manufacturers when they need anything of the sort.

Cray Slip Roof Outfit and Tops.

When the top on a Ford car becomes worn or leaky it is now possible to obtain a new heavy rubber roof, quarters, back stays and back curtain, stitched and ready to slip over the old top frame, thus giving a new top at a price stated to be about one-third the cost of a top complete with bows, bow sockets, side curtains, etc. This outfit is designated as the Cray Slip Roof Outfit "A" by the manufacturers, Cray Bros., 1111 West 11th St., Cleveland, Ohio. It is made only for 1912, 1913, 1914 and 1915



Top for Ford Touring Car.

model T touring cars, and as the side curtains on most old tops are in good condition curtains are not included. Price to the trade, $7.50 each, or $80 per dozen. This concern also builds a complete extension top, made up with heavy 32-ounce black back rubber. This top is built over Ford body frame, giving a perfect fit. A very easily operated one-man top is also put out, this top maintaining the same general level while being put up as when it is in place, not falling on the front seat or going up into the air. It is staunch and rigid, and is furnished in three grades. A 512-page catalogue is offered free to all those in the trade. Every dealer and garage man should have a copy of this book.

Polson Blow-Out Patches.

These tire patches are said to be unusually strong, and quite as strong as the tire itself. They fit perfectly, and the rubber end prevents pinching. They cost no more than others, and are sold by the best dealers everywhere. If your dealer is unable to supply you, address the Polson Rubber Company, 329 Southwest Blvd., Kansas City, Mo.

Waiting at the Curb.

That Des Moines, Iowa, has no pow to regulate the length of time that automobile may be left standing at curb is the decision of Judge Utterba sitting in the Iowa District Court Des Moines. The decision was given a suit brought to test the city ordinan that prohibits a motorist leaving car at the curb for more than twen minutes in the downtown district a not more than an hour in other sectio The court ruled that the city has power to regulate the standing tim and that consequently that portion the automobile ordinance is void. Th reverses the decision given bv the poli court before which the test case w first brought.

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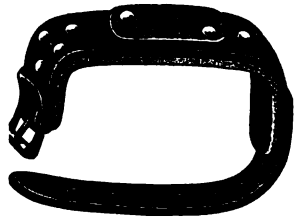
According to a ruling of the highwa commission of Pennsylvania, motor c dealers are forbidden to lend their l cense tags to purchasers of cars pen ing the arrival of the purchasers' tags.

Canada Feels the War.

The war has curtailed Canada's impor tation of luxuries, especially in moto cars and carriages. In the last twelv months imports were $7,420,000, com pared with $18,560,000 for the precedin twelve-month period.

Spring Oiler Strap.

The Leather Tire Goods Company, of Niagara Falls, N. Y., have recently brought out a spring oiler which consists of a strap having wicking on the inside, designed to be buckled around



Oiler Strap.

the spring just inside the clip which holds the leaves together. This is the point where there is most motion between the leaves, and the oil from the wicking works between the leaves when they are in motion, keeping them lubricated, making the springs ride easier and less liable to be broken. The wicking is saturated with oil when the strap is buckled on, and has a hole in the top with a leather cover over it through which the oil can easily be squirted with the can when one is oiling the car. These Spring Oiler Straps have the advantage of being adjustable so that one size will fit all cars. They are unbreakable, are easy to put on, and sell at 25 cents each, making a full set for a Ford cost only $1. Other cars require from eight to sixteen, according to the type of springs.

Weather Strips for Automobiles.

The McCormick weather strip makes the windshield of your car absolutely weather tight, dust and wind-proof. It is adjustable to any space or thickness of glass, is easily put on or removed, and will not obstruct the vision. It is made by the Robinson Manufacturing Company, 508 Lincoln Bldg., Louisville, Ky.

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The Standard

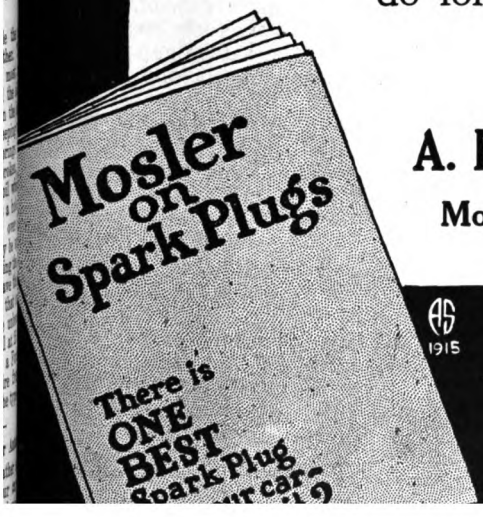
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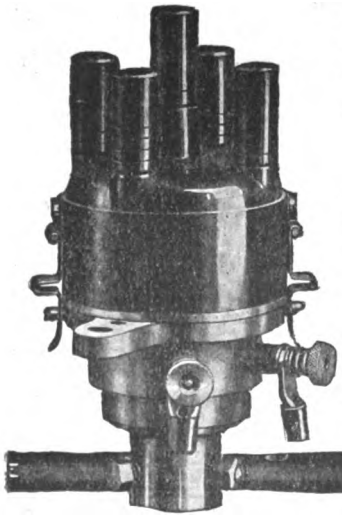
Progress has put a generator on every car for lighting purposes—an instrument capable of maintaining the supply of electric current not only adequate for the needs of the starting and lighting system but ample for ignition as well.

Such a current supply has a decided advantage over the magneto's self-contained generator in that it is constant at all speeds—the magneto's supply varies according to speed.

AUTOMATIC · IGNITION
CONNECTICUT

takes its current from the storage battery of the car's starting and lighting system and not only produces an effective spark at all speeds but delivers a spark that grows hotter as motor speed decreases.

What little power the generator requires for maintaining the current supply is returned hundreds of times over in the cumulative effect of more powerful explosions resulting from more effective sparks.



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Cause of a Clicking Noise.

An intermittent clicking noise resembled that obtained by clicking the fingers together. The owner of the car thought something was loose, and hunted everywhere to find some mechanical defect. In one or two cases this noise was found to be due to the spark jumping at the safety spark gap on the magneto. The distributer of the magneto was cleaned up, but this did not remove the trouble as it does in some cases. The spark plugs were then examined, and it was found that the spark gaps of two of them were very wide, and at low magneto speeds the current preferred to jump the safety gap rather than that at the plug. Hence the clicking noise which alarmed the owner.

Sparking at the safety gap is generally due to excessive resistance somewhere in the high tension circuit; in this case one, or possibly two, of the spark plugs were the cause. Firing at the safety spark gap should not be allowed to continue, otherwise there is a possibility of some weak part in the armature insulation giving way. When a high-tension wire is detached from its spark plug the end should always be allowed to touch the engine, and the current thus earthed if the engine is to be run. Otherwise on each firing stroke of that cylinder the safety spark gap on the magneto will operate. This puts a bigger stress on the armature insulation than the normal operation of the magneto does.

The drive chains on trucks should be adjusted carefully. If too tight the chain will wear rapidly, and if too slack the jerks of starting will be apt to break the chain prematurely.

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New Battery Charger.

The General Electric Company, of Schenectady, N. Y., has brought out a new and inexpensive mercury arc rectifier which is especially designed for charging batteries such as are used for starting, lighting and ignition currents in automobiles and for other purposes where not over five ampere—fifteen volts direct current—is required and only alternating current is available. The new rectifier consists of a metal base on which are mounted the necessary reactance coils, and the rectifier tube is in a suitable cover, the whole being encased in perforated sheet metal. It is designed for charging one three-cell, one six-cell or two three-cell batteries as required, and is automatic in that it is self-adjusting to any of these three conditions. This type of rectifier can be supplied for 60, 50, 40, 30 or 25 cycles, 110-volt circuits.

Will Now Be Made in America.

The Longuemare carbureter, which up to the present has been manufactured in France and imported here, is now to have an American model, arrangements for manufacture at Syracuse, N. Y., having been completed by the Longuemare Carbureter Company, New York. Some changes have been made to suit American requirements, and other changes which are general improvements in the direction of convenience of fitting, adjusting and assembling. The water jacket, surrounding the throttle, has been dropped, and the opening in the throttle valve for the idling jet has been increased to permit a longer dwell. There is no vital alteration in the operation of the carbureter. There are two jets, one for idling and the other for running, the first above the other. By more compact design the weight has been brought down on all models about 40 per cent. The connections are S. A. E. standard.

Gold Medal for Genemotor.

Having just won the gold medal at the Panama-Pacific International Exposition with the genemotor starting and lighting system for Ford cars, the General Electric Company, through its general distributors, A. J. Picard & Co., announce immediate delivery of the new series genemotor, which has a double point of contact relay and a flexible driving pinion.

Lights Must Not Glare.

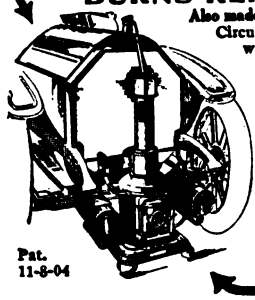
Springfield, Mo., has passed an ordinance providing a fine of from $1 to $100, or jail sentence of from five to sixty days, or both, for using glaring headlights. Incorporated in the ordinance is a clause that prohibits the use of a revolving searchlight such as is now seen on many cars throughout the country.

The New Era Cars.

The New Era Mfg. Co., of Joliet, Ill., is casting about for a larger factory, for the manufacture of New Era cars. The local Association of Commerce has been asked to assist in finding additional factory facilities for the company.

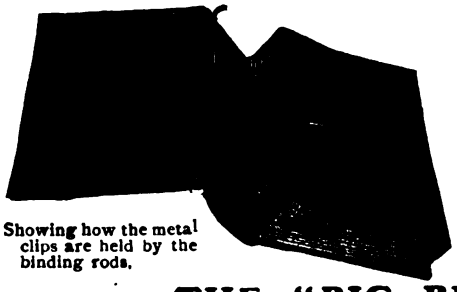
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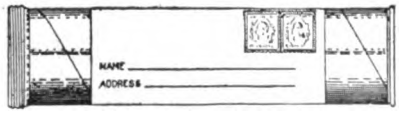
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Same with clock and electric light comb. list $85.00	20.50
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NEW YORK, 253 West 58th Street, (at Broadway)
PHILADELPHIA, 1314 Arch Street.

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Auto Accessories

REPAIRMEN

Did you ever see such a large assortment of parts to select from? Keep this list. It will save you money.

NEW MOTORS.

48 Buda 4-cyl. 50 H. P. 4¼x5¼.....$135.00
36 Marion 4-cyl. 35 H.P. 4x5 crank and pump. 115.00
4 Piggins T head 4x4½, with pump.... 135.00
1 Krit 1915 Unit power plant, with Remy Unisparker, carburetor, fan, pedals, levers, pump, and plugs..... 175.00

USED MOTORS.

1 Thomas 4 cyl. 60 H.P. 5½x6 fitted with Stromberg carburetor and Bosch Magneto $150.00
1 Krit 1914 Unit Power Plant with Remy Unisparker, carburetor, fan, pedals, and pump..... 160.00
1 Krit 1913 Unit Power Plant with levers and pedals..... 135.00
1 Ruttenbur 4-cyl. (good condition).. 75.00
1 Oswald 4-cyl. 4x4¼ with fan..... 85.00
1 Cadillac 4-cyl. 4⅜x5¾, 40 H. P..... 75.00

AXLES.

12 Weston-Mott full floating (complete) 80.00
50 Weston-Mott semi-floating (complete) 45.00
200 Weston-Mott fronts 28½" centers 18.00

TRANSMISSIONS.

1 Krit 1915 with multiple disc clutch and pedals 50.00
7 Brown & Lipe, with levers, 3 speed 45.00
15 Keeton, 4 speed, center control..... 75.00

RADIATORS.

V-Shaped (brass) to fit Ford..... 20.00
Flat tube honeycomb to fit Ford..... 16.00
Buick 10 (give year) 20.00
Hudson 20 ..... 28.00
Chalmers 30 ..... 29.50
Flat or V-Shaped for any car. Write for special price.

MISCELLANEOUS.

100 Speedwell Steering Gears (Right Hand) $14.00
98 Style A Differentials (9½" Dia. Flange) 3.00
95 Pressed Steel Frames 150x32..... 7.00
400 Pair oil proof mohair Gauntlets, pair .25
200 30x3 Clincher Wheels (Ford)..each 1.50
150 30x3½ Clincher Wheels (Ford)..each 2.00
200 Splitdorf Model A Magnetos..... 12.00
30 Reed Mfg. Co. vises 4½" jaw..... 3.50
20,000 ft. Secondary ignition cable, per C ft. 2.95
925 E Z Gas Starters (4-cyl.)..... 2.95
120 Dash Boards 24x38..... 1.00

CYCLECAR PARTS.

250 Car-Nation shaft drive axles (complete) $25.00
250 Car-Nation front axles (complete) 10.00
100 Sets Car-Nation Wire Wheels, (set 4) 10.00
60 De Luxe 2-cyl. V-Shaped 9 H.P. Motors 40.00
6 Badger 4-cyl. 2½x3½ Motors..... 75.00
180 Front Wire Wheels 28x3.....each 1.50
125 Rear Wire Wheels 28x3 with pulley each 2.00
Car-Nation Barnes Steering Gears, complete 7.50
7 Dayton 2 passenger bodies with top, upholstered 30.00
23 Car-Nation 4 passenger bodies unupholstered 10.00
15 Finalt 2 passenger Roadster Bodies, unupholstered 10.00
90 Straight (2 piece) Windshields 21½x36 ..... 7.00

TRAILER AND TRUCK PARTS.

100 Portland front axles with hubs and caps $25.00
100 Portland I-Beam rear axles with hubs and caps 20.00
30 36x2 Solid Tire Wheels .....each 10.00
Full Elliptic Springs 34½x1½x6....each 2.00
Full Elliptic Springs 34½x2x7.....each 2.00
30 Dart Sheldon Jackshafts (Chain drive) 20.00
Ross 1 Ton Truck Steering Gears..... 16.00
Radiators any size. Send Sketch. Write for prices.

Send for our special forging sheet No. 104.

DEPT. D

AUTO PARTS COMPANY

737 W. Jackson Blvd. CHICAGO, ILLINOIS

Tires

SAVE 75%
ON YOUR
TIRE BILLS
BY USING OUR
DOUBLE TREAD TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

With ENGLEBERT STEEL STUDDED TYRES

You don't have to stop to put on chains for every shower or stretch of wet asphalt.

The Englebert secret process insures big mileage and holds studs on firmly. If you try Steel Studs once you will always use them for partial equipment.

STANDARD GUARANTEE 3500 MILES

PRICES

32x3½	18.90	35x5	35.75
34x3½	21.75	36x5	36.75
32x4	24.90	37x5	38.10
33x4	25.50	37x5½	42.00
34x4	26.25	38x5½	43.75
35x4	27.00		
36x4	28.00	810x90	18.30
34x4½	30.50	910x90	21.50
35x4½	31.00	815x105	24.90
36x4½	31.50	875x105	26.25
37x4½	32.25	880x120	30.50

Above prices subject to withdrawal without notice.

Terms: Cash with order.

ENGLEBERT TYRE COMPANY
1928 BROADWAY NEW YORK

TIRES TIRES TIRES
Automobile Dealers Take Notice.
We now offer for sale our Henschel Special tires in a sizes and types. **Write for our special dealers' proposition**
HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

GERMANIA RUBBER WORKS
AUTO-TIRE REPAIRING
Tube Vulcanizing, 15c.
Use Roll-in-White, it Preserves your Tires, 25c. per pint.
1092 Bedford Avenue BROOKLYN, N. Y.

Tires

Double Tread Tires
AT 75% SAVING
GUARANTEED

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.00	$8.75
30x3	$5.00	$5.25	36x4	8.00	9.00
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
32x4	7.00	8.00	36x4½	9.00	10.00
33x4	7.50	8.25	37x4½	9.00	10.00
34x4	7.50	8.25	37x5	10.00	11.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
243a West 56th Street NEW YORK

TIRES TIRES

NEW TIRES GUARANTEED 3500 MILES
40% off Standard list price

We also carry a large stock of

Double Tread Tires
GUARANTEED 3500 Miles
AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
NEW YORK CITY
The Home of Double-Tread Tires

SAVE YOUR OLD TIRES
AND HAVE THEM
Reclaimed for $2.50 to $4.00
ACCORDING TO SIZE.

SQUARE DEAL TIRE EXCHANGE
247 West 49th Street NEW YORK CITY
Write for catalogue on Double Tread Tires.

I carry a full line of tubes, reliners and slightly used tires of all makes. **Write for particulars.**

LEON JAFFESS
Main Office
252 West 55th Street New York City
Branch: 5019 Euclid Avenue, Cleveland, Ohio
Factory and Salesroom: Fifth and Cross Sts., Harrison, N. J.
Not connected with any other Jaffess.

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Tires

REDUCE YOUR TIRE BILLS

By Having Your

OLD TIRES RECLAIMED

We Are the Originators

Why not get 2,000 additional miles out of your old casings, in place of throwing them away? Others are doing it. Why not you? Reclaiming prices sent on request.

COWANS BROTHERS
150 West 55th St. New York
Branch: 815 North Broad St., Philadelphia

TIRES

BUY THE BEST

Double Tread Tires

IN THE MARKET

— PRICE LIST —

30x3	$4.50	34x4½	$9.00
30x3½	5.50	35x4½	9.50
32x3½	6.50	36x4¼	9.50
34x4	8.00	37x4½	10.50
36x4	9.00	37x5	11.00

One dollar extra for non-skids.

A deposit of 10% is required on all C. O. D. orders. You can save C. O. D. charge by sending a money order. Please specify in order whether Q.D., Clincher or Straight Side desired.

R. K. TIRE CO.
1401 RIDGE AVE., PHILADELPHIA, PA.

DOUBLE TREAD TIRES

All sizes up to 38x5½
Guaranteed for 3500 Miles

Size	Plain	Non Skid	Pure Gum Tubes	Red
30x3	5.00	5.50	2.35	2.60
30x3½	6.00	7.00	2.70	3.00
32x3½	7.00	8.00	2.80	3.10
32x4	8.00	9.00	3.80	4.20
33x4	9.00	10.00	3.90	4.35
34x4	9.00	10.00	4.00	4.45
35x4	9.00	10.00	4.10	4.55

These tires are Absolutely Puncture Proof.
Be sure to state whether regular Q. D. or straight bead.

WHY PAY MORE?

Will outwear any make of tire at a saving of 75% of your tire bills. **Send us a trial order today.**

THE DOUBLE TREAD TIRE CO., Inc.
'Phone, Col. 8681 116D W. 52d St., New York City

TIRES - Send for list of factory blemished standard makes.
Agents Wanted
STAR RUBBER CO., 1781 Broadway, New York, N. Y.

DOUBLE TREAD YOUR OWN TIRES. You can do it yourself with the Ruff Wire Outfit. Make two old tires into one and get this additional service at a cost of less than 50 cents per tire. Dealers, Repair and Garagemen, make money Double Treading Tires for your customers. Complete outfit and stock, enough for 4 large tires, $2.50. Address, Tire Trading Co., 50 William St., Newark, N. J.

Tires

OWNERS CUT YOUR TIRE BILLS

BY USING

Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

For all other sizes write for prices.

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN & CO.
27A East 110th St. NEW YORK CITY
Branch: 205 W. 48th St., New York City

Auto Lists

200,000 1915 N. E. REGISTRATIONS $13.00
During 1915 from January 1st we shall publish in weekly installments and numerical order, all the motor registrations of New England as filed. Sub. $13.00. AUTO LIST PUB. COMPANY, 138 Pearl Street, Boston

1915 Automobile Registrations
NEW YORK STATE OR ANY OTHER,
supplied on sheets or cards. Addressing, folding and mailing to auto owners. Special lists promptly compiled such as Ford, Overland or Electric owners, dealers, chauffeurs, etc.
List Ten States, 1915 Complete, $20.00
Write for Details
NAT'L TRADE LIST & ADDRESSING COMPANY
ALBANY, N. Y.

MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. Motor List Co. of America, 1111 Locust St., Des Moines, Iowa.

Used Cars

FOR SALE—Automobiles in first-class condition. Renault, 14-20 H.P. Rochet Schneider, 50 H. P. Houpt. Rockwell, 50 H.P. All spare parts for sale by Kuehn & Metz, 1926 Broadway, New York.

Bodies

FORD PLEASURE BODIES.
Brand new 1915 Ford Cowl Dash Touring and Roadster Bodies complete with Top and Windshield at money-saving prices. London Auto Supply Co., 2548 Wabash Ave., Chicago.

JANDORF AUTO COMPANY
Largest dealers in Tires and Tubes. Bargains.
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CYLINDERS REBORED AND REGROUND and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.
McCADDEN MACHINE WORKS,
St. Cloud, Minn.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

TOPS BUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REBORED
Best quality piston and rings fitted, any make and size. $3.00 and up.
KENNEY COLWELL CO., NORFOLK, NEBR.

CYLINDERS REGROUND
and fitted with new pistons and rings for $5 to $11 per cylinder. We do this class of work exclusively and give you the highest quality of work at these prices. Ford cylinders reground and fitted with pistons, rings and wrist-pins for $20, discount to dealers.
CROWN MACHINE SHOP
Crown Point, Ind.

SCORED CYLINDERS
We fill your scores with a silver composition by patent electric process. No heating to warp cylinders. Welding in all its branches. L. Lawrence & Co., Newark, N. J.

REMOVES CARBON—Takes the carbon out of your cylinders quickly, conveniently and economically. Every car owner and garage owner should investigate. Write the Bowling Green Sales Co., 323 Decatur St., Brooklyn, N. Y.

PAINT YOUR OWN CAR
FOR $4.00. Write for interesting booklet and color card. We can save you money.
ECONOMY SERVICE COMPANY
2714 Boulevard Place Indianapolis, Indiana

CYLINDERS REBORED & REGROUND
Fitted with my heat treated light weight pistons and patented three section rings. From $6 to $15 per cylinder. Ford cylinders reground, fitted with new pistons, rings, bushings and wrist pins, $20.00.
TRUMP MANUFACTURING CO., CROWN POINT, INDIANA

CYLINDER GRINDING
NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
Prompt and reasonable.
NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

INCORPORATE your business. Avoid partnerships. Protect private personal property from business ventures. Stock companies incorporated. Fees small, blanks and information free. Philip Y. Lawrence, former Assistant Secretary State, Huron, South Dakota.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 318 West 57th St., New York City.

Cars Wanted

WANTED—Auto in good condition to trade for Two valuable level residence lots in Kansas City, worth $550 to $600. Lots good for loan of $200 to $250. Also have a corner lot in Fruitdale, Mich., a Remington Typewriter, a Winchester High Power Repeating Rifle to trade for a good motorcycle. Address Paramount Company, Moline, Illinois.

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Magnetos and Batteries

MAGNETO SALES CO.
Official Bosch Service Station. Expert repairing guaranteed. All types of magnetos and coils bought and sold.
1779 Broadway - New York City

JOHN F. ESSER
The Oldest Ignition Expert asks you to Avoid Expense on Your LIGHTING SYSTEM, SELF STARTERS, MAGNETOS AND COILS OF ALL MAKES, and ship any troublesome apparatus Direct to our Service Station, where repairs are made by experts at shortest notice and Reasonable Prices.
Agents and Supply Station for
THE BOSCH MAGNETO
Lighting and Starting Batteries
Furnished or Repaired at the Right Price
EXIDE STATION
Branch — 152 Amity St., Flushing, L. I.
General Offices & Station — 1908 Broadway, New York City

Hecht's Magneto Exchange, Inc.
Dealers in Magnetos of all Makes.
Lighting Systems and Self Starters.
We have always on hand a large assortment of high and low tension magnetos, BOSCH, SPLITDORF REMY, EISEMANN, and all other standard makes, at 50% off list.
Expert Repairing of All Makes.
Distributors and Service Station for
MICHIGAN and NATIONAL MAGNETOS
Also ESTERLINE GENERATORS
230 West 49th Street NEW YORK CITY

MAGNETOS REPAIRED BY A MAGNETO SPECIALIST. Expert on Bosch, Eisemann, Remy. Magnetos bought, sold, installed and repaired at short notice. Agent for New York Coil Co.
GENERAL MAGNETO REPAIR CO.
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MAGNETOS
Of all makes repaired and guaranteed.
IGNITION SPECIALTIES COMPANY
798 Seventh Avenue New York City
Official Service Station for
SIMMS, WILLARD, BERLING

Radiators and Lamps

Telephone 6597 Bryant M. Drimmer, Pres
German-American Auto Radiators & Lamp Co.
Radiators, Mud-Guards, Tanks and Fancy Brass and Copper work. New and Repaired. Also Nickel Plating. Glasses and Wind Shields a Specialty. Open Day, Night and Sundays. 258 W. 47th St., New York City

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.
HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
Branch: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATOR BARGAINS

Ford, Model T, Honeycomb, V-shaped	$22.50
Buick 16 and 17, Tubular	30.00
Buick 16 and 17, Honeycomb	33.50
Buick 10, Tubular	20.00
Buick 10, Honeycomb	22.50
Hudson 20, 32 and 33	28.50
Chalmers 30	30.00
Cutting Models A and B40 or T35	30.00
Colby Model 40 and 50, Honeycomb	30.00
Rambler radiators, all models	26.00

Write for prices on other makes.
AUTOMOBILE APPLIANCE CO.
1436-38 Michigan Avenue CHICAGO, ILLINOIS

RADIATORS AND FENDERS
MADE AND REPAIRED.
EVERYTHING in the AUTO SHEET METAL WORK
UNIQUE AUTO RADIATOR COMPANY
676 North Broad Street Philadelphia, Pa.

Gears and Parts

GEARS AND SHAFTS
Piston Pins
"Manufacturers for the Trade"
SERVICE GEAR & MACHINE CO.
READING, PENNA.

WE CARRY IN STOCK
STODDARD-DAYTON PARTS
DAYTON AUTO REPAIR COMPANY
353 West 52nd St., New York City

Gears and Repair Parts
At Discount For
PACKARD, REGAL AND CHALMERS "30" and "36"
Carried in Stock
Auto Parts & Accessories Co.
1983 Broadway New York

PARTS FOR ALL MAKES
Motors, transmissions, differentials, front axles, gears, etc., for any automobile.
Machine Shop and Blacksmith on Premises
AUTOMOBILE SALVAGE CO.
315-317 W. 47th St. New York City

Parts For All Makes
Motors, Transmissions, front and rear Axles, Carburetors, in fact everything for any automobile made, at sacrificed prices.
NORTHERN PACIFIC MOTOR CO.
212A West 50th Street NEW YORK CITY

For Sale

FOR SALE.—25 Lincoln milling machines; $35 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

FOR BARGAINS in Screw Cutting Engine Lathes write South Bend Lathe Works, 625 E. Madison St., South Bend, Ind.

FOUR LINCOLN MILLING MACHINES $50.00 each. Send for photo. Lucas & Son, No. 3 Fox St., Bridgeport, Conn.

10 NEW CROME NICKEL STEEL AUTO Frames, $10 each. Send for sketch. Lucas & Son, Bridgeport, Conn.

FOR SALE OR LEASE—MANUFACTURING PLANT—Suitable for Automobiles, Trucks, Shells. Thirty-five Thousand square feet floor space, Foundry, Machine and Woodworking Shops, Railroad Siding, Steam Power Plant, 3-phase, 60-cycle Power System and Compressed Air System. Satisfactory terms will be made to responsible parties. K. B. Ward, Painesville, Ohio.

VULCANIZING PLANT.—This is a chance to make yourself independent on very small investment. No competition. Standard tire jobbing contracts offer immense possibilities. Wife's health requires removal to other climate. Cash proposition only. Investigation solicited. H. L. Bigelow, Chariton, Iowa.

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Starting and Lighting Systems
of all makes repaired.
All repair work done under our guarantee.
IGNITION SPECIALTIES COMPANY
798 Seventh Avenue New York City
SIMMS-HUFF SERVICE STATION

BRUSHES
Metallic and Carbon Brushes
for every make of
Starting and Lighting System
Magnetos and Generators Repaired
CARLILE & DOUGHTY
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DELCO ELECTRIC SYSTEMS
Information Instruction Book No. 2
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Complete authentic Wiring Diagrams of all systems used on Delco equipped Motor Cars to date, 30 complete plates in all. Complete instructions as to care of parts, their operation, how to make adjustments and tests and general information of value to every automobile owner, garage man and mechanic. Only book of its kind ever issued. Sent postpaid upon receipt of 40 cents in stamps or money order.
AUTO ELECTRIC SYSTEMS PUBLISHING CO.
1700 Broadway New York, N. Y.

Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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PATENT IT
Patented Ideas Make Money. We Show You How. Send for Free Book.
Williamson & Williamson
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Welding

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WELDING PLANTS--$25 to $250
LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.
Write at once to Manager Dept. B.
BERMO WELDING APPARATUS CO. OMAHA, NEBR.

Bearings

We Buy New Bearings
of all kinds. What have you to sell?
M. GEORGE TIGAR BEARINGS CO., Inc.,
1876 Broadway, New York City

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Piston Rings

RESTA WINS
With
Houpert Rings

"Your piston rings stood up splendid in the 100-mile Chicago Challenge race today, which I won at the speed of 104 35-100ths miles per hour.

D. RESTA."

✣ ✣ ✣

HOUPERT
Cylinder Grinding
and
Houpert Rings

get results for touring as well as racing.

We lead as usual; others follow.

✣ ✣ ✣

Houpert Machine Co.
355 West 52nd Street
NEW YORK, N. Y.

WE SPECIALIZE IN CYLINDER GRINDing, pistons and rings. First class equipment, 20 years' experience make low prices possible. Ford and Metz cylinders reground, new pistons and rings, $20. Bridgeport Piston Ring Co., 346 Connecticut Ave, Bridgeport, Conn.

Piston Rings

"ECO" NEW PROCESS PISTON RINGS

These rings are made to accurately fit every different make of car, the slight differences in each car ring being carefully observed, thus saving YOU all labor cost of fitting. That's why repairmen like them so well. Order a set today. Full stock of sizes and oversizes up to 5½" x 5/16". Prices reasonable. All orders shipped C.O.D. same hour received. Money back guarantee.

E. H. MISH, Distributor, 1790 Broadway, N. Y.

PISTON RINGS—Simplex Leak Proof for Ford cars, 50 cents each. Dealers, or Peerless Piston Ring Co., 91 Lafayette St., Newark, N. J.

Magneto Parts

MAGNETO PARTS

We manufacture parts for all types of

Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos

Liberal discount to the trade.

Illustrated Catalogue on request.

MAGNETO PARTS CO., Inc.
1790 Broadway New York City, N. Y

If interested in agency write for particulars.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Help Wanted

WANTED—Salesmen calling on the Ford trade to handle new line of Ford specialties as a side line. Goods guaranteed. Liberal commission. W. S. Giaffam, 86 Locust St., Northampton, Mass.

WANTED—Salesmen covering the garage trade. Make big money selling our line of Simplex grease guns and wrenches. Special prices made on samples to Salesmen. Inquire, Raymond C. Agner Co., Box 233, Burlington, Wis.

SALESMAN—Exceptional side line. Good Commissions. Write or call. B. Richard, 693 Broadway, New York City.

REPRESENTATIVE WANTED.—We will assign large, exclusive territory to good salesman who can manage branch office. Automobile experience desirable but not necessary. Business now a success in East. Want to expand. Have ample capital, but if satisfied as to prospects applicant must make a small investment as guarantee of proper attention to business. Address S. C. Bilger, 1710 Mallers Bldg., Chicago, Ill.

Automobile Clutch Leathers

CHAS. HAGER & SON
High Grade Mfrs. of
AUTOMOBILE LEATHER EQUIPMENTS

Our Specialty—Domestic and Foreign Oak Tanned Clutch Leathers. We cut them while you wait to either your used leather or paper template from stock 3/16" to 5/16" thick. Other Specialties—Steering Joint Boots, Straps and Magneto Covers.

Prices quoted upon specifications.

1876 Broadway (62d St.), New York City

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

BUSINESS READING

The business man should be a constant student of the thing in which he has invested his capital, his experience and his effort. To do this he must acquire the reading habit. If he neglects this he makes a costly mistake.

The man who imagines he is too busy to read should never go into business. The chances for his failure are too great, and at best his success can never be more than a half-success.

There is no better business reading than the advertisements in this number. They are full of information and no one who is interested in automobiles can afford to neglect them.

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THE NEW SERIES

Genemotor

Trade Mark

The General Electric Company announces a New Series Genemotor, now ready for delivery.

It is much more efficient than the original model, which attained leadership in 90 days.

Two important new features—a double-point contact relay and a flexible driving pinion—establish the New Series Genemotor on a new basis of supremacy.

They provide against the misuse of the Genemotor in the hands of the novice and make doubly sure long and continuous service.

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To the big distributor or to the small dealer the New Service Genemotor now means a big Fall season, particularly in view of the new conquest of the Genemotor in winning

THE
GOLD MEDAL
AT THE
PANAMA-PACIFIC
INTERNATIONAL
EXPOSITION

This is a distinction which has an important bearing on sales, for all the world loves a winner.

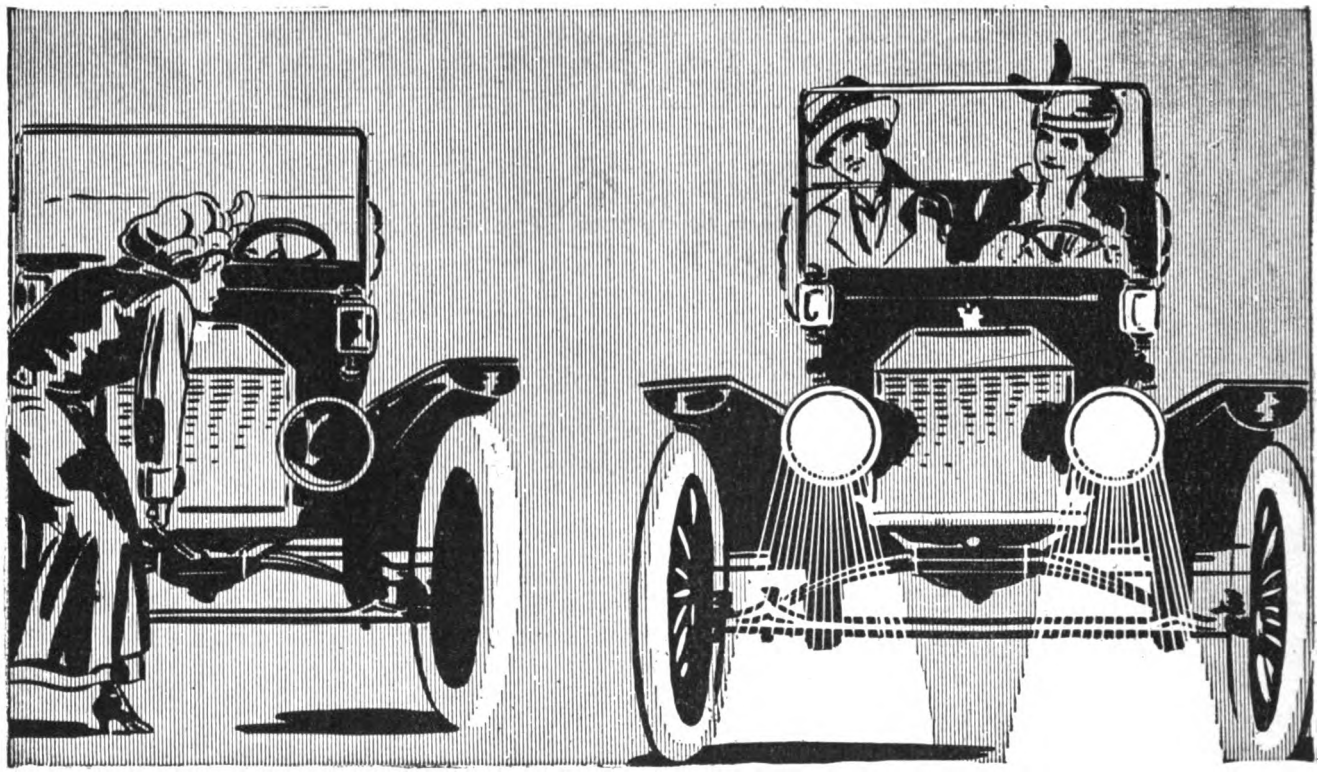
A merchant, they say, is known by the goods he sells. Why not sell the best?

If you are not now handling the Genemotor, please write us.

DISTRIBUTORS EVERYWHERE

A·J·PICARD & CO
1720-1722 BROADWAY, NEW YORK

649954
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Women Can Drive $65

Ford cars with perfect freedom if they will be sure to see that the car is equipped with a

SPLITDORF-APELCO
ELECTRIC STARTING AND LIGHTING SYSTEM

$73 f. o. b. Pacific Coast
$85 f. o. b. Toronto

Hand-cranking with its physical strain and the ever present possibility of a back fire and broken wrist, is entirely eliminated with the use of a powerful SPLITDORF-APELCO outfit.

Just a little foot pressure from the driver's seat and the never-failing SPLITDORF-APELCO system "spins the motor" whether starting from the house or garage or quickly starting up the motor after confusingly stalling it in traffic.

The crowded city streets and the highways and byways of the country can hold no terrors for women drivers of ***Ford*** cars, so long as the car equipment includes a SPLITDORF-APELCO system—the electric starting and lighting is ***always*** taken care of.

It is simple and easy to install the SPLITDORF-APELCO system, and ***Ford*** motor repairs can be made without disturbing the installation. You can make the installation yourself or any garage or supply man will do it for you. SPLITDORF SERVICE, too, is at your command at our branch houses, and the work of installation can be promptly attended to by our own experts.

BY INVITATION MEMBER OF

DEALERS' PROPOSITION We have an attractive offering for the handling of SPLITDORF-APELCO Systems. Write for details.

SPLITDORF ELECTRICAL COMPANY

ATLANTA .... 10-12 E. Harris St.
BOSTON..... 1112 Boylston St.
CHICAGO..... 64-72 E. 14th St.
CINCINNATI..... 811 Race St.
DALLAS..... 402 S. Ervay St.
DETROIT ..... 972 Woodward Ave.
KANSAS CITY..... 1827 Grand Ave.
LOS ANGELES..... 1215 S. Hope St.
MINNEAPOLIS ..... 34 S. 8th St.
NEWARK..... 290 Halsey St.
NEW YORK..... 3-5-7 W. 61st St.
PITTSBURGH..... 5941 Ellsworth Ave.
PHILADELPHIA.. 210-212 N. 13th St.
SAN FRANCISCO..... 1028 Geary St.
SEATTLE ..... 1628 Broadway
TORONTO..... 469 Yonge St.
LONDON
BUENOS AIRES

Factories: NEWARK, NEW JERSEY

(All SPLITDORF features are fully covered by patent or patents pending)

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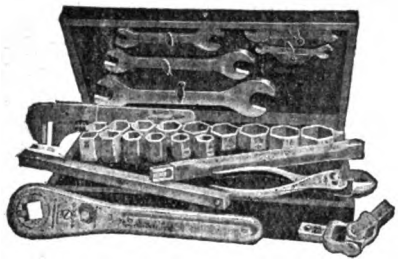
Suppose it IS Really True!

Would YOU take the trouble to specify MOSSBERG Wrenches
—if they ***are*** honestly made and thoroughly guaranteed
—if they ***are*** constructed to do just the work demanded
—if the prices of them ***are*** consistently low.

Ask for Catalog No. 171B.

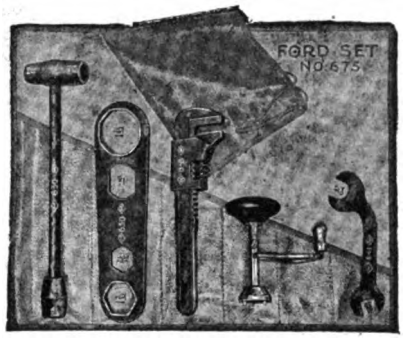


From the Little "74" Telescope Model at 36 Cents.



No. 26. Set of Sockets. New Rustproof Finish, $10.00.

They Are All Ab-so-lute-ly Guaranteed

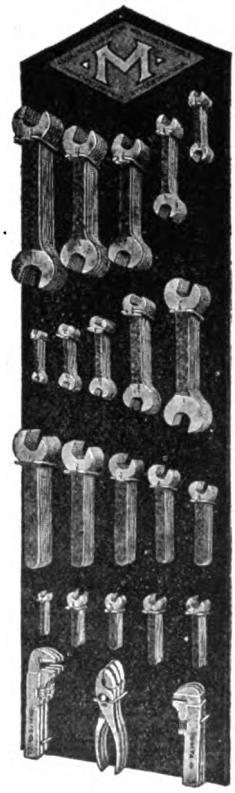


Ford "Repairkit" No. 675. Priced at just $1.00.

To the *"No. 14 Set."*



The "Complete-est" Wrench Set, $14.00.
55 openings—averages 23½ per wrench.



The Only way to increase your business on Engineers' Wrenches—Get our free Display Board No. X.
WHY NOT?

Frank Mossberg Co., Attleboro, Mass.

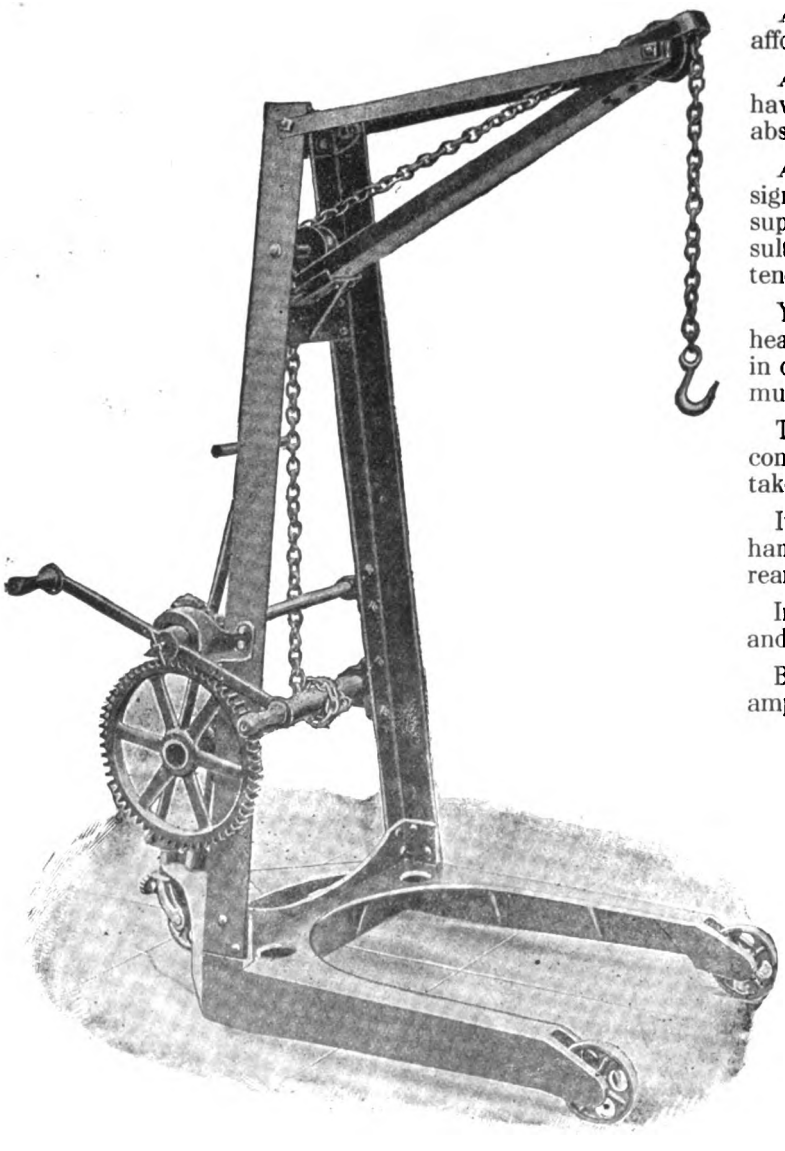
To FRANK MOSSBERG CO., ATTLEBORO, MASS.
NAME.....
ADDRESS.....
Really believes Mossberg means it. Send him a catalog in a hurry.

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The Easy Moving of Heavy Weights

The Manley Hilite Portable Floor Crane

Designed for GARAGE use and conditions



At last, a Crane at a price you can afford to pay.

At last, a Crane of one ton capacity, having the lift and overhang that is absolutely necessary in every garage.

At last, a Crane that is properly designed and built, having a light steel superstructure with a cast iron base: Result, one-half the weight—less bulk—less tendency to upset—low center of gravity.

You *now* do not have to purchase a heavy crane of two or three tons capacity in order to get the lift and overhang you must have.

The greatest time saver, labor saver and convenience that a Garage can install. It takes the place of several men.

It is an indispensable tool, as it will handle engines, transmissions, front and rear axles, etc., as no other appliance can.

Incomparably superior to a chain block and costs no more.

Besides the main features of low price, ample lift and overhang, this Crane has:

Powerful Leverage.
Double Throw Operating Handle.
Single Hoist Chain, always out of the way of the operator.
Gears Cover for Safety.
Wheel Lock.
Three Point Suspension for Base.
Unbreakable Steel Handle.
Steel Cantilever, bridge type construction.
Strength and Rigidity.
Ease of Operation.

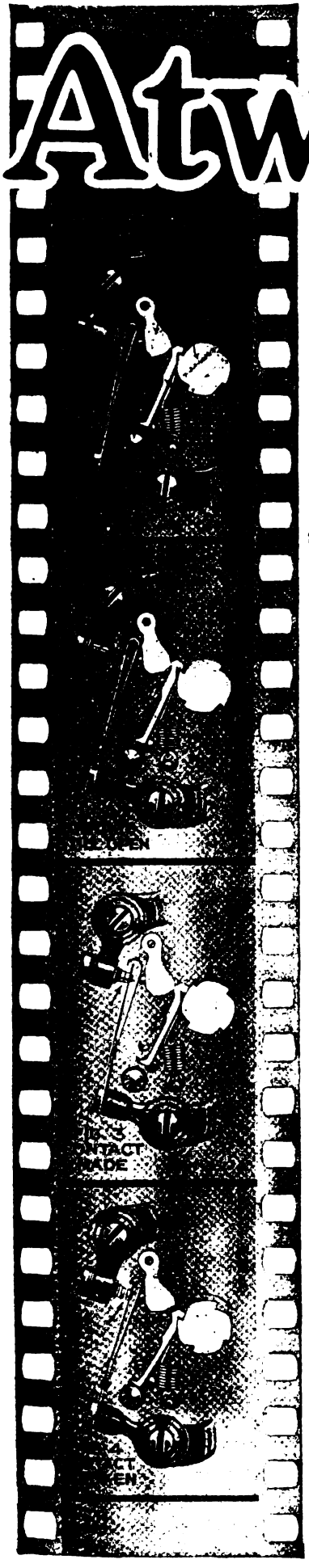
Write for our Catalogue on Shop Equipment Today

THE UNITED ENGINE & MFG. COMPANY

HANOVER, PENN., U. S. A.

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Atwater Kent Ignition



The lifter as it is pulled forward by the notched shaft does not touch the latch, and the contact points remain open.

The lifter, reaching the point where it rolls off the notched shaft is pulled back by the lifter spring, striking the latch as it returns.

The latch, being struck by the lifter, presses against the contact spring and closes the contact points for a brief instant, immediately opening after the lifter passes.

The latch and lifter, having returned to their original position, are ready for the next spark.

Owing to the fact that it is impossible to stop the motor in any position which will leave the ignition circuit closed, the Atwater Kent System is fundamentally safe, and no accessory safety devices are necessary to protect the battery. The current flows only during the brief instant of each spark and the ignition switch is practically useless except for stopping the car. In other words, it might be left in the "ON" position permanently without the slightest danger of draining the batteries.

The Atwater Kent principle is absolutely unique among ignition devices. Its success is certified by more than nine years of uninterrupted growth. It is in use to-day on upwards of 200,000 cars and is endorsed by more than 30 reputable manufacturers and over 10,000 dealers, garages and repairmen.

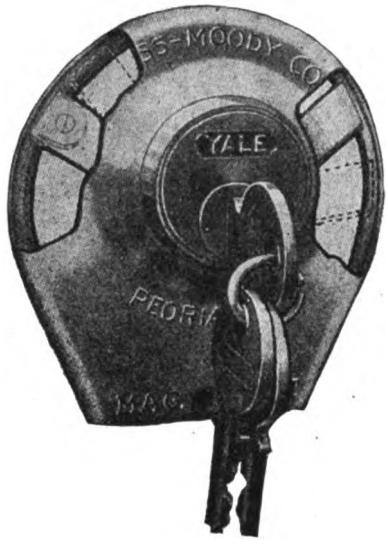
The Atwater Kent magneto replacement system can be easily installed in place of the magneto on any standard car. Thousands upon thousands of car owners realizing the benefits of Atwater Kent Ignition are installing this system on cars previously equipped with magnetos and other types of ignition.

Our special outfit for Fords deserves the investigation of every owner of this remarkable car, and the opportunities which it offers to dealers, garages and repairmen are attracting the attention of the entire trade.

If you are a car manufacturer, dealer or owner and are not fully posted regarding this wonderful system, by all means get in touch with us without further delay. You owe it to yourself to have our complete data on file.

Atwater Kent Mfg. Works
4933 Stenton Avenue, Philadelphia, U. S. A.

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What's This?

THE B. M. SWITCH WITH YALE LOCK FOR FORD CARS HAVING METAL COIL BOX

1. A mechanical device that is an absolute protection against Ford thieves.
2. Installed in two minutes—by removing present switch plate—substituting this.
3. **Note:** the two brass shutters that cover the upper two deeply countersunk screw holes.
4. These absolutely prevent removing of plate and making connections to start car.
5. The Yale Key (no duplicates) acts as the switch key —automatically locking car when engine is shut off.
6. Cheapest insurance against theft.

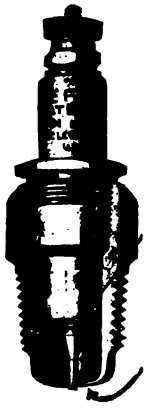
Address Your Nearest Dealer or Jobber.

Get our prices and full particulars on this and a large line of other specialties for the Ford Car.

SALES OFFICE

The Goodrich Accessory Association, 300 NORTH BROAD STREET, PHILADELPHIA, PA.

JOBBERS: We do special contract manufacturing on specialties involving castings, machine work and stampings. Write for our special prices on Malleable Lined and Unlined Brake Shoes, Truss Rods, and Ignition Assembly Outfits for Ford Cars.



Perfect Ignition Guaranteed by Using

REFLEX Spark Plugs

EVERY Reflex plug is sold under a Guarantee of perfect satisfaction after 30 days' trial—or return it and get your money right back, without argument, explanation or delay.

EVERY Reflex Plug has our patent Baffle that reflects the soot and dirt *away from* the interior and *out through* the spark gap at every explosion. In connection with the enclosed end this makes Reflex plugs practically self-cleaning and long lived.

Used by 16 leading automobile and motorcycle manufacturers. We sell direct where we have no dealer.

WRITE FOR CATALOG AND PRICES.

The Reflex Ignition Company, 211 High Avenue, CLEVELAND, OHIO

TELEGRAM



Chicago, Ill., Aug. 7th, 1915.

JOSEPH DIXON CRUCIBLE CO.,
Jersey City, N. J.

Won the 100-Mile Challenge Race at 104.35 miles per hour. I used Dixon's Graphite Automobile Lubricants, which I can highly recommend.

D. RESTA.

G-87

GROBET "VIBRATOR" FILES



Six inches over all — Price, 15 cents each post paid

Length of Cut three inches — Price, per dozen, $1.50

Screwdriver end

Quality Guaranteed — Price, per gross, $13.75

LIBERAL DISCOUNT TO DEALERS

MONTGOMERY & CO., Inc., Tools, Supplies and Machinery, **105-107 Fulton Street—62 Ann Street, NEW YORK CITY**

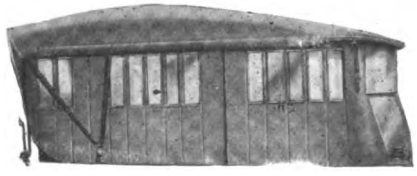
"Hercules"

ONE-MAN-TOP

EQUIPPED WITH
JIFFY SLIDING CURTAINS AND DUST HOOD
FOR ALL CARS

ALSO RUNABOUT AND 4 POST TOPS

Made of Silk Lustre Mohair, Imitation Leather or Khaki Twill.



LIBERAL DEALERS' DISCOUNT
Send for General Price List

Ford $30.00 **Hup $33.00**
Overland $35.00 **Hudson $38.00**

(Mohair) Complete with Jiffy Curtains and Dust Hood, F. O. B. MICHIGAN.

HERCULES RUBBER CO.
ONE-MAN-TOP DIVISION
2 Hudson St., New York, N. Y.

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Drive Your Car In Comfort This Winter

Use Ieco Steer Warms



They make winter driving a pleasure. Be comfortable. Keep your hands and whole body warm with this practical and inexpensive device. Steer Warms consist of two net leather covered grips which lace on to the steering wheel at any place convenient for driving. Special resistance wires between thin copper plates connected with storage batteries (or magneto on Ford cars) give out an even heat, enough to keep the hands warm in zero weather. They have many talking points:—

1. **Keep the hands warm in coldest weather.**
2. **Make Driving Safer.**
3. **Help Preserve the Health.**
4. **A Saving to Truck Owners.**
5. **Simplicity—No Moving Parts.**
6. **Easy to Install.**
7. **Economical.**
8. **Save on Gloves.**
9. **Price Low.**
10. **Guaranteed.**

PRICES:
For Ford Cars $5.00
For Other Makes 7.50

No More Starting Troubles

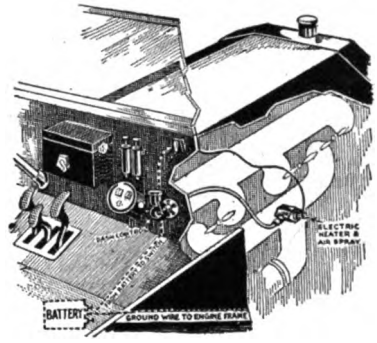
The IECO Electric Manifold Plug will eliminate your starting troubles and will always enable you to start your motor on the first turn regardless of the weather.

This wonderful electric plug is inserted in the intake manifold and a small copper tubing connects it with the priming cup on the dash—a switch at the side of the priming cup turns on the gasoline in the plug. Current from your storage battery heats the plug.

Use Hot Gasoline To Start In Winter

Gasoline flowing through the heated plug is vaporized, putting a rich hot mixture into the cylinders. There are many good talking points:—

1. **Starts Car on Coldest Day.**
2. **Primes Cylinders from the Seat.**
3. **Cuts Gasoline Bills 20% to 30%.**
4. **Tests Carburetor.**
5. **Removes Carbon Deposits.**
6. **Saves Money for Truck Owners.**
7. **Easy to Install.**
8. **Economical.**
9. **Simplicity.**
10. **Guaranteed.**



Price - - $5.00
Ford car requires 6 dry cells.

To Dealers:

Increase Your Sales During Dull Season

Persuade your customers to use their cars during winter months and increase your sales. If a motorist has Steer Warms and Manifold Plugs, which do away with the discomforts of cold winter driving, he will not be so apt to put up his car. Carry an assortment—you will sell a lot of Steer Warms and Manifold Plugs.

You Make A Good Profit

We allow dealers a liberal discount. The articles being well advertised you will sell them quickly and turn over your capital often. Steer Warms and Manifold Plugs are easily handled. They are easily demonstrated. They explain and sell themselves. Easy sales mean easy money.

What We Do To Help You Sell

We are starting a big advertising campaign and taking a large space in the Saturday Evening Post and the leading Trade Journals. We are furnishing real co-operation by giving you the following:—electros, window displays, folders with your name imprinted, lantern slides, etc.

These Articles Sell Rapidly

On account of the great comforts they give and because they make winter motoring a pleasure, Ieco Steer Warms and Manifold Plugs readily appeal to the motorist. Show them and they will sell. Last season although they were introduced late the Dealers who handled them were very enthusiastic.

SPECIAL OFFER
Before October 15th

In order to secure your active co-operation and have the articles in your place of business before the first ad. appears in the Saturday Evening Post, we are making a special offer to all Dealers who will buy before October 15th. This special offer means money in your pocket. **Write for full information today.**

INTERSTATE ELECTRIC CO., 845 Perdido Street, New Orleans, La.

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Satisfaction or Your Money Back



That is our iron-clad guaranty on

BURD HIGH COMPRESSION PISTON RINGS

No ifs—ands—or buts. No matter what rings you are using now—plain or fancy. We guarantee your motor to develop more power, higher compression and to give more miles per gallon when you install Burd Rings. Write the nearest sales office—now.

BURD HIGH COMPRESSION RING CO., General Offices and Factory, ROCKFORD, ILL.

CHICAGO BRANCH
927 Monadnock Block

DETROIT BRANCH
736-8 Whitney Building

DALLAS, TEXAS
819 Wilson Building

INDEPENDENCE, IOWA
Gidney Hotel Building

KANSAS CITY, MO.
216-217 Rialto Building

MILWAUKEE, WIS.
403 Jefferson Building

MINNEAPOLIS, MINN.
714 Metropolitan Life Bldg.

NEWARK, N. J.
282 Halsey Street

NEW YORK, N. Y.
1105-9 U. S. Tire Building

PHILADELPHIA, PA.
684 No. Broad Street

PORTLAND, OREGON
816-817 Lewis Building

PEORIA, ILLINOIS
Masonic Temple

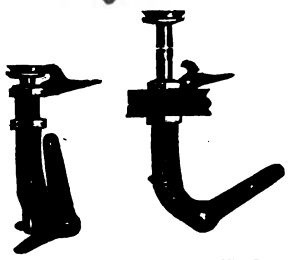
ROCHESTER, N. Y.
254 East Avenue

SEATTLE, WASHINGTON
427 Central Building

SPOKANE, WASHINGTON

LOS ANGELES, CAL.
316-317 Hass Building





The Ideal Cut-Out

Simply Cut Notch in Exhaust Pipe and Clamp over it.

PRICES

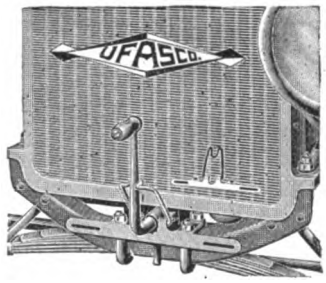
No. 5B.	For Pipe, 1½ in. o. d.	$1.00
" 6B.	" 1¾ " "	1.50
" 7B.	" 2 " "	1.75
" 7D.	" 2¼ " "	1.75
" 8B.	" 2½ " "	2.00

Gray Lock Pedal

No. 3.	Black	$0.60
" 3.	Brass	.75
" 3.	Nickel	.80

Liberal Discounts.
Ask for Catalogue, No. A.D.-15.

GRAY-HAWLEY MFG. CO., 937 Jefferson Ave., DETROIT, MICH.



Easy Money

Made by Selling

TRADE MARK UFASCO

COMBINATION CRANK HOLDER and NUMBER BRACKET No. 80

Stops Wear and Rattle
Ford Owners want it.
Increased Sales Has Reduced Price, but not Quality.

New Price, 50c.

Write for Circulars and Prices.

UNIQUE FINDINGS & SUPPLY CO., PROVIDENCE, R. I.

"There's a mighty big difference in lubricators!"



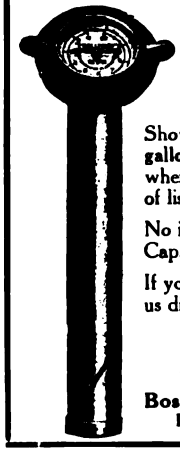
Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.
Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.



The "CHALLENGE"

A PERFECT Combination Gasoline Gage and Filler Cap

***For* FORD CARS**

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

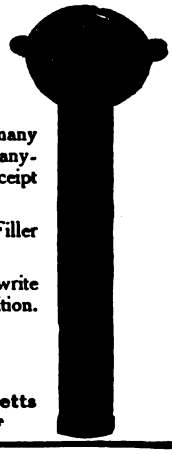
Dealers

If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.

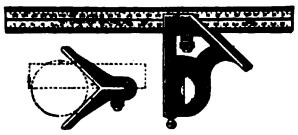
Quality Counts

BOSTON AUTO GAGE CO.
Boston Massachusetts
DETROIT OFFICE 1231 Woodward Avenue

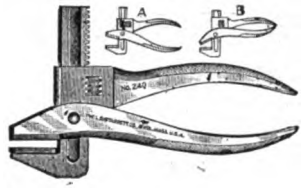


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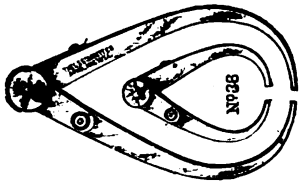
If You Own a Car You Should Own These Tools



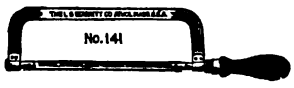
Every man who owns a car knows the necessity for handy tools in the tool box when there is no garage nearby. For emergency repairs or for overhauling your car you will find need for all of these



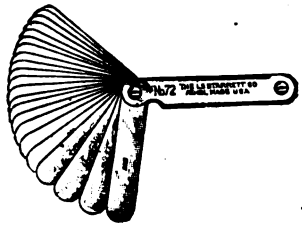
Starrett Tools



They are convenient and useful. The combination square may be used as a rule, square, or level. The calipers are used in taking sizes of any part. You often need a hack saw to cut some metal part or to fit a piece for temporary repairs.



The expansion pliers are the most useful pliers made. They give the plier action on large work far beyond the reach of ordinary pliers. Their grip is extremely powerful. The thickness gage or "feelers" are useful for setting sparking points and for determining thickness of shims for loose parts.



The cut nippers are quick cutters on wire and small stock.

Send for our 320-page catalog No. 20 D. C. showing complete list of tools and prices.

Starrett Tools are sold at all good hardware stores.

BY INVITATION MEMBER OF

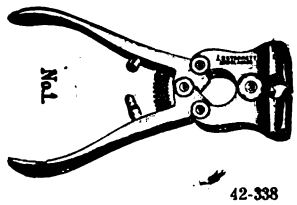


NEW YORK U.S.A.

The L. S. Starrett Co.

WORLD'S GREATEST TOOLMAKERS

Athol, Mass.



42-338

YOU NEED NEVER WORRY

ABOUT BURNING UP TUBES, OR ABOUT PATCHES COMING LOOSE

If You Repair Punctures and Blowouts with

TIRE-DOH

TIRE-DOH can be used anywhere—on the road or in the shop—requires no heat or tools, and 2 cents worth repairs the average puncture. At any dealer's, or direct from us, $1.00 per outfit.

Tire-Doh Repairs Are Permanent.

TIRE-DOH IS MADE ONLY BY THE

ATLAS AUTO SUPPLY CO., 680 W. Austin Ave., CHICAGO

Brighten Up Your Car With

Marvel-Mist

Removes Road Tar, Oil and Grease

Prevents Rain Streaks



Guaranteed Not to Injure Paint or Varnish

Non-Combustible-Inflammable-poisonous

Applied thru Sprayer

Keeps Your Car Looking New

Midget Outfit, With Cloth, $1.00 Giant Outfit, With Cloth, $1.25

Refillers—Pint, $0.75 Quart, $1.00 ½ Gallon, $1.75 Gallon, $2.75

1 Pint of Marvel-Mist is equal to 1 gallon of ordinary polish.

Write for our attractive Dealer's Proposition.

MARVEL-MIST MANUFACTURING CO., 56 Greenpoint Ave., Brooklyn, N. Y.

Pistons for Ford Cars



Made of soft grey iron, and accurately machined. Pistons are exact weight—three pounds, nine ounces—and are shipped complete with rings, pin and bushings.

On hand for immediate shipment, standard, or .005", .015" or .030" oversize.

Price, Cash With Order, $1.00 Each

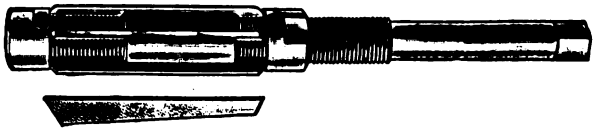
Depuy Bros., Canterbury, N. H.

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The best made for repair work

The Critchley Expanding Reamer

Try one and you will want more



Reams odd size holes

CHADWICK & TREFETHEN

32 BOW STREET **PORTSMOUTH, N. H.**

THE UTILITY DEMOUNTABLE RIM WRENCH

A Whole Tool Kit In One.

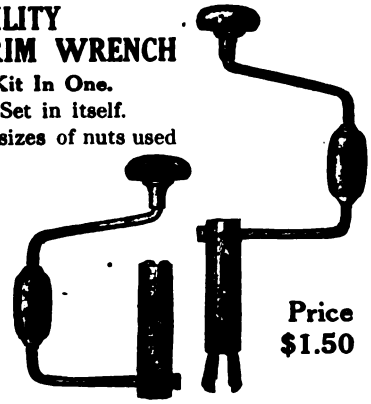
A Socket Wrench Set in itself.

Takes not only all sizes of nuts used in connection with demountable rims, but many other kinds and sizes.

Wrench can be folded when not in use.

Send for circular.

HILL PUMP VALVE CO.
Chicago, Ill.

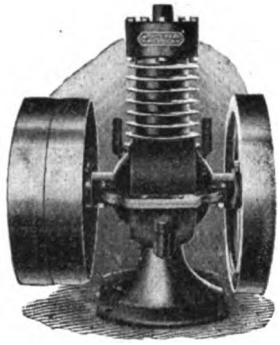


Price $1.50

New York Sales Office, 115 West Broadway

YOU Need Compressed Air

NOT Hot Air



You can't clean an engine or inflate a tire with noise. Performance, not promises, is what you need at both ends of the air hose. This is why you should install an

AU-TO AIR COMPRESSOR

Small in Size and Price. Large in Performance

It is built for service—compact, sturdy, durable, with every part easily accessible and simple. Fasten it to the floor, put on the belt and it is ready to run. Using 6½ cubic feet of free air per minute at 300 pounds pressure and requiring only 1½ H. P. to operate, the AU-TO Air Compressor is guaranteed to give perfect satisfaction.

A necessity in every garage, machine shop and repair plant.

Write for our catalog, the sooner the better.

THE AU-TO COMPRESSOR CO.

Dept. 62 **WILMINGTON, OHIO, U. S. A.**

DEALERS:

Two Sure Fire Money-Makers are Awaiting Dealers in Every State

THE

1916 MECCA At $695

Never in Motordom's History has a car with every possible up-to-date feature been offered at such an epoch-making price. There is no competition in the MECCA "30's" sphere.

AND

New TWOMBLY At $195.00

The lowest price car in the world, without an equal at three times the price. Simple in operation and most economical car to run. Has been a big seller wherever shown.

TIRES We have the greatest Tire Proposition ever offered in this country of Tires equal in quality to any Tire now on the market.

Act quickly, if your section is open you can get the Agency with good Generous Territory and Terms. WRITE OR WIRE TODAY.

TIMES SQUARE AUTO CO.

S. W. Cor. 56th Street and B'way, New York || **WORLD'S LARGEST DEALERS** || **1210 Michigan Avenue Chicago - Illinois**

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Guaranteed for 10,000 Miles



BRICTSON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Brictson Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding too.

Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

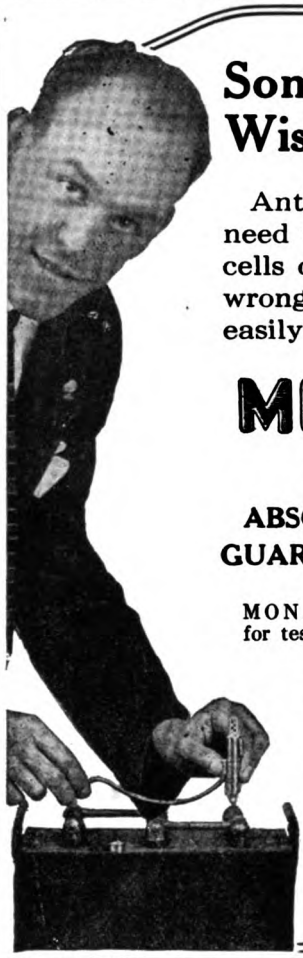
Your Tires Rebuilt The Brictson Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blowouts, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write today for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

The Brictson Mfg. Co.
195 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires



Some Day You'll Wish You Had One

Anticipate that inevitable need today. When your dry cells or storage battery goes wrong you can quickly and easily locate the trouble with

MONARCH

UNBREAKABLE
ABSOLUTELY ACCURATE
GUARANTEED FOR 5 YEARS

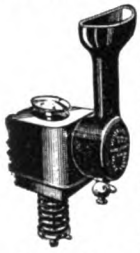
MONARCH AMMETER for testing dry cells **$1.00**

MONARCH STORAGE BATTERY TESTER . . **$1.50**

At your dealer's or direct upon receipt of price.

Hercules Instrument Co.
Dept. D. R. **Mount Vernon, N. Y.**

THE HEISER VALVE TESTER



Shows you the leaky valves and the tight ones; it shows you the condition of the valve stem and valve stem guides. INTAKE VALVE STEMS AND VALVE STEM GUIDES worn to such an extent that they admit auxiliary air, cause erratic running motors, loss of power, waste of gasoline. It is obvious that if air passes one Intake Valve Guide that the mixture is weakened in that particular cylinder; a weak mixture pops back in the carburetor. This condition cannot be overcome by adjusting the carburetor, for it will be seen that the cylinders that are tight receive a mixture that is too rich for perfect combustion. Nine-tenths of the garages absolutely disregard the importance of this repair. Because valves have recently been ground does not indicate they are perfect. The Heiser Valve Tester verifies the work after it is done. No shop, large or small, public or private, is complete without this tester. This tester not only tests the valves of Fords but a great many others where the valve port does not exceed two inches in diameter.

The price of the Tester, delivered to any address in the United States is **$2, cash with order.** Address

HEISER SPECIAL TOOL CO., Dept. A., Kingston, Missouri

STOP THAT LEAK

You are using too much oil!
You are wasting gasoline!
You are not getting enough power!
DON'T THE UP-KEEP GIVE YOU THE BLUES?

Trade Mark



Patent Applied For

There was a time when water pumps at the City water stations used a fabric or leather packing; not so today. A copper jacket is put in the cylinders. Large grooves are cut in the pistons, the volumes of water in the grooves form a packing, small particles of water cannot pass the volumes of water in the grooves. Thus making a perfect packing of water against water. Just so with "NO-LEAK-O" Rings. The volumes of oil in the grooves act as a packing against the oil being drawn or forced up into the firing chamber. "NO-LEAK-O" piston rings have grooves which CONTROL THE OIL, giving perfect lubrication without waste. No smoke. No carbon. No oily spark plugs. No grinding of valves. We absolutely guarantee each ring for QUALITY, ACCURACY and SATISFACTORY service. ONE PIECE, LOW COST, HIGH EFFICIENCY. Carbon eliminated by controlling the oil. *Write at once for complete particulars.*

AUTOMOBILE ACCESSORIES CO., 816 W. North Avenue, Baltimore, Md.

Special Request

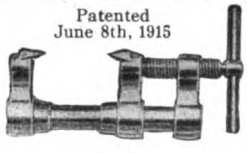
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Knowlson's Spring Spreader

Drop Forged

Nickel Plated and Polished

Patented June 8th, 1915



100% Easier Riding

Stops the Squeak

No. 1142280

WARNING To The Trade
Our Patent is basic, covering all spring spreaders with wedges on the market no matter how operated. Our rights will be protected.

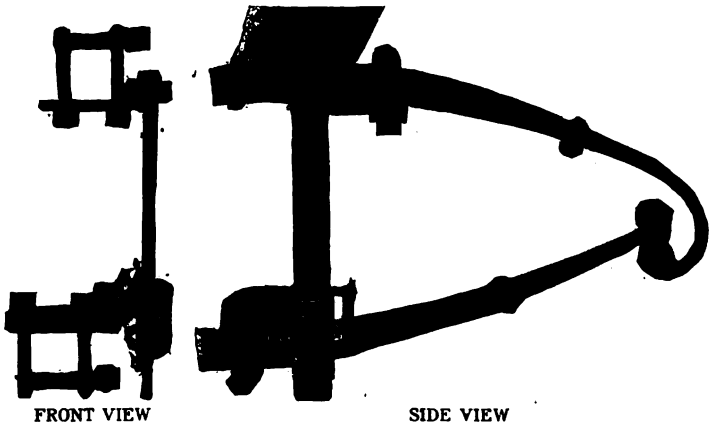
At all best Dealers, or sent prepaid anywhere for **$1.50.**

Money returned if not satisfactory.

Write for complete particulars.

Spring Leaf Lubricator Co., **1000 Forest Ave., Ann Arbor, Mich.**

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FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.

WHY REPAIRMEN SHOULD USE Marko STORAGE BATTERIES



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

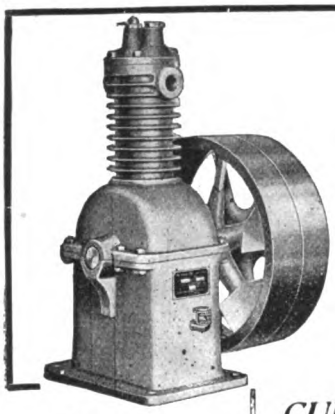
"Marko" batteries lead because of their great efficiency and reliability.

Write At Once for Our Proposition to Repairmen and Dealers.

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.

AIR FREE FROM OIL—

THAT IS WHAT YOU MUST FURNISH TO YOUR PATRONS IF YOU WISH TO GIVE THEM GOOD SERVICE.



MADE IN FOUR SIZES.

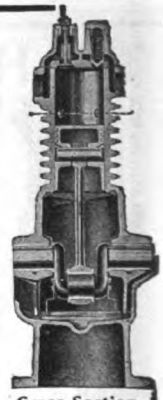
CURTIS GARAGE AIR COMPRESSORS

will furnish AIR FREE FROM OIL because unlike all other air compressors the amount of oil furnished the cylinder is controlled—only sufficient oil furnished to properly lubricate without excess to be carried over into the air line. Examine the cross-section illustrated and note that neither crank nor connecting rod dip into the oil and the oil is not thrown direct into the cylinder.

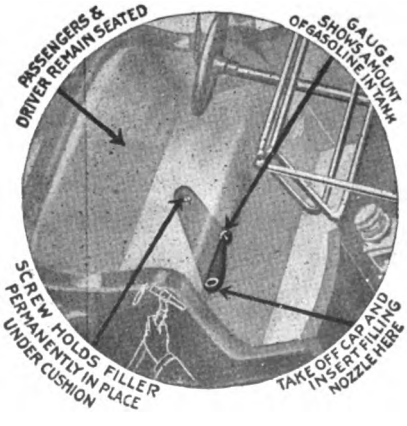
Write Us For Full Particulars Of Either Stationary or Portable Outfit.

CURTIS PNEUMATIC MACHINERY CO., *1530 KIENLEN AVENUE, ST. LOUIS, MISSOURI.*

Chicago Office, Marquette Building. New York, 30 Church St.



Cross-Section of Curtis Compressor.



A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge. Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline.
A Great Comfort Particularly In Stormy Weather.

If You Once Install a *"Fillometer"* You'll Never Part With It

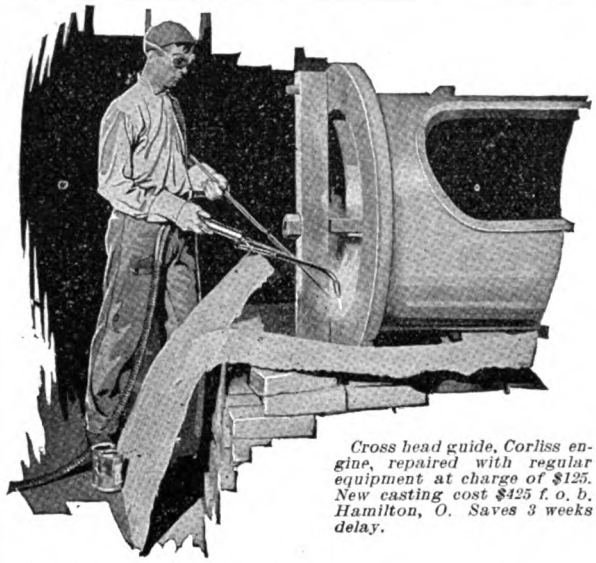
THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

APEX ELECTRIC MFG. CO.,

1410-12 W. 59th STREET, CHICAGO, U. S. A.

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Cross head guide, Corliss engine, repaired with regular equipment at charge of $125. New casting cost $425 f. o. b. Hamilton, O. Saves 3 weeks delay.

Added profits, for live garages and repair shops

There are many welding repair jobs outside of your regular automobile repair work that you can do, with this modern welding equipment.

The welding of broken metal parts of any kind is quickly and easily done at small cost. New customers come quickly when they learn they can have their repairing done on the spot, at less cost and without the expense and delay required to replace broken parts.

Even at very moderate charges the profits are too large to overlook.

PREST-O-LITE

Dissolved Acetylene

Gives you this opportunity to increase your business

Very small outlay for apparatus is required. Equipment soon pays for itself. We furnish a thoroughly high grade welding outfit for $60. The average user will also need gas cylinders at additional cost and about $10 worth of welding supplies. Truck and special cutting equipment at extra cost. Complete instructions free with every outfit.

Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene (ready-made carbide gas) in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

Start Now—Get Full Details

The demand for Oxy-Acetylene Welding Repair work is large and growing. Get your share of the profits. Send for literature that shows how you can apply Oxy-Acetylene welding in your shop, with profits to you and savings for your customers.



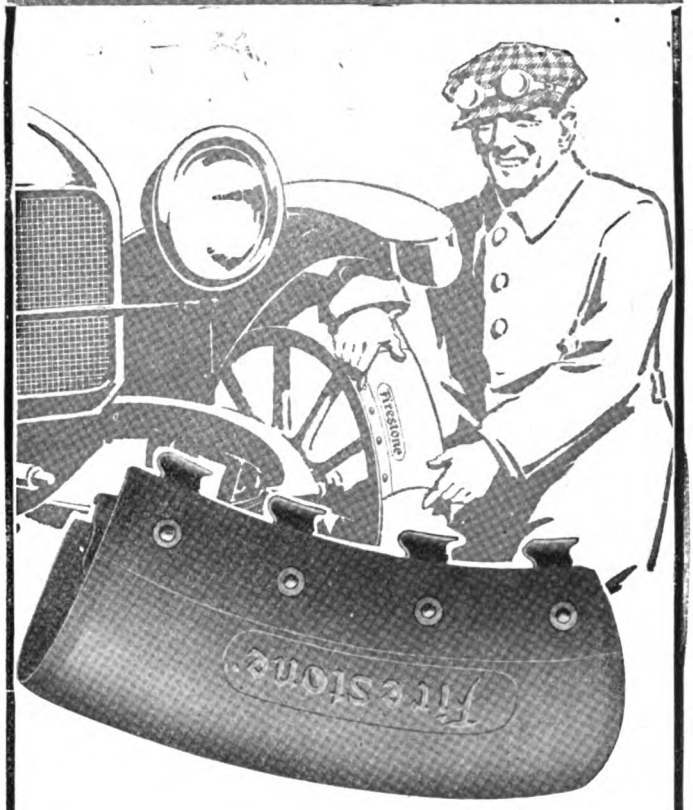
The Prest-O-Lite Co., Inc.

The World's Largest Makers of Dissolved Acetylene

820 SPEEDWAY, INDIANAPOLIS, IND.

53 direct factory branches and charging plants in principal industrial centers.





Firestone Hook-On Boot

LIKE all Firestone Accessories, this is a little thing which staves off big troubles.

Equipped with hooks which fit under clinch of rim. Inflate tire and go on your way—secure. The boot will "stay put."

The Man Who Sells Them

can be sure of the profits and prestige which follow when troubles are easily met and emergencies are foreseen. Firestone service builds good will.

Repair Materials in Air-tight Packages
Write for Catalog with Description

Firestone Tire & Rubber Company

"America's Largest Exclusive Tire and Rim Makers"

Akron, Ohio—Branches and Dealers Everywhere

Firestone Accessories

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"RAJAH GIANT"

on your

Spark Plug

means

Ignition Absolutely Sure!



The Rajah Plug will work efficiently for years — usually for the lifetime of your motor.

Except that it is heavier in all its parts, the construction of the "Giant" is the same as that of the

RAJAH STANDARD PLUG

Rajah Giant Plug, $1.50 } Postpaid—with
Rajah Standard Plug, 1.25 } Thumb-nut Terminal
Rajah Waterproof Plug, - - $1.50, Postpaid

Dealers: Are Rajah Plugs in your stock? If not, just consider the number of sales you may have lost.

A Rajah user will choose no other plug!

Write Now for Particulars to

RAJAH AUTO-SUPPLY CO.
BLOOMFIELD NEW JERSEY



IF

one piece piston rings could exert the same pressure against the cylinder walls at every point,—

and if

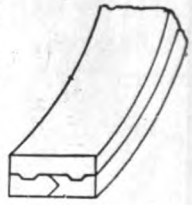
two piece piston rings, under stress, did not work "egg shaped" and "out of round"—

then three piece piston rings would not be a necessity.

But three piece piston rings are absolutely necessary to stop that costly leakage of power and compression.

"A Motor Is No Better Than Its Piston Rings."
Efficiency Ed.

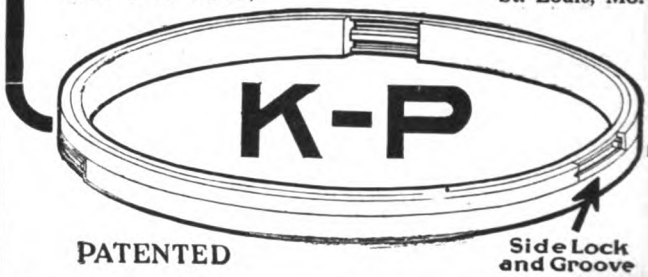
K-P Piston Rings are made up of three individual interlocking rings grooved together with their section openings so distributed that multiple contact against the cylinder walls is always assured.



LEAKAGE IS A MECHANICAL IMPOSSIBILITY

Special Inducements to Dealers and Agents.
Rings in all sizes. Write for literature.

STA-TITE PACKING RING CO.
3037 Olive Street, St. Louis, Mo.



PATENTED

Side Lock and Groove

HASSLER

Gives Added Profits to Live Dealers

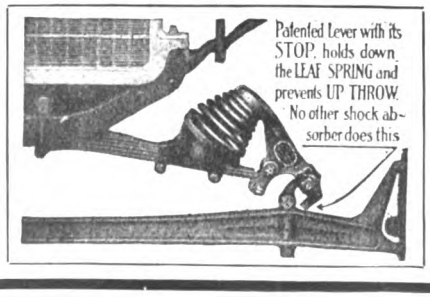
$15 For a Set of FOUR

THE Hassler Shock Absorber for Ford cars is being used by 50,000 owners with perfect satisfaction. Hundreds of dealers are increasing their profits by selling them.

The Hassler is considered by men who know the automobile equipment business to be the most efficient shock absorber ever made. The new price has made it the fastest seller in its line. Don't overlook this opportunity to be a Hassler dealer.

We are now offering a special dealer proposition. Will send you a trial set. Profit is large. Sold under absolute guarantee. Not sold through jobbers. We protect you. Exclusive territory. Write today.

Robert H. Hassler, Inc.,
Indianapolis, Indiana





BRAENDER

Tires and Tubes

Are Famous For Their QUALITY

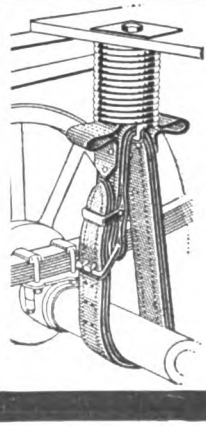
We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2.60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

Braender Rubber & Tire Co.
Factory: Rutherford, N. J.
New York, 250 West 54th Street
Agents in principal cities

Established Agents Solicited.



HOOVER AUTOMOBILE LEATHER NECESSITIES

Manufacturers of a complete line of
SHOCK ABSORBERS, $5.00 to $9.00
For cars weighing from 1000 to 5000 pounds. Also special for Ford Cars

Kick or Rebound Straps, $1.25 to $2.40
Crank Boots, Bow Rests, Door Stops
Steering Gear Boots, Trunk Straps
Fan Belts, Magneto Covers
Quick Detachable Motorcycle Puttees
Get our Catalog and Prices

THE W. H. HOOVER CO., NEW BERLIN, OHIO
Manufacturers of a complete line of
Top Straps, Rebound Straps, Bow Rests
Joint Covers Tire Rim Removers, etc.
Write us for Catalog

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A Low-Priced Vulcanizer

FOR CAR OWNERS AND GARAGES, THAT DOES AS GOOD WORK AS THE HIGHEST PRICED VULCANIZER

Why should you pay a big price for vulcanizers when you can get the **SUPERIOR VULCANIZER** at a price that will enable you to pay for it on a few jobs?

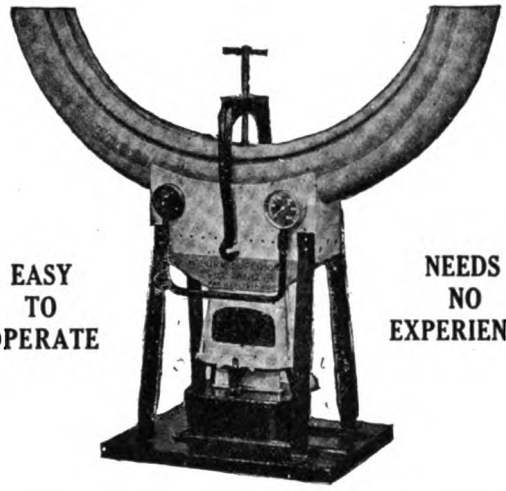
Inexpensive to operate.

No rubber air bags, bead molds, solid forms, etc. As simple as we know how to make it.

Write for our book fully describing machines. Free for the asking.

Money back if not satisfied.

LEE C. MAPES, 16 FULTON AVE., ROCHESTER, N. Y.



EASY TO OPERATE

NEEDS NO EXPERIENCE

Great Sale of Auto Bodies

An Opportunity for Live Dealers

We announce one of the most important sales of new and rebuilt auto bodies that we have ever inaugurated. Every type of body is included and the list includes many fine examples of the coach builders' art, at the lowest prices ever quoted.

Touring Bodies — **Raceabouts**
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Prices as low as $50.00—values that mean big profits to dealers. If you can drop in we will be pleased to show you the full line and quote you prices. Out-of-town dealers will receive full information on request. Let us know your requirements. We can save you *money*.

Large stock of windshields, racing seats and tanks.

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Increase the Horse Power, Efficiency and Speed

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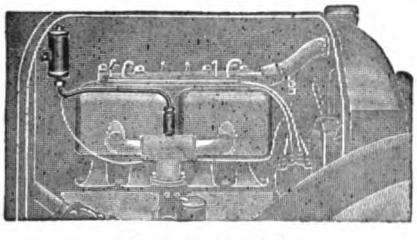
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We are the largest independent manufacturers and dealers in repair parts for Ford cars in the world.

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(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

With Gasoline Burner Outfit, extra - $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.

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Common Tread Stock, per lb	$0.40
Standard Tread Stock, per lb	.55
High Grade Tread Stock, per lb	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried	Net, 1.50
*Miller's Three in One Repair Stock	.90

* This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture



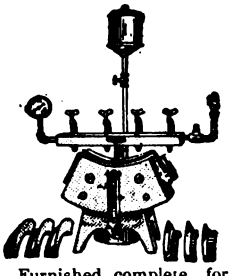
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That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Molds.....$42.00

MILLER'S SECTIONAL VULCANIZER
With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $41.50

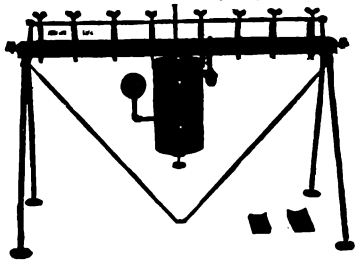
Miller's High Pressure Air Pump

is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. pressure. Write for details.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Inner Tube Vulcanizers
Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an **abundance** of steam.

PRICES FROM $5.00 to $30.00

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Write for our **52 Page** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Cog" Tread Tires** *and* **Heavy Red Tubes.** *Address Dept. D.*

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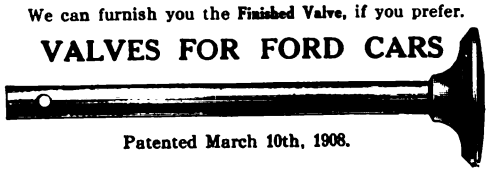
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REPAIRMEN—make your own valves and save money by buying the rough blanks from us; we can furnish you blanks with any size head or stem in quantities to suit you. All blanks have **Cast Iron Heads** and **Carbon Steel Stems** fused by a patent process and guaranteed.

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We can furnish you the **Finished Valve,** if you prefer.

VALVES FOR FORD CARS



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We make them and make them right, all finished complete. A large stock always on hand.

Get Our Prices Before Buying Elsewhere

MICHIGAN ENGINE VALVE CO. - Detroit, Mich.

TOWNSEND GREASE GUN





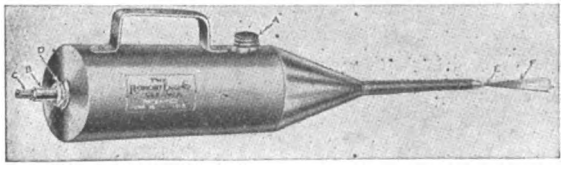
A Good gun should be
Quickly, easily and completely filled.
Quickly, easily and completely emptied.
—A pound a minute.
Not a speck should get on your hands.
The Townsend is such a gun—**the only one.**

S. P. TOWNSEND & CO.,
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THE ROMORT ENGINE CLEANER

For Automobiles and Motor Cycles

PRICE $3.00 Delivered. We Guarantee Satisfaction or refund purchase price.



Fill with two quarts common coal-oil, attach Cleaner to air supply (Power tire pumps or storage air systems preferred). Cleans the dirt and grease from the machinery perfectly. Once a week will keep your car looking new. Full directions with each Cleaner. Ask your dealer or fill out Coupon below.

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1322-1326 Michigan Ave., Chicago, Ill., or 1810 Westlake Ave., Seattle, Wash.

Gentlemen:—Inclosed find Three Dollars, please send me by Prepaid express or Parcel Post, One Romort Engine Cleaner, subject to your guarantee of satisfaction or refund.

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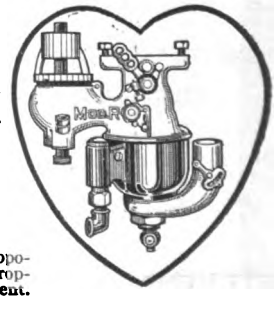
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equipped the Stutz Car winner of second place in the

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This was the first American car to finish in both races and was of course

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Why not have a SCHEBLER yourself?

Ask us about our remarkable exchange proposition on new Model "R." Get our special proposition and particulars for Ford car equipment.

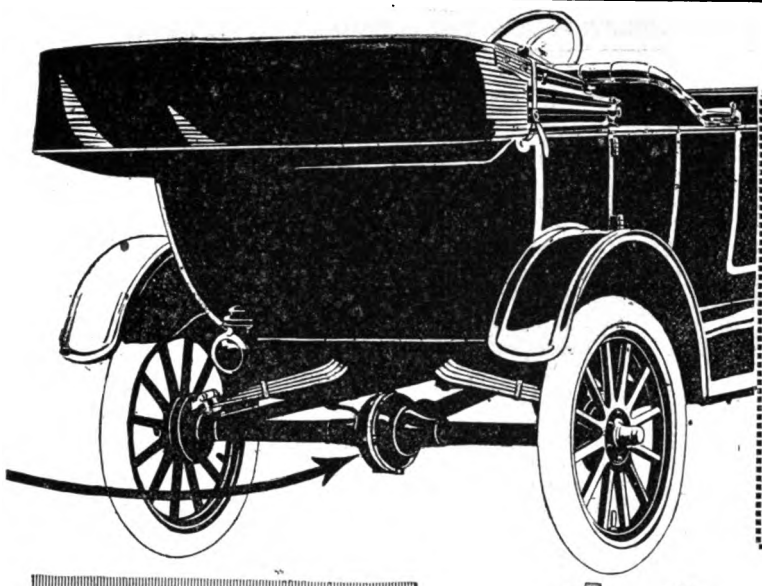
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Honestly—what does the average man know about the Differential

He knows it's the device which makes it possible to turn a corner and that's about all. Does he know when his car is stuck in mud or sand that **it's the fault of the old style bevel gear differential, which pulls only one wheel and allows the wheel having the least traction to spin?**

Does he know that this unequal pull is the cause of **rear tires wearing out** because of "wheel spinning"? Does he know that the old type bevel gear differential is the cause of **lost traction**—and that loss of traction is the chief cause of "wheel skidding"—the start of the car skid?



M. & S. Gear Co.
Whitney Bldg.
Detroit

Without any obligation on my part, you may send me full particulars about the M. & S. Differential. I might be interested in

Installing in my car ☐

Agency proposition ☐

Check which might interest you.

I drive a.....car

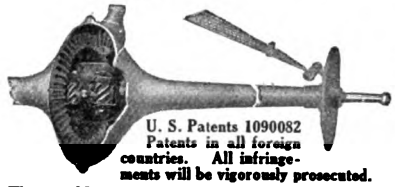
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M&S DIFFERENTIAL

"Pulls Both Wheels"

gives you an hitherto undreamt-of control—a sense of security in driving and handling your car that is as noticeable as the flexibility between a multiple cylinder engine and a one-lunger. The M. & S. is "standard equipment" on the Jeffery Quad.



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FORD Owners Get "First Chance"

The car Manufacturer can get M. & S. Differentials for equipment from the Brown-Lipe-Chapin Co. of Syracuse—the world's greatest manufacturer of differential gears.

But what about cars at present in use? We can't make M. & S. Differentials for all of them—not at present anyway. So first of all we have arranged to supply Ford owners.

Send in the coupon before you forget it and get our booklet telling all about this wonderful improvement in differential construction.

There's a great opportunity for dealers to sell M. & S. Differentials to Ford owners.

M. & S. GEAR CO., 1036-1042 Whitney Bldg., DETROIT

STEVENS TOOLS PARTS ACCESSORIES

QUALITY AND PRICE ALWAYS RIGHT
ALL LEADING JOBBERS CARRY THEM

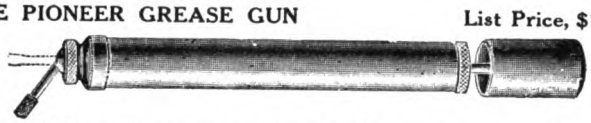
THE STEVENS DUPLEX REAMER List Price, $2.00



A high grade combination reamer for Ford steering pin and steering arm bushings; carefully ground to exact dimensions.

We also furnish a complete line of both plain and expanding reamers in all automobile sizes.

THE PIONEER GREASE GUN List Price, $1.50



The "Pioneer" is a heavy, well made brass gun, with many good features. It has a strong swivel nozzle suitable for oil or grease, and years of experience have shown that it will give more service than any other gun made.

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The best file made for facing up contact points. IGNETO Files have a dead smooth cut and leave a clean, burnished contact, without removing much platinum.

Mounted on display cards for the dealer.

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STEVENS & CO., 375 Broadway, New York City

Save Your Car!



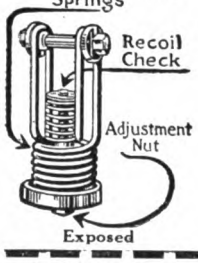
Save it from jolts and jars—from excessive vibration—from road shocks. Save tires—prevent spring breakage—make your car 100% easy riding by attaching

JOHNSON SHOCK ABSORBERS



Stop the Rebound! Absorb All Shocks!

The only coil spring shock absorber with a recoil check. Each Johnson has **not just one supplemental spring** but a **set of three compensating springs** so interposed that all shocks, big and little, are simply "eaten up" before they reach the car.



Our claim, which we will gladly prove to you is that it would require two sets of competitive equipments to do the work of one set of Johnsons.

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Please send descriptive literature and full details of your FREE trial offer.

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More Power For Your Car

The efficiency of your car is determined by comparing the **useful** power **delivered** to the driving wheels with that which is lost by friction. **Friction and loss of power is costly.** All of which emphasizes the vital necessity of using—

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE



BECAUSE NON-FLUID OIL reduces friction to a minimum by providing a durable, pressure-resisting cushion between all contact surfaces. It delivers the maximum of power to the driving wheels, thereby insuring you the greatest efficiency from your car with the least loss of power and with the least wear.

BECAUSE NON-FLUID OIL is strictly neutral—hot or cold, wet or dry, its consistency never changes. It does not leak off like LIQUID oils, nor gum up, decompose, or develop acidity and score the bearings like ordinary greases.

BECAUSE NON-FLUID OIL economizes upkeep. It lasts 3 to 4 times longer than LIQUID oils, or greases. Being of non-fluid consistency it **stays where put** and lubricates perfectly to the last small particle.

Get a can today and try it in comparison with what lubricant you now use so there can be no question of doubt as to NON-FLUID OIL'S superiority.

*The **original** NON-FLUID OIL is identified by orange-colored cans bearing the above sprocket-wheel trade mark. Avoid substitutes.*

"K No. 00 Special" grade for sliding gear transmission

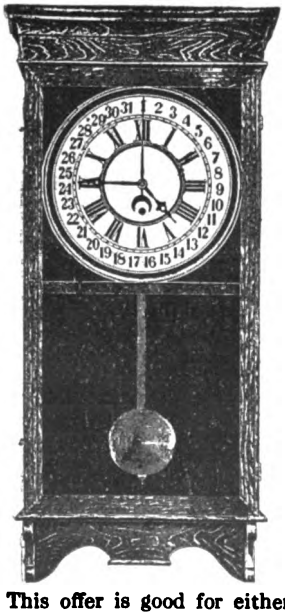
"K No. 000" for differential, compression cups and all bearings

Reduced prices for 1915
Ask your dealer

New York & New Jersey Lubricant Co.

165 Broadway, New York **1430 Michigan Ave., Chicago**

Every Repair Shop or Garage
SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers in the United States or its territories a **Regulator Eight Day Calendar Clock 38½ inches high, with a 12 inch dial, finished in Oak or hand-rubbed Mahogany,** with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of **$3.90.** This clock cannot be sent to any foreign country except Canada, and Canadian subscribers must send **50 cents** more to cover extra postage on the paper.

Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

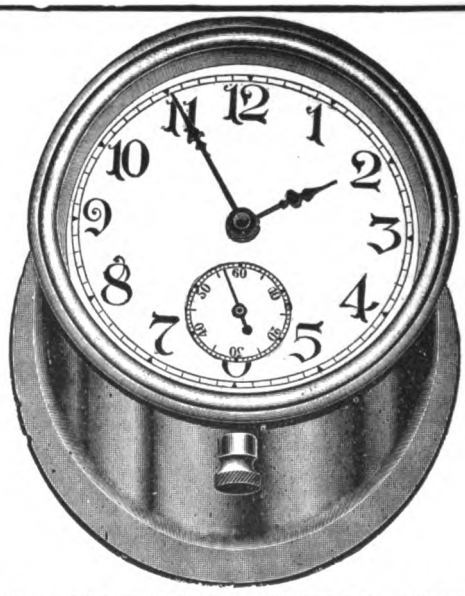
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"James"

After hearing what Mr.

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Use OPCO and get rid of carbon.

Dealers—get discounts and terms.

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STANDARD FORD 1915 EQUIPMENT

"Absolutely Accurate"

Special for Ford Cars

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Only $10

You can sell more Shock Absorbers and make more money

if you sell the low-priced, big value, heat-treated, STEEL, triple-coil C. C. Shock Absorbers that are built to stand abuse and are sold with the COX guarantee. For cars other than Fords they sell for only $10 for complete set for rear.

For Fords—$4.50 Set of Two **Set of Four $8.00**

Dealers everywhere are making MANY quick sales—and attractive profits—selling Standard C. C's. We are furnishing COX dealers everywhere with some mighty valuable selling helps that enable them to "hook up" with the COX advertising in National Publications. Send for our Free Booklet, "Proof of Profit," which tells why so many dealers everywhere are making more dollars profit this year than last, selling C. C. Shock Absorber quality at C. C. Price.

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Fill it out, mail it to us and we will send you post-haste some very interesting FACTS.

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Dept. M-2 *Established 1872* **Albany, N. Y.**

Branches or Distributors in all Principal Cities of U. S. A.

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Use SELF-VULCANIZING RUBBER PRODUCTS

Guaranteed to Triple Tire Mileage. Positively Self-Vulcanizing. Requires no Heat, Cement or Driers. Does not deteriorate with age, not inflammable, guaranteed.

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¼ lb. Can, $1.25; 5 Cans Any Assortment, $5.00, Prepaid.

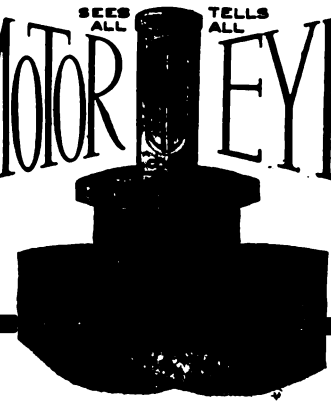
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Send immediately for descriptive circular giving full particulars of all our special products.

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DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH **$2.50**

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

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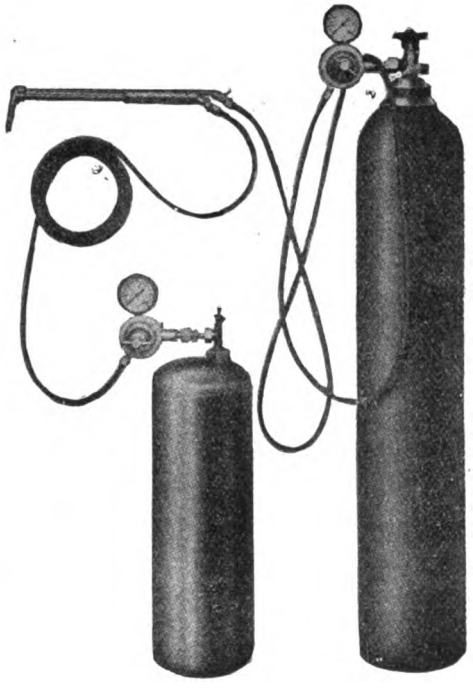
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No Extras

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See one before you buy. Will ship subject to your examination at our expense.

Write for Catalogue and Prices.

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Present price of land $50 per acre. No frost and no irrigation or fertilization required. The young man's opportunity and the old man's paradise.

The grape fruit raised here surpasses in flavor and quality anything grown in Florida or Southern California.

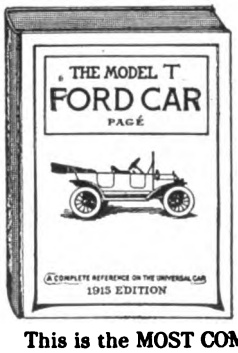
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FOR EVERY FORD OWNER, DEALER, SALESMAN and REPAIRMAN

THE MODEL T FORD CAR
ITS CONSTRUCTION, OPERATION AND REPAIR



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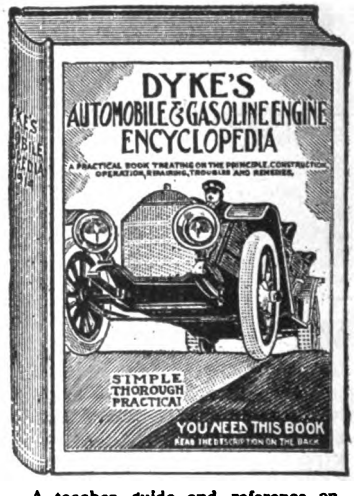
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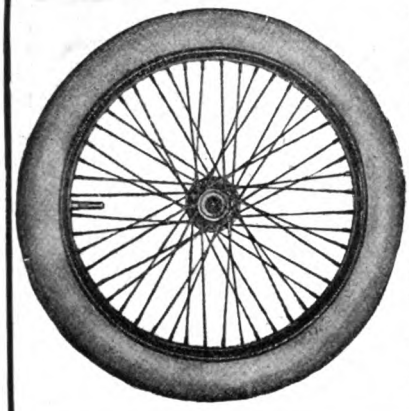
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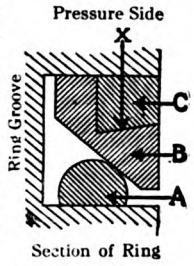
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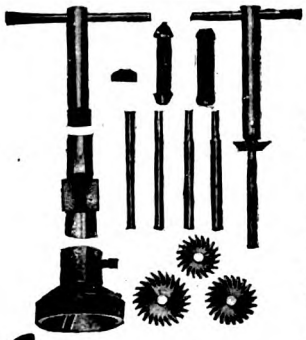
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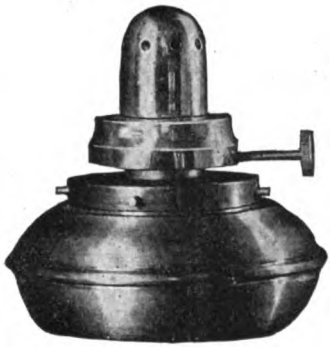
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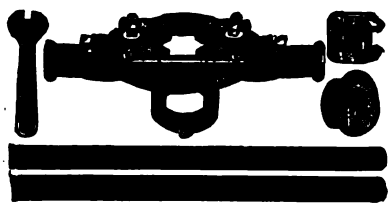
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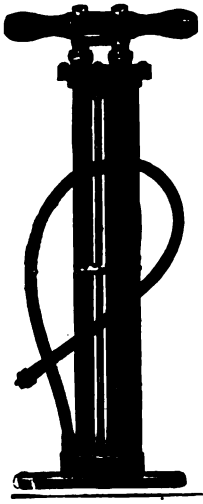


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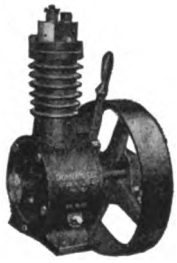
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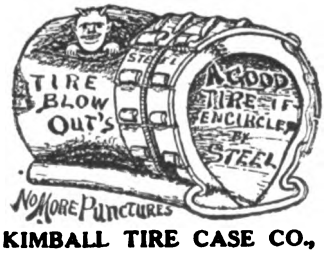
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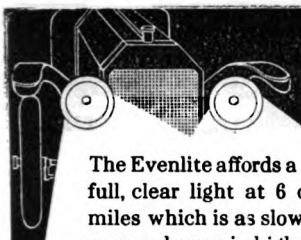


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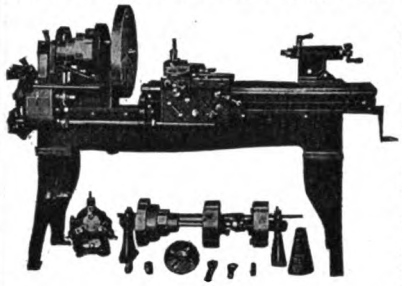
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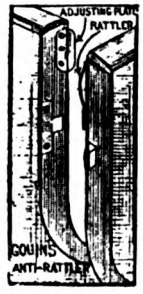
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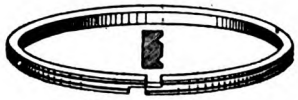
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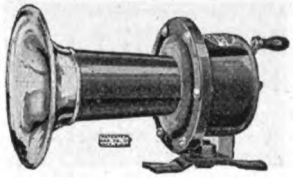
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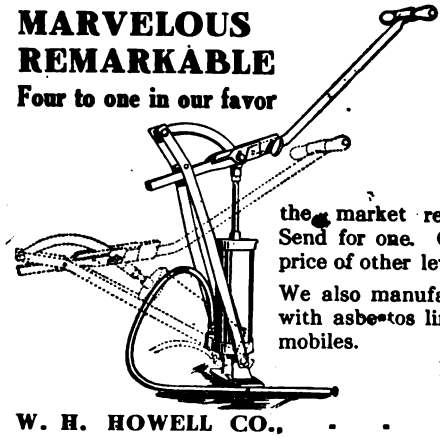
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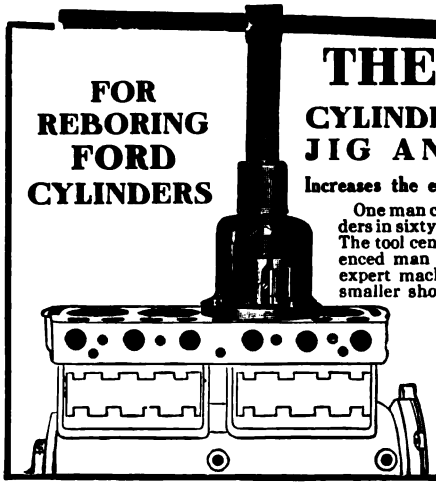
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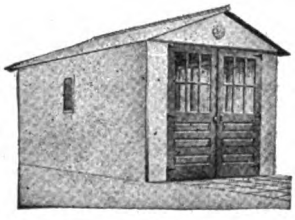
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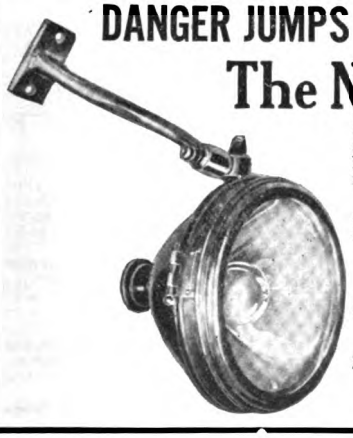
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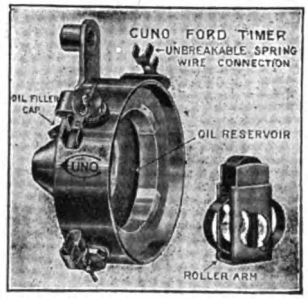
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Cuno Ford Timer

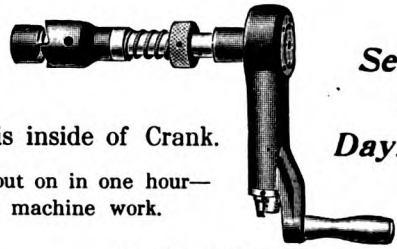
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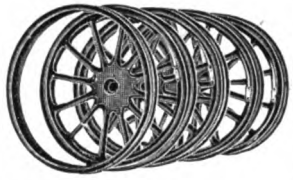
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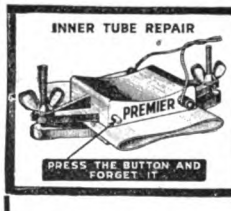


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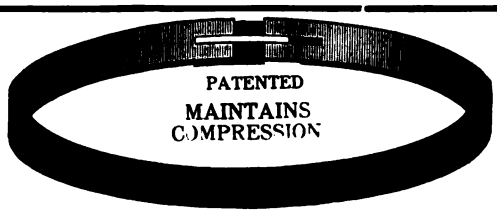
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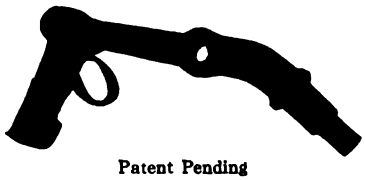
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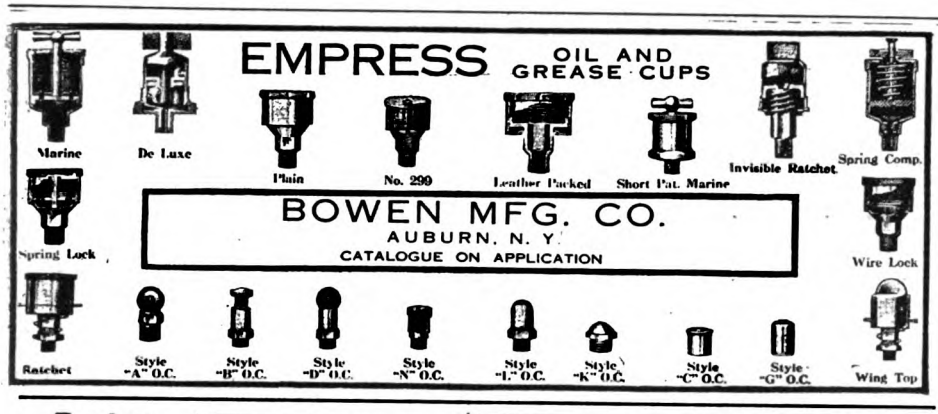
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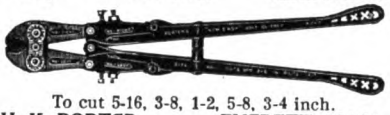
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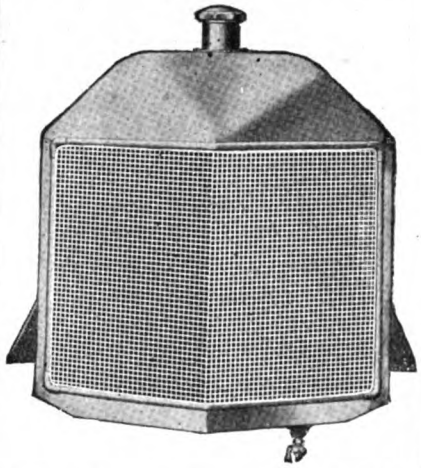


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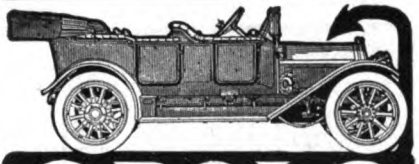
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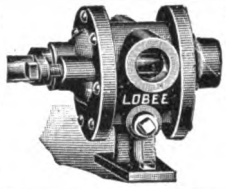
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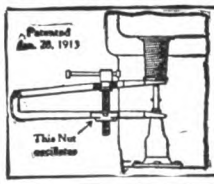
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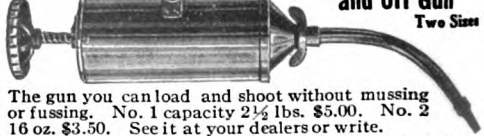
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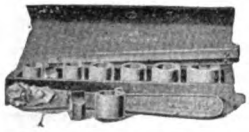
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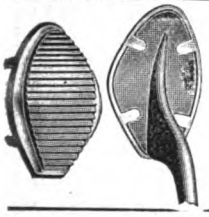


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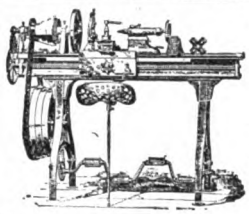
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GREER COLLEGE OF MOTORING
1519-21 WABASH AVE., CHICAGO, ILL.

SALES have been so enormous on our **National V Type Radiator and Streamline Hood for Ford Cars** that we merely call the dealer's attention to the fact that he is **Missing the Greatest Seller of the Season** if he does not get in on the proposition now. We are doubling our capacity this month and next month we will tell you more about it.

Write for Information.
UNIVERSAL CAR EQUIPMENT COMPANY,
62 East Jefferson Avenue, DETROIT, MICH.

Garage $69.50



10x12 feet "Steelcote" Edwards ready-to-use garage. $69.50 complete. Factory price. Fireproof. Portable. Quickly set up. All styles and sizes of garages and portable buildings. Send postal for illustrated catalog.

THE EDWARDS MFG. CO.
423-473 Eggleston Ave., Cincinnati, O.

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"The Better Kind"
50% Saved by buying now. Write for new prices and discounts.
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AUTO SUPPLIES COUPON BOOKS
INEXPENSIVE. F. O. B. DESTINATION. SAMPLES FREE.
WE HAVE SOLD MILLIONS OF OUR COUPON BOOKS!
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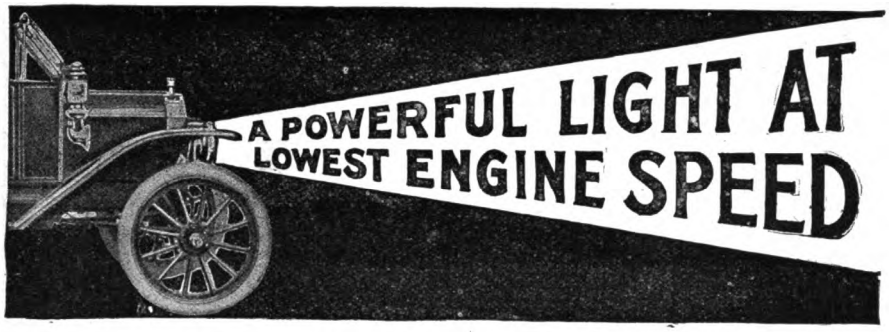
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Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

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List of Fords, Overlands, and All Makes at Rock Bottom Prices
Card Systems any Make, any State or Section Thereof
PROMPT SERVICE
New Jersey and New York State Automobile Registrations for $10.00 per Year

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1735 BROADWAY Telephone, 6600 Columbus NEW YORK CITY

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A POWERFUL LIGHT AT LOWEST ENGINE SPEED

The Price is But
$5.00
Complete

You have nothing else to buy

The season has arrived when satisfactory lighting is an absolute necessity. Therefore if your Ford car is not already equipped with the **NEW YORK ELECTRIC AUTOMATIC HEAD LIGHT CONTROLLER,** you should purchase at once if you desire to have a light as powerful at low speed as the best storage battery-dynamo system.

Our device makes use of the Ford fly wheel magneto and gives an equally efficient light at the highest as well as the lowest speeds at which the car can be run. At the same time it prevents the bulbs from becoming burnt out. **The value of this system is so great** that you simply **cannot afford** to be another day without one.

Do not compare this instrument with so-called transformers, resistance coils, etc. It is in use at this minute on thousands of Ford cars and stands **unquestioned as the first and only practical solution to the electric light problem on Ford cars.** You can install it in ten minutes. *Absolutely Guaranteed.*

We also manufacture the famous New York Master Vibrators, UNI-Coil Ignition Systems, Rhoades Battery Ignition System, and other **high grade** accessories for Ford cars.

Send for our booklet, "FORD PROBLEMS EXPLAINED."

Two Ignition Systems for Ford Cars



The New York UNI-Coil Ignition System for Ford Cars

PRICE $15.00

Operated by the Ford Fly Wheel Magneto (or Battery)

This system is primarily intended to operate on the Ford fly wheel magneto. It consists of a well-made elevating rear bracket upon which our Combined Timer and high tension Distributor is mounted. The Distributor is of the most simple construction containing the essentials of the high tension magneto. It uses one unit equipped with vibrator of your regular Ford coil. It dispenses with the timer and practically all of your present wiring, insuring a perfect timed spark and freedom from trouble.

The only satisfactory distributor system for the Ford magneto.

Furnished complete to the smallest detail.

Rhoades Non-Vibrating Coil



The Rhoades Battery Ignition System

is intended for the class of Ford owners who prefer to **dispense entirely with vibrators.** This system operates entirely on battery, six dry cells supply ignition for from two to four thousand miles. **We supply a handsome non-vibrating coil fitted with kick switch,** also elevating gear bracket. Six years of hard service have proven it to be the best battery system obtainable for Ford cars.

PRICE $20.00



RHOADES UNIT SPARK SYSTEM



Prevent your Ford from being stolen by buying

Our New York Kick Switch With Yale Lock--Price $2.50

which fits the new Ford metal or wood coil boxes. This is a handsomely constructed **kick switch containing a genuine Yale Lock,** which affords the convenience of the regular Kick Switch, but possesses the locking feature which is found in no other type.

Anyone can install—Remit $2.50 today—Money back if not satisfactory

INSTALL A GENUINE

New York Master Vibrator on Your Ford Car

Price $8.00 at Your Dealer's
and enjoy the smooth, evenly applied power so noticeable in six-cylinder engines

It is immaterial if your car is the latest or oldest model. You need our master vibrator, as it dispenses with all coil adjustments and replacements, and insures easy starting, a hot, perfectly timed spark under all conditions, and entire freedom from ignition troubles. It has for the past six years proven itself to be superior to any existing type. Though many times imitated it has never been equalled and stands today the best in its class at any price.



With fittings to install on the new 1916 models

Our Booklet, answering many questions that have puzzled you, is free for the asking

NEW YORK COIL COMPANY, 338 PEARL ST., NEW YORK, N. Y.

WESTERN BRANCH: 1461 Michigan Avenue, Chicago, Ill.

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A Great Conference Of Interest to All Tire Users And Dealers

Once every year all Firestone salesmen meet at our Akron headquarters.

At our first annual meeting only thirty men were present; this year, September 28th, 29th and 30th, over three hundred were present from all parts of the United States and several foreign countries.

Besides attending the general sessions addressed by the Company executives, branch managers and salesmen, every representative spent hours in the factory studying, in a practical way, the manufacture of Firestone tires. They saw Firestone experts building in the "extras" you have been reading and hearing about; that extra layer of fabric in the five-inch tire; the extra ply in the three-inch; the extra coating of pure gum between the plies, etc. They saw the "inside" reasons why 50 per cent more Firestone dealers were added last year, and why our output was increased 78 per cent.

They saw five great buildings under construction to provide over seven acres of additional floor space which will increase the Firestone output of pneumatic tires from 7,500 to 12,000 a day. This increase of 4,500 tires per day is larger than the output of the original new Firestone plant erected on its present site four years ago.

They rubbed shoulders with hundreds of men whose interests are kin to theirs, and from them they reaped a great harvest of valuable and helpful information which they will use to the advantage of customers.

These days of conference and study represented a large investment, but it will produce adequate dividends in better service for tire users the world over. It will mean a greater, more alert, better informed Firestone organization, and that insures satisfied customers. And there you have the vital reason for it all because—satisfied customers constitute the corner stone of the Firestone business.

FIRESTONE TIRE AND RUBBER COMPANY

"America's Largest Exclusive Tire and Rim Makers"

AKRON, OHIO—Branches and Dealers Everywhere

Firestone

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Fifty dollars in the road —Would You Stop to Pick It Up?

The motorist who throws away his half worn tires without having them re-soled by the European method is doing the same thing as though he saw from $50 to $200 lying in the road, but drove on without stopping.

Your Half Worn Tires Are Still Good for 5000 Miles

For over three years European motorists have been getting from 10,000 to 15,000 miles out of their tires by "half-soling" them with Steel Studded Treads, just as we half-sole our shoes when the original sole gets thin.

In eight months over 20,000 American motorists have followed their example and are saving $50.00 to $200.00 a year in tire expense. And what is just as important, they have almost entirely eliminated the constant dread of punctures, rim cutting and blowouts!

Guaranteed 5,000 Miles Without Puncture

Think of it—a 5,000 mile tire vacation—to be able to FORGET tires!

This is a pretty strong statement unsupported, but it's not merely a claim.

Durable Treads are delivered to you under a signed guarantee for 5,000 miles of wear without puncture.

This guarantee is an ironclad agreement—as good as a government bond—and holds good whether your tires are new or old, tread worn, rut worn or rim cut.

Durable Treads cover the tire completely, extending entirely around from rim to rim. Nothing can work its way in between. They afford a perfect protection—that's why we can guarantee them as we do.

No More Skidding

Durable Treads are studded with sharp-edged steel rivets which dig right down through the mud and slush and get to earth every time. In London and Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of steel studded Treads for public safety.

Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains—and what is more important—you receive perfect non-skid service while your tires are protected instead of injured.

Special Discount Offer

To motorists in territories where Durable Treads are not as yet represented we offer a special introductory discount for advertising purposes equal to the full dealer's profit. This offer is limited, however, and may be withdrawn at any time.

We Ship On Approval

You have everything to gain and absolutely nothing to lose, for all we ask is the opportunity to give you a demonstration at our own expense and risk.

We have a catalog, sample and copy of written guarantee ready to send, and they're yours free for the asking.

Don't let the tires on your car run another week in "bare-footed" condition—don't wait until you get your next puncture or blow-out.

Fill out and mail the coupon right now and you will hear from us within a week; no expense and no obligation to you.

Colorado Tire & Leather Co.

105 Tread Bldg., Denver, Colo.
Dept. J5, Box 228, Chicago
510 Woolworth Bldg., New York

COLORADO TIRE & LEATHER CO.
105 Tread Bldg., Denver, Colo.
Dept. J5, Box 228, Chicago
510 Woolworth Bldg, New York

Send me your special discount terms, your book "10,000 Miles on One Set of Tires," samples and a copy of your 5,000-mile-guarantee. This request carries no obligation.

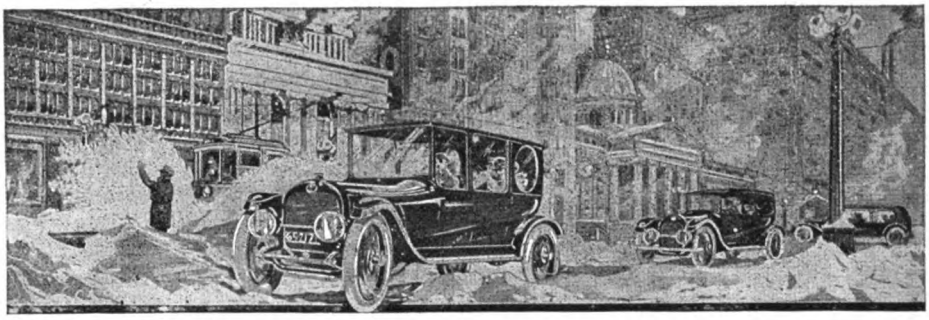
Name .....

Address .....

City ..... State .....

My tire sizes are .....

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Better Business in Slack Seasons

Last month we told you of our plan to get car owners interested in winter driving. We are keeping right on with our talks to Mr. Owner about putting his car in shape—**now**—before the bad weather comes.

He's willing enough to keep his car in use if he sees any possible way to protect himself against power failure and those other troubles and inconveniences he has always connected with winter driving.

So we're doing the telling—and it's up to you to do the selling on

LEAK-PROOF Piston Rings

MADE BY McQUAY-NORRIS MFG. CO

Back up our advertising with your own personal effort on your customers. Get them to see there is right and reason in our arguments. You know the LEAK-PROOF Ring and what its performance record is; you can bank on it making good with every car owner who tries it.

You can make a good season of the dull Fall months by supporting this "Install LEAK-PROOF Piston Rings for Winter Use" idea. Last year lots of dealers found it a profitable idea to push—and—remember, every owner who isn't using LEAK-PROOF Rings now is a prospect for you because he will be looking around for them sooner or later.

And, remember too, that there are imitations and substitutes masquerading as LEAK-PROOF Rings. Use the patented angle-to-angle interlocking construction of the two members of the genuine LEAK-PROOF Ring to identify it. Look for the name stamped on the Ring.

Write for FREE Booklet, "To Have and To Hold Power."
Explains LEAK-PROOF construction—gives you facts and arguments that will sell your customers on LEAK-PROOF RINGS.

"Ask the User"

Angle-to-Angle interlocking construction identifies LEAK-PROOF —insist



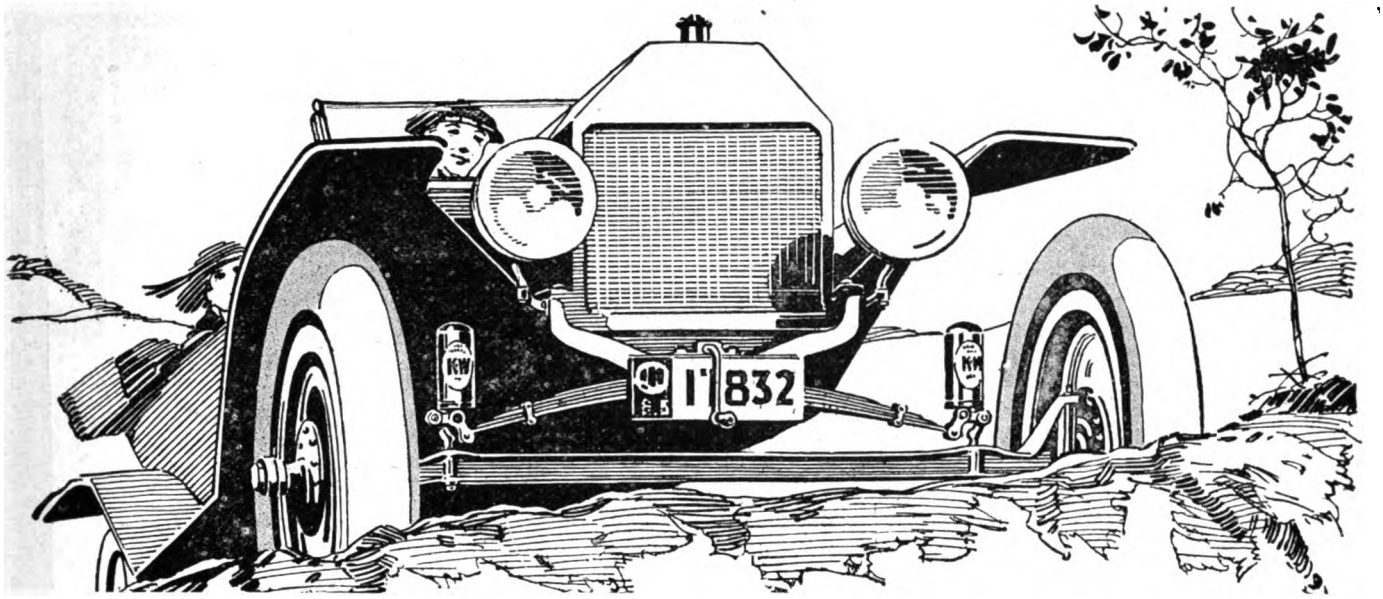
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The Ford is not Responsible for Rough Roads

But no matter how rough the roads or how fast you drive you can ride smoothly over every inch of the roughest roads when you equip your Ford car with

TRADE K-W MARK REG U.S.PAT OFF **Road Smoothers**

QUICKLY APPLIED TO YOUR FORD CAR

Give your Ford car advantages, with heavy car comfort

In Buying, Here's What You Must Look For in Order to Combine Comfort, Safety and Economy:

1. A spring to effectively take up the shock.
2. An Anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.
4. **A construction that absolutely does *not* interfere with the steering.**

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car. Here's how the K-W Road Smoother fills all these requirements:

The K-W Spring

A helical spring that effectively takes up the shock, made of electric smelted, chrome vanadium steel. The K-W bracket design allows almost *twice the length of spring action* or "travel" (in actual service) of any other.

The K-W Air Chamber

The anti-rebound air chamber with its smooth fitting piston acts like a door check, and gently "eases off" the rebound of the spring. This is an exclusive K-W feature. Its design provides a strong, tough, self-lubricating piston, working in a dust-proof air chamber. It requires no attention.

The K-W Side Motion Links

Made of the highest grade heat-treated drop forgings of remarkable toughness. This enables them to withstand the great strain put upon them. They prevent your car from pitching, swaying or skidding while making sharp turns.

$15 SET OF FOUR
ONE FOR EACH WHEEL



K-W Road Smoothers absolutely do *not* interfere with the steering.

K-W Bushings

All bearings are phosphor bronze throughout. That means long life.

But you can find all of these vital factors only in K-W Road Smoothers!

That is why they lengthen the life of your car, by eliminating shock and vibration. Tire economy is assured, because K-W Road Smoothers enable the wheels (not the whole body of the car) to follow the contour of the road. That means no grinding off the rubber of the tires. K-W Road Smoothers always make good because they are built with characteristic K-W quality throughout.

But after all's been said and done it's results that count; and the K-W guarantee covers not only workmanship and material, but *results* as well.

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary, except a wrench. And the final and biggest advantage you get from K-W Road Smoothers is that they increase the radius of your car's usefulness, and bring you home with "that satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid upon receipt of price.

Write for booklet, "That Satisfied Feeling."

TRADE THE K-W MARK IGNITION Co.
2817 Chester Ave. CLEVELAND, OHIO. U.S.A.
Manufacturers of the 125,000 K-W Master Vibrators

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Double the Pleasure of Ford Ownership!

Add to the pleasure and safety and decrease the cost of running your Ford by getting

STANDARD Hartford EQUIPMENT FOR Ford CARS

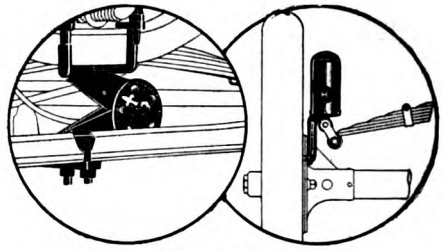
Any or all of these famous Ford favorites will prove a paying investment—

— THE —

HARTFORD COMFORT COMBINATION

consisting of one **Hartford Shock Absorber** on the front, and two **Hartford Cushion Springs** on the rear, will give you a riding comfort that will surprise and delight you. It will stop spring breakage and road racking.

PRICE ONE HARTFORD SHOCK ABSORBER TWO HARTFORD CUSHION SPRINGS **$12.00**



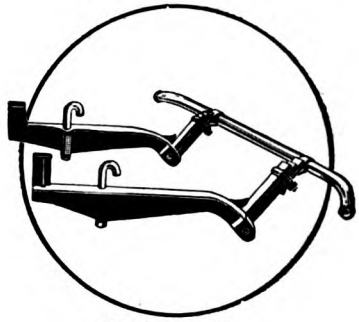
Hartford Comfort Combination

— THE —

HARTFORD BUMPER

the only bumper that absorbs the shock of collision, preventing damage, not only to lamps, mudguards and radiator, but to **all** the car. Gives a Ford longer lines, adding greatly to its appearance.

PRICE, Complete, $10.00



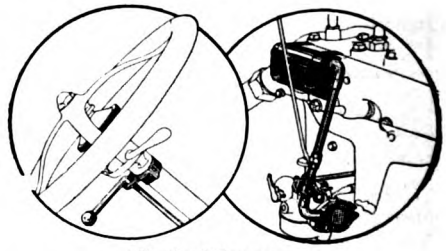
Hartford Bumper

— THE —

HARTFORD ECONOMIZER

decreases gasoline consumption **over one-third.** Feeds your engine an ideal mixture, making it smoother-running and more powerful.

PRICE, Complete, $6.00



Hartford Economizer

ALL GUARANTEED SATISFACTORY OR MONEY BACK

Be comfortable, safe, economical—use Hartford Standard Equipment for Ford Cars

DESCRIPTIVE LITERATURE ON REQUEST

HARTFORD SUSPENSION CO., E. V. HARTFORD President **141 Morgan St., Jersey City, N. J.**

Makers of the Hartford Cushion Spring, E. V. Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper

BRANCHES: BOSTON, 319-325 Columbus Avenue; CHICAGO, 2637 Michigan Avenue; NEW YORK, 1846 Broadway and 212-214 West 88th Street; NEWARK, N. J., 273 Halsey Street; INDIANAPOLIS, 425 North Capitol Boulevard.

DISTRIBUTORS: Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; L. Mastrangel & Co., 117 South Beatty Street, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Charles Rubel & Co., 1311 Fourteenth St., N. W., Washington, D. C.

**Formerly the Truffault-Hartford.*

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Do Not Throw Away Cracked Or Broken Parts



AT WORK

Welding will make them as good as new, if you use the

WATERHOUSE COMPLETE WELDING OUTFIT Costing Only $42

Free Trial allowed at that.

Repair and Garage men can add considerable to their income and make up for losses in other ways with money made with one of our outfits.

The equipment necessary to weld with our outfit is so small and compact, it occupies very little space.

You can also save considerable money for your customer, as well as making money for yourself.

The Waterhouse Outfit

	Value
1 B Welding Torch with 5 tips	$17.00
1 Oxygen Reducing Valve with 50 lb. line pressure gauge	10.25
1 Acetylene Reducing Valve with 50 lb. line pressure gauge	11.00
1 Set of Special Welding Hose (20 ft.)	3.00
1 Pair of Welding Glasses	.75
1 Carbon Burning Torch	Free
1 Set Instructions	Free
Net Cost Complete	**$42.00**

If you have a regulator for carbon burning, the oxygen regulator with the outfit is unnecessary, and you can deduct the price ($10.25), from the above total price.

TERMS: 5% discount cash with order or C. O. D., or $20.00 cash with order, balance in two payments, first of $12 in 30 days, $10 in 60 days.

ABOUT TANKS

The two gases used are oxygen and acetylene. The regular automobile lighting cylinders contain acetylene, so you can use them, and oxygen can be bought in loaned cylinders at little cost.

If supplies are desired as well, we will sell for $4.50 additional the following, making you ready for any auto welding:

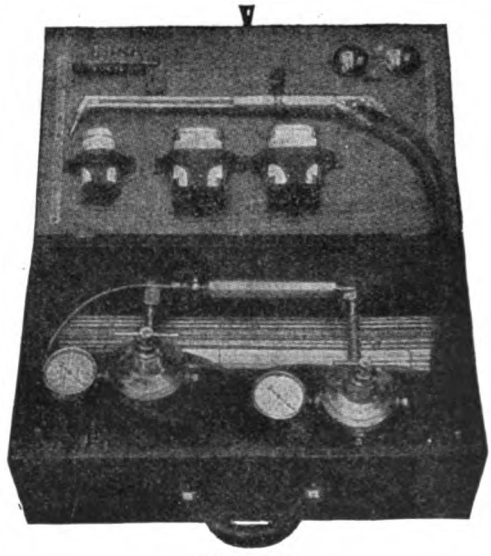
1 Bottle Aluminum Flax
1 Can Cast Iron Flux
1 Can Copper and Brass Flux
5 pounds Cast Iron Welding Rods
2 pounds Aluminum Welding Rods
2 pounds of Steel Welding Rods
2 pounds Brass Welding Rods

Send at once for descriptive circular.

WATERHOUSE WELDING COMPANY

16 PELHAM STREET, BOSTON, MASS.

See Waterhouse Ad's in previous issues of this paper



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ADDRESSING

To Automobile Owners

Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

100% POSTAGE GUARANTEED

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We have the Largest Addressograph Plant in the World for Public Business

List of Fords, Overlands, and All Makes at Rock Bottom Prices

Card Systems any Make, any State or Section Thereof

PROMPT SERVICE

New Jersey and New York State Automobile Registrations

for $10.00 per Year

Send for Sample Sheets.

AUTO LIST & ADDRESSING CO.

1735 BROADWAY Telephone, 6600 Columbus **NEW YORK CITY**

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The Smartest Accessory you can put on your Motor Car

A welcome achievement has been worked out for the interior trim of motor cars—Campbell Detachable Upholstery.

It transforms the car with the shabbiest upholstery into a car of luxurious beauty. To the new car it adds a touch of smartness that no other single unit of equipment can give it. It is Full Dress for Motor Cars!

CAMPBELL ESTABLISHED 1879 **DETACHABLE UPHOLSTERY**

Anyone can install Campbell Detachable Upholstery in a short time. It is hand-tailored to fit over the regular upholstery of your car without alterations, and is held by quick-detachable fasteners. In appearance it is an inherent part of the car, not a mere attachment, yet it can be removed for cleaning and replaced in a few minutes.

Many new fabrics

Campbell Detachable Upholstery is made in many beautiful, rich tones of special motor cloths and linens. It permits of an interior trim that is a harmonious part of the general color scheme of the car. It combines the smart luxury of the finest limousine trimmings with the durability of good leather. It affords greater comfort and cleanliness.

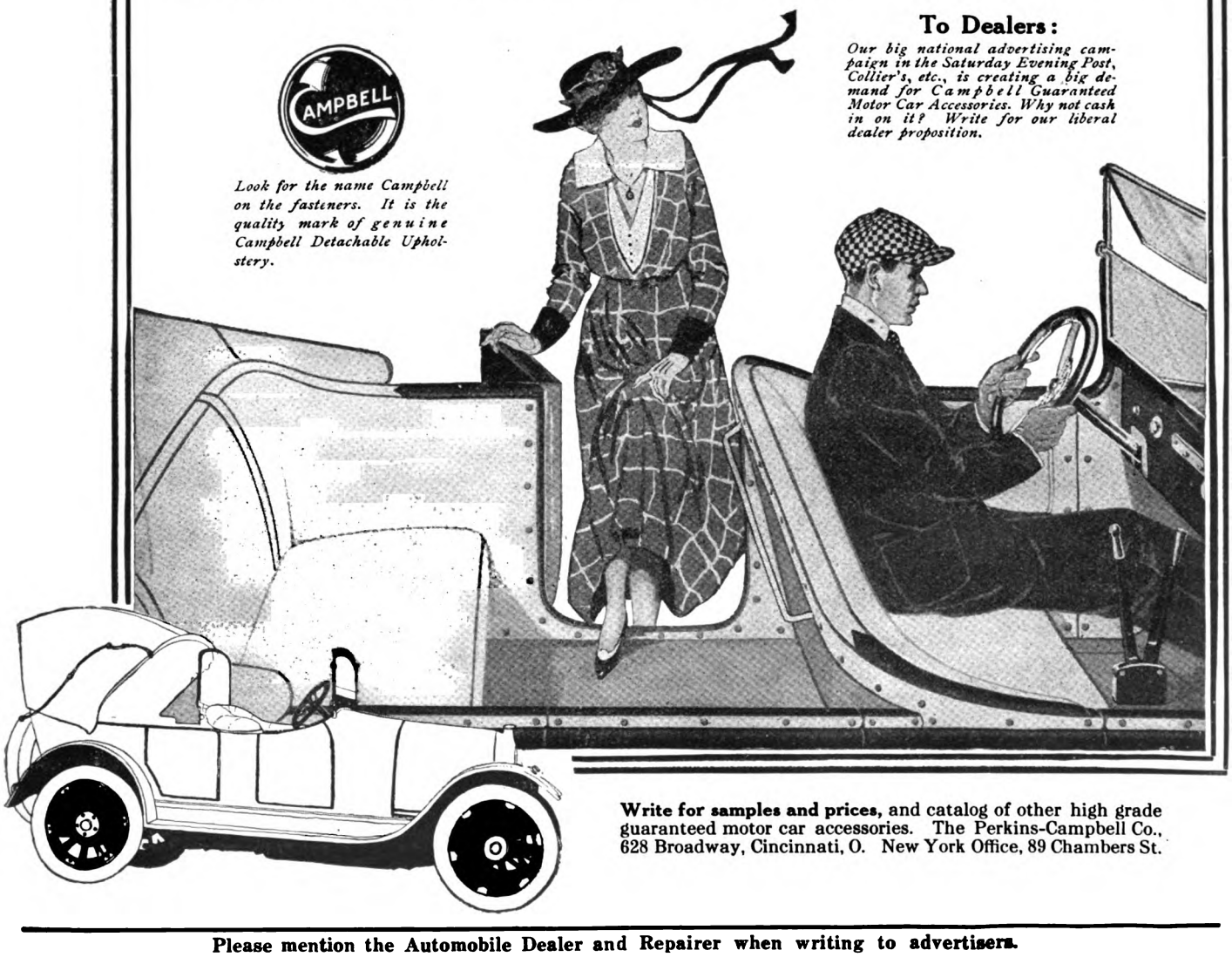
If you contemplate buying a new car, ask to have it fitted with this stylish equipment. Or, if you already own a car, no matter how old it is, you can freshen it up with Campbell Detachable Upholstery in just the fabric and shade that best suits your purse and your taste.

To Dealers:

Our big national advertising campaign in the Saturday Evening Post, Collier's, etc., is creating a big demand for Campbell Guaranteed Motor Car Accessories. Why not cash in on it? Write for our liberal dealer proposition.

CAMPBELL

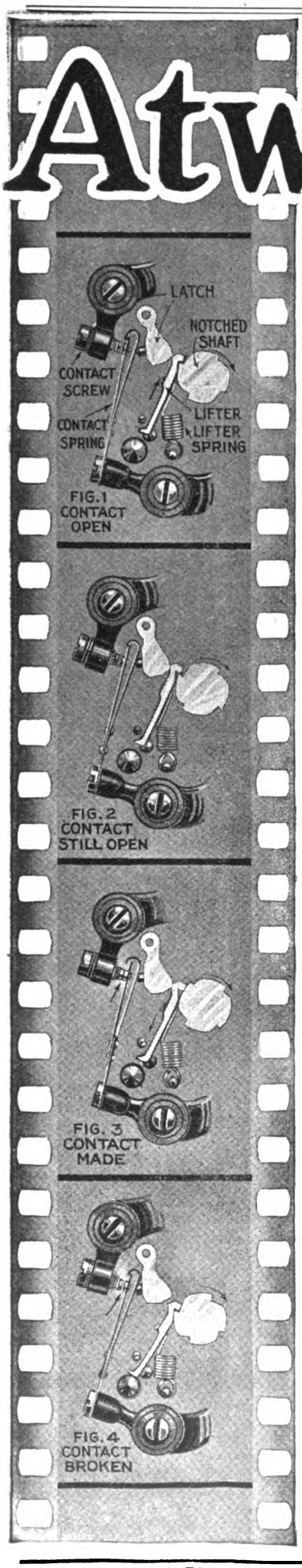
Look for the name Campbell on the fasteners. It is the quality mark of genuine Campbell Detachable Upholstery.



Write for samples and prices, and catalog of other high grade guaranteed motor car accessories. The Perkins-Campbell Co., 628 Broadway, Cincinnati, O. New York Office, 89 Chambers St.

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Atwater Kent Ignition



The lifter as it is pulled forward by the notched shaft does not touch the latch, and the contact points remain open.

The lifter, reaching the point where it rolls off the notched shaft is pulled back by the lifter spring, striking the latch as it returns.

The latch, being struck by the lifter, presses against the contact spring and closes the contact points for a brief instant, immediately opening after the lifter passes.

The latch and lifter, having returned to their original position, are ready for the next spark.

Owing to the fact that it is impossible to stop the motor in any position which will leave the ignition circuit closed, the Atwater Kent System is fundamentally safe, and no accessory safety devices are necessary to protect the battery. The current flows only during the brief instant of each spark and the ignition switch is practically useless except for stopping the car. In other words, it might be left in the "ON" position permanently without the slightest danger of draining the batteries.

The Atwater Kent principle is absolutely unique among ignition devices. Its success is certified by more than nine years of uninterrupted growth. It is in use to-day on upwards of 200,000 cars and is endorsed by more than 30 reputable manufacturers and over 10,000 dealers, garages and repairmen.

The Atwater Kent magneto replacement system can be easily installed in place of the magneto on any standard car. Thousands upon thousands of car owners realizing the benefits of Atwater Kent Ignition are installing this system on cars previously equipped with magnetos and other types of ignition.

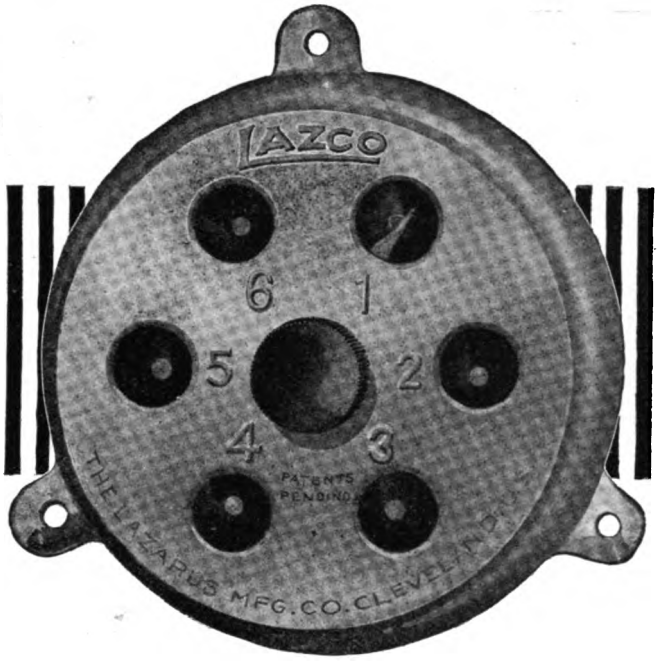
Our special outfit for Fords deserves the investigation of every owner of this remarkable car, and the opportunities which it offers to dealers, garages and repairmen are attracting the attention of the entire trade.

If you are a car manufacturer, dealer or owner and are not fully posted regarding this wonderful system, by all means get in touch with us without further delay. You owe it to yourself to have our complete data on file.

Atwater Kent Mfg. Works
4933 Stenton Avenue, Philadelphia, U. S. A.

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LAZCO LAZCO



American and Foreign Patents Pending

Dial Actual Size

Engine Trouble Detector

"More necessary than the speedometer, more useful than the clock"

Fulfills a positive need in the convenience and economy of motoring. With the Lazco Detector you can quickly locate and determine engine trouble from the dash, without raising the hood. Misfiring cylinders, carbonized or broken spark plugs, faulty ignition, cylinder knocks, battery and magneto difficulties, loose connections, lack of compression, etc., are simply and conveniently investigated and determined with the aid of this ingenious device. No complicated connections. You can install it yourself. The dial is quickly attached to the dash—boring one ¾" hole through which to pass the motor connections. The ONLY DEVICE of its kind and purpose. No motorist can afford to be without one. Shipped complete with all attachments and instructions.

PRICES:

FOURS AND SIXES	**$ 5.00**
Eights	**7.50**
Twelves	**10.00**

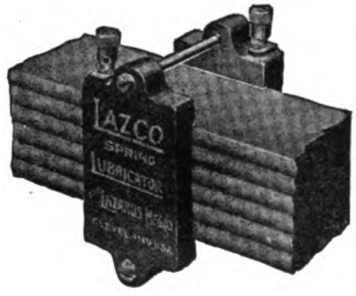
Order through your dealer or direct.

Full Information, etc., on Request, Dept. R.



LAZCO Products

	PRICE
Engine Trouble Detector	**$ 5.00**
Lazco Vulcanizer	**1.50**
Lazco Spring Lubricator (4 Pairs)	**2.00**
Lazco 2-in-1 Vulcanizer (Large Size)	**2.50**
Lazco Fire Extinguisher 22'	**2.00**
Lazco Fire Extinguisher 12'	**1.00**
Lazco Repair Rubber, 1 lb	**1.75**
Lazco Electric Vacuum Cleaner	**21.50**



THE LAZCO VULCANIZER

For Casings and Tubes to 3½" Size, especially adapted for Ford Sizes, a smaller type of our well-known 2-in-1 Vulcanizer—effects perfect vulcanization, either tubes or casings. Automatic in operation. Enclosed flame, safe and sure—in the garage or on the road. Repairs casing cuts while tire is inflated. Complete with roll of Lazco Repair Rubber and instructions. Price $1.50.

DEALERS

The Lazco Line offers every advantage to dealers. A wide range of meritorious products—priced right and liberally discounted to the trade.

LAZCO SPRING LUBRICATOR

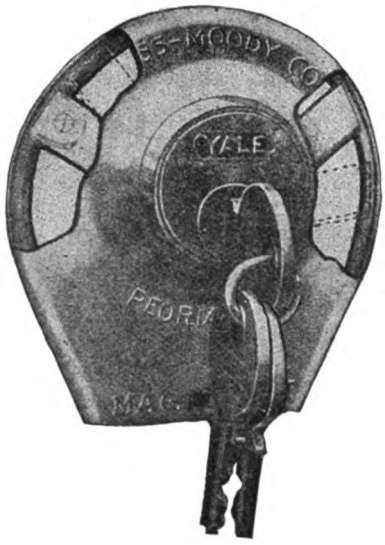
Cushions the jars, kills the squeaks, minimizes breakage and prevents rust. Automatically distributes the oil evenly and slowly between each leaf of your spring—simple—compact - efficient and easily attached to any make of car.

Full Equipment, PRICE $2.00 (set of eight—4 pairs).

The Lazarus Manufacturing Company, Dept. R

752 Euclid Avenue, CLEVELAND, OHIO

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What's This?

THE B. M. SWITCH WITH YALE LOCK FOR FORD CARS HAVING METAL COIL BOX

1. A mechanical device that is an absolute protection against Ford thieves.
2. Installed in two minutes—by removing present switch plate—substituting this.
3. **Note:** the two brass shutters that cover the upper two deeply countersunk screw holes.
4. These absolutely prevent removing of plate and making connections to start car.
5. The Yale Key (no duplicates) acts as the switch key—automatically locking car when engine is shut off.
6. Cheapest insurance against theft.

Address Your Nearest Dealer or Jobber.

Get our prices and full particulars on this and a large line of other specialties for the Ford Car.

SALES OFFICE

The Goodrich Accessory Association, 300 NORTH BROAD STREET, PHILADELPHIA, PA.

JOBBERS: We do special contract manufacturing on specialties involving castings, machine work and stampings. Write for our special prices on Malleable Lined and Unlined Brake Shoes, Truss Rods, and Ignition Assembly Outfits for Ford Cars.



Miller GEARED TO THE ROAD **Tires**

What a false bottom is to a gallon measure, so is weakened, brittle and lifeless cotton fabric to a tire.

You get a false bottom tire (no matter what its exterior dimensions are) unless the native strength of the cotton fabric is preserved intact. Miller retains the rubber's native toughness and the fabric's tensile strength during vulcanization.

Miller Rubber Company, Akron, Ohio, U.S.A.

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1¼ DIAMOND 1¼ ROUND

"Gemco Insurance"

It's A Good Policy

To Use A Gemco Bumper And Protect the Front of Car

The front of every car should be protected by a GEMCO BUMPER. It is the most economical and the safest protection. At the same time a Gemco Bumper adds to the appearance of the car. This insurance costs only from $5.00 to $14.00, depending upon the style of Bumper desired, and will last throughout the life of the car.

THE WORLD'S STANDARD BUMPER

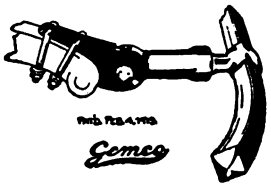
The Original End Thrust

Fits All Standard Cars

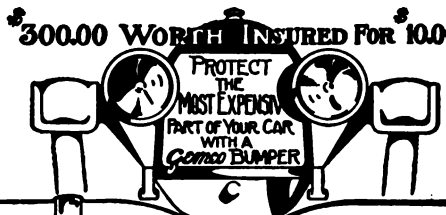
No Holes to Drill—Simply Clamps to End of Frame

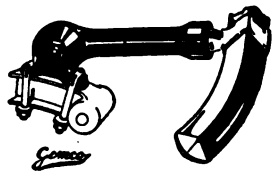
The Universal and Clamp-on Bumpers fit all standard frames. Special Fittings are designed for cars with individual frames, as the Ford, Cadillac, Overland, Hudson, etc. The Bars are furnished in various styles, sizes and finishes with Fittings for EVERY REQUIREMENT. Attractive and Substantial—they are the World's Standard Bumpers.

Sold and Recommended By All the Principal Supply Houses—Because They ARE THE BEST



With Universal Fittings





With Clamp-On Fittings

2" ROUND 1¼ CHANNEL 2" CHANNEL 1¼ DIAMOND

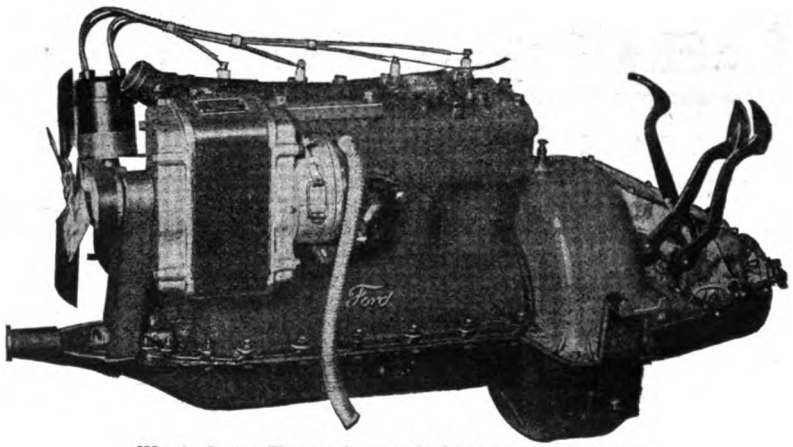
GEMCO MFG. CO. 656 SO. PIERCE ST. **MILWAUKEE, WIS.**

Westinghouse Starting - Lighting - Ignition For Ford Cars

This single-wire, twelve-volt system, with silent chain drive, cranks the engine at 175 r.p.m. or more and charges battery at speeds above 9 miles per hour.

The Lighting and Starting System is complete, consisting of Motor-Generator Unit, battery and box, switches, fuses, chain and guard, sprockets, fan pulley and belt, wires with terminals attached, all wiring details and instructions, everything required for installation. Each equipment packed separately.

Price $75 f. o. b. Pittsburgh.



Westinghouse Electric Starting-Lighting-Ignition Installed

The Ignition System is complete with Ignition Unit, including self-contained coil, mounting bracket, all wiring with terminals attached. Spark plugs are supplied extra.

Price $15 f. o. b. Pittsburgh.

The lanterns consist of bright and dim headlights (two bulbs) and tail light. Westinghouse-McCandless Mazda Lamps used.

Price $7.50 f. o. b. Pittsburgh.

Installations made Complete at Westinghouse Sales Service Stations and agents listed herewith.

Atlanta, Ga.....Ozburn Automobile Supply Co.
Boston, Mass.....Motor Parts Co.
Buffalo, N. Y.....Motor Parts Co.
Chicago Ill...Westinghouse Sales Service Station
Chicago, Ill.....Motor Car Supply Co.
Cleveland, O.....The Auto Elec. Equipment Co.
Cleveland, O.....Westinghouse Sales Service Station
Detroit, Mich.....Westinghouse Sales Service Station
Denver, Colo.....Shaffer Auto Supply Co.
Indianapolis, Ind.....Westinghouse Sales Service Station
Kansas City, Mo.....The Equipment Co.
Houston, Tex.....Tel. Electric Co.
Memphis, Tenn...Ozburn Automobile Supply Co.
Minneapolis, Minn. .....Reinhard Brothers Co.
New Orleans, La.....Shuler Rubber & Supply Co.
New York, N. Y.....Westinghouse Sales Service Station
Oelwein, Ia.....Chas. W. Bopp
Oklahoma City, Okla...Severin Tire & Supply Co.
Omaha, Neb.....Powell Supply Co.
Philadelphia, Pa.....Motor Parts Co.
Pittsburgh, Pa.....Pittsburgh Auto Equipment Co.
Pittsburgh, Pa.....Westinghouse Sales Service Station
Springfield, Mass.....Motor Parts Co.

Folder 4311-A gives full particulars.

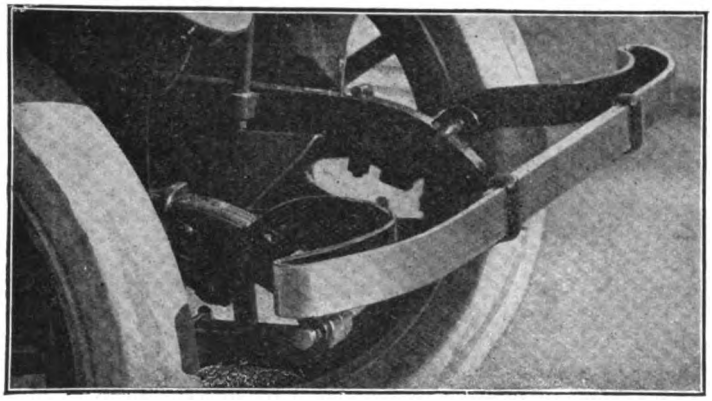
Westinghouse Electric & Manufacturing Co.

Automobile Equipment Department **Shadyside Works, Pittsburgh, Pennsylvania**

109

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SELL the only BUMPER that can be struck without being damaged!



PATENTED

There are Bumpers galore—but only one that really protects and which won't break. The others are all alike. Their claims are strong—but their action mightily inefficient. The

LYON Resilient Bumper

is different. You can run it into a pole at reasonable speed without injuring either the bumper or car! Strong statement? Prove it yourself at our expense.

The LYON is resilient, having ten times as much spring play as any other make.

The LYON is clamped on any car in 15 minutes; harmonizes with streamline bodies and is guaranteed not to rattle or become loose. It is packed in individual boxes, making it easy to reship. The price is low.

$7.50 up to $10.50; all finishes. FORD Bumpers $6.00

Why sell others that cost as much or more and don't deliver the goods? Give your customers their money's worth by selling them the LYON. We have something interesting to say to dealers and garagemen. ***Write us at once.***

METAL STAMPING COMPANY

BOULEVARD, LONG ISLAND CITY, NEW YORK

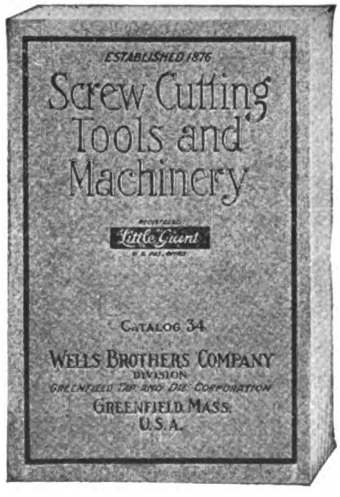
Garage and Repair Men

Look into the showing of Screw Cutting Tools and Appliances

Note particularly the **Combination Screw Plates**

Both S. A. E. and United States Standard Threads in the same assortment.

Very handy for both general and automobile repairs.



(Taps, Dies, Screw Plates, Reamers, Gages, etc.), in this New Wells Brothers Catalog No. 34—Just Out.

All of the celebrated brand

Little Giant

Standard for 40 years

Write for your copy NOW

WELLS BROTHERS COMPANY, Division

Greenfield Tap and Die Corporation

Greenfield, Mass.

New York Chicago Philadelphia Detroit

In Canada: WELLS BROTHERS COMPANY OF CANADA, Limited, Galt, Ontario

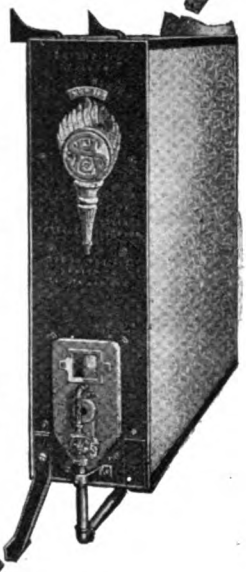
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It's High Time To Heat Your Garage

Now, during the early days of autumn is garage heater time.
Every man who owns an automobile faces this problem annually.
What provision have *you* made against cold weather deterioration?

THE FAMOUS 1916 SCIENTIFIC SAFETY GARAGE HEATER



The famous Scientific Safety Garage Heater is now ready for immediate delivery. Over 5,000 of these heaters are giving satisfactory use all over the world. The only heater listed by Underwriters. Cannot explode. Economically consumes artificial or natural gas. Simple to install. Easy to operate—no matches required. A self-lighting device eliminates danger from an exposed flame. Hot water always handy for washing the car.

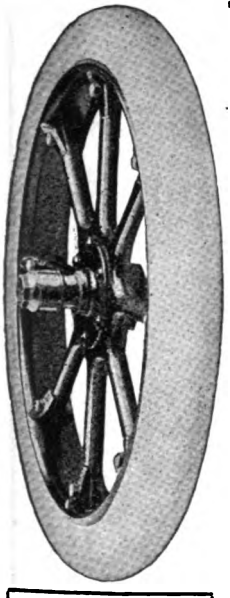
This compact heating system occupies what would otherwise be waste room. Built in three sizes. The No. 700 size will comfortably heat the ordinary two machine garage during zero weather. The price of this model is $25.00.

Use Your Car in Winter

By using the Scientific Safety Garage Heater you can start your car in January as easily as in June. There is no danger from frozen radiators or cracked cylinders. Parts cannot rust or gum. Batteries take full charge. Truck deliveries are made efficient.

Ask your dealer first or write today and secure a free copy of "Scientific Garage Heating."

The Scientific Heater Co.
2300 Power Ave. Cleveland, Ohio



$19.75
SET OF FOUR
Enameled black, 30x3½" wheels; spare clincher rim; full set new hub bolts and brace wrench. With wheels enameled red and clincher rim enameled black, $20.50.

Stop Carrying Around 192 Pounds of dead weight!

Any automobile engineer will tell you that a pound of weight under the springs is equivalent to six pounds over them at ordinary speed.

PARKER-HYDRAULIC
PRESSED STEEL WHEELS FOR FORDS

weigh 32 pounds ***less*** per set than wooden wheels with demountable rims. This is equivalent to a 192-pound load—the weight of a big man.

This decrease in unsprung weight means more mileage from your tires and quicker acceleration. Altho lighter, these wheels have such remarkable strength that they are practically unbreakable, and if bent by some terrific strain that would smash any other wheel, they can be easily straightened. Your safety is assured.

They give you the simplest and quickest demountable rims—the only part to come off being the rim itself—no loose parts—nothing to stick.

These wheels have a handsome baked-on finish, are easily cleaned and non-rustable. They combine strength with their light weight and allow quick tire changes.

Sold by reliable dealers everywhere. If you don't know yours, write us.

These wheels offer a real opportunity to live dealers. Full details on request.

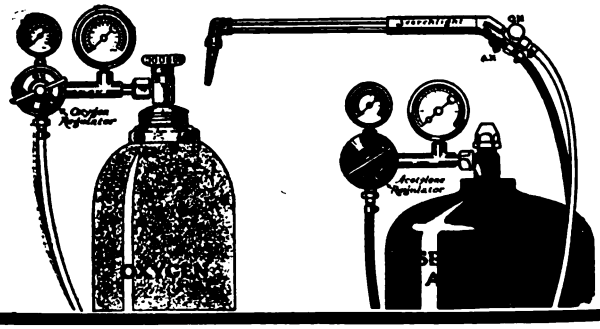
The Hydraulic Pressed Steel Company
3158 EAST 61st STREET - CLEVELAND, OHIO
Builders of "Hydraulic" Pressed Steel Frames on which Reliable Cars are built

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A Magic Wand

For the Modern Garage



THE Searchlight Oxy-Acetylene Welder is the magic wand of the modern garage. With it enormous profits can be made.

The work your competitor can't handle, is the work which makes you your biggest money.

You'll find no end of profitable work for a Searchlight Welder.

You will be able to repair broken castings and auto parts easily, quickly and cheaply, getting a long price because of the strength and neatness of the job and because of the time saved for the delayed tourist.

You will also be able to build up a very profitable general repair business for the factories in your neighborhood.

Broken castings which tie up factory machinery often cost hundreds of dollars and profits lost. No process or method of repair (or even of replacement) can compete with Acetylene welder. It is easily portable. You can carry it right to the job. You make repairs without even dismantling the machine. Guarantee a quick job and quote a price which allows you an unusually large profit. You will get it every time.

Searchlight Welder

This is the only welder in its class which sells for less than $100. Our price for complete equipment is only $50.00 (cylinders extra, however).

Write for complete information and we will show you the new source of big profit.

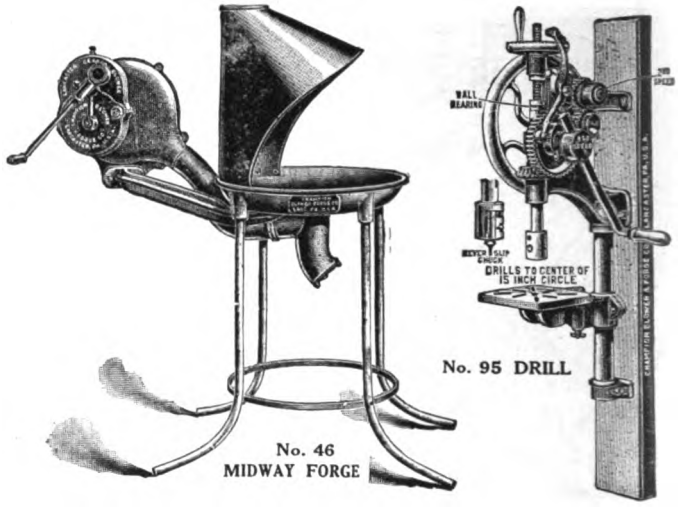
The Searchlight Company

1014 Karpen Building **Chicago, Ill.**

BRANCHES AND REFILLING STATIONS

Atlanta, Ga.	Cleveland, Ohio	New York City, N. Y.
Boston, Mass.	Dallas, Texas	San Antonio, Texas
Buffalo, N. Y.	Detroit, Mich.	Toronto, Ont.
Camden, N. J.	Kansas City, Mo.	Warren, Ohio
Chicago, Ill.	Minneapolis, Minn.	

Garage Tools of Quality



We manufacture a full line of Garage Forges Drills, Grinders, Screw Plates, Etc., Etc.

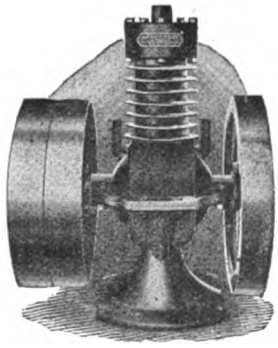
Write for our handsome Free 350 page catalog. It means not only a saving in labor but in money. Our tools sell because they satisfy.

CHAMPION BLOWER & FORGE COMPANY

LANCASTER, PENNA.

YOU Need Compressed Air

NOT Hot Air



You can't clean an engine or inflate a tire with noise. Performance, not promises, is what you need at both ends of the air hose. This is why you should install an

AU-TO AIR COMPRESSOR

Small in Size and Price. Large in Performance

It is built for service—compact, sturdy, durable, with every part easily accessible and simple. Fasten it to the floor, put on the belt and it is ready to run. Using 6½ cubic feet of free air per minute at 300 pounds pressure and requiring only 1½ H. P. to operate, the AU-TO Air Compressor is guaranteed to give perfect satisfaction.

A necessity in every garage, machine shop and repair plant.

Write for our catalog, the sooner the better.

THE AU-TO COMPRESSOR CO.

Dept. 62 **WILMINGTON, OHIO, U. S. A.**

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H-S

REPAIR PARTS FOR FORD CARS

We are the largest independent manufacturers and dealers in repair parts for Ford cars in the world.

Our price list, containing over 300 parts, in frequent demand by the dealer and repairman, will be sent on application.

Rear Axle Shafts	Front Radius Rods
Differential Drive Gears and Pinions	Front and Rear Springs
Connecting Rods	Bushings
Nuts	Screws
Bolts	Pins
Keys	Ball Bearings
Gaskets	Washers, Etc.

HILL-SMITH METAL GOODS CO.,
88 Pearl St., Cor. High St.,
BOSTON, MASS.

LOOK THROUGH THESE FOR A BETTER MOTOR!



"One-In-One" Piston Rings, *"Concentric,"*

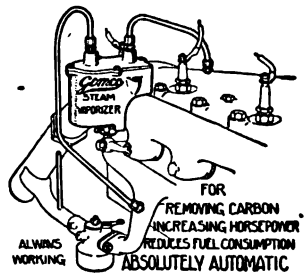
Will show better results than any other type of ring.

BECAUSE, they are made of a fine gray iron, compatible with cylinder and piston; are made and ground—true to size— in 2 units to expand equally against the cylinder wall—reducing the friction caused by a single eccentric ring—and insuring **more Compression and Power and less Carbon and Smoke.**

Write for circular.

"ONE-IN-ONE" PISTON RING CO.
P. O. STATION "S" PHILADELPHIA, PA.

A Great Victory--Science Conquers!



The Gemco Steam Vaporizer

Kills Carbon

Gemco MILWAUKEE "THE SIGN OF SATISFACTION"

MORE POWER AND A CLEAN MOTOR are the two most important results achieved by the "Gemco" Steam Vaporizer. Works absolutely **AUTOMATIC**—requires **NO ATTENTION**—mechanically perfected—operates as a part of the motor and at **NO COST.**

THE PRINCIPLE IS the suction of water from the cooling system converted into steam and injected into the firing chamber. The moisture loosens all carbon, assists more perfect combustion and eliminates new carbon deposits which means less fuel and a smooth-running Motor.

THE MOST IMPORTANT INVENTION IN MOTORDOM. It solves the greatest problem—Carbon—that the motorist has had to contend with.

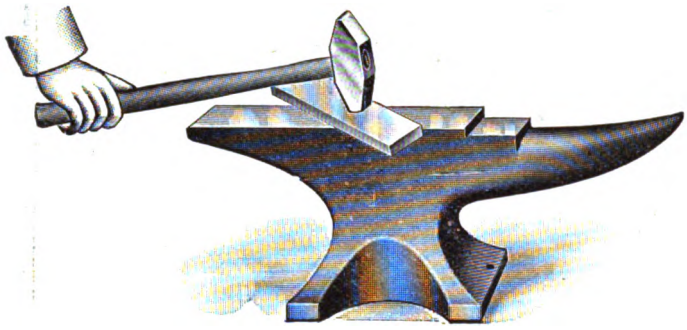
Remember Gemco Guarantees It

Quickly attached without mechanical changes. Packed in a neat carton with directions; three sizes:

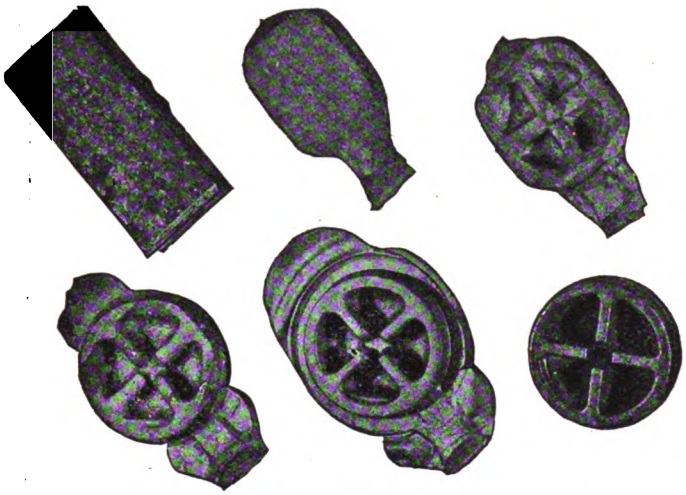
No. 1—Ford Special	$5.00
No. 2—For 1½ and 2 in. dia. exhaust pipe	6.00
No. 3—For 2½ and over dia. exhaust pipe	6.00

Gemco Manufacturing Co.
(Formerly Garage Equipment Mfg. Co.)
656 So. Pierce Street, Milwaukee, Wis.

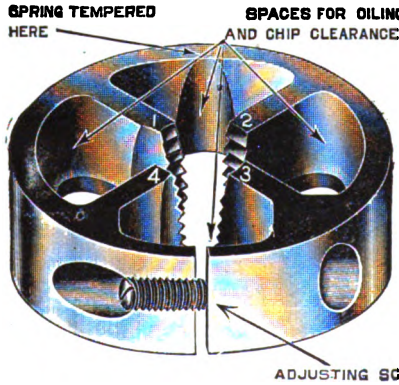
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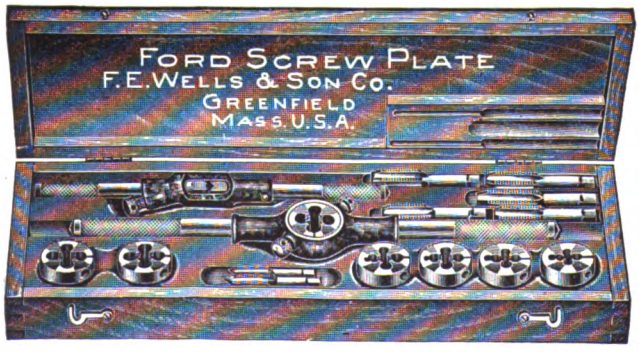
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

Increase the Horse Power, Efficiency and Speed

of YOUR Car with

The TRIPLEX GAS ECONOMIZER and CARBON REMOVER

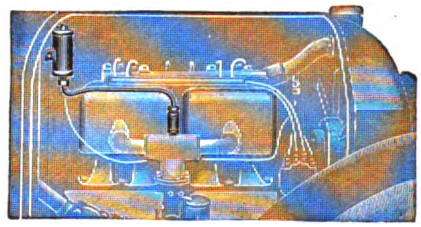
It is New, Different and Better because Fully Automatic and Utilizes Atomized Moist Air

Absolutely and Unreservedly Guaranteed

$7.50 by prepaid parcel post

Send for Catalogue

Triplex Gas Economizer Company
223 West 49th Street **New York City**



Patent Applied For



The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company
3326 Ludlow Street **Philadelphia, Pa.**

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South
A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver

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For Dealers Only

ADVANCE EDITION 1915 CATALOG AUTO SUPPLIES

Off the Press July 26th

—and chuck full of everything new and good including staple lines that have made good.

A Copy for Every Dealer in the Country.

Something New

A large, complete catalog of auto supplies, **exclusively for dealers,** published in mid-season and containing many new lines that you would not get ordinarily until next year.

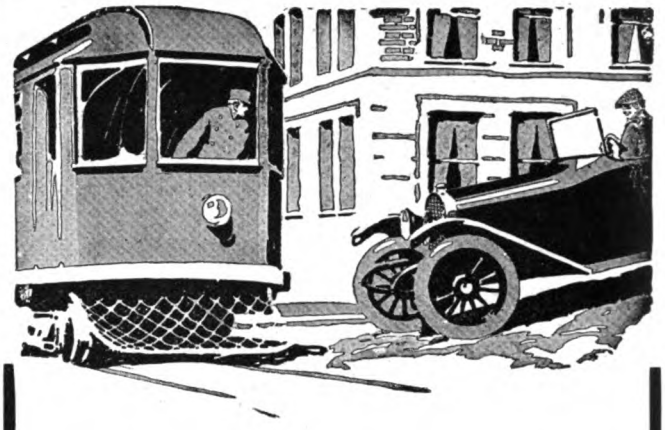
How To Get It

If you are not on our mailing list your request on your business letterhead will bring your copy by return mail, but get it by all means and be correctly informed before you buy further; our prices are a revelation. Send tonight for the new 1916 SMS CATALOGUE.

Dealers Protected

The Service Motor Supply Company sells to legitimate Dealers only—no orders filled from consumers.

SERVICE MOTOR SUPPLY COMPANY
Washington Boulevard and Desplaines Street
CHICAGO, U. S. A.



What stopped the automobile in front of your door?

Brake Lining!

There is a constant demand from motor car owners for brake lining, because even the best will not last forever. There is a steady demand for

Thermoid HYDRAULIC COMPRESSED Brake Lining - 100%

because it is known universally as the brake lining that retains its gripping efficiency until worn paper thin. Thermoid is brake lining clean through—tougher for its purpose than steel itself. It is brought by hydraulic compression to a uniformity and density that give 100% gripping power until it is actually worn out. Even that takes months longer.

You will find it worth your while to look into Thermoid as a motor accessory staple. A line will bring further particulars.

Thermoid Rubber Co. TRENTON, N. J.

Branches:
New York
Chicago
Pittsburgh
Indianapolis
San Francisco
Philadelphia
St. Louis
Detroit
Boston



Our Guarantee—Thermoid will make good or WE will.

Cannot be burned out or affected by oil, heat, water, gasoline or dirt.

Guaranteed for 10,000 Miles



BRICTSON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Brictson Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding too.

Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

Your Tires Rebuilt The Brictson Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blowouts, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write today for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

The Brictson Mfg. Co.
1105 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires

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For Leaky Cylinders

Superior to All Others

EVER TIGHT

PATENTED AUGUST 6, 1912

A Piston Ring Which Gives Compression in "Out-of-Round" Cylinders as Perfectly as in True Ones



Beware the "Just as Good"

Here is a piston ring that gives 100% efficiency to every type of motor, engine, compressor or pump.

Ideally adapted to use in Automobile and Motorboat engines.

Gives compression when all others fail. No need to rebore worn cylinders—simply install EVER-TIGHT piston rings and the motor is good as new.

EVER-TIGHT piston rings are made up of three individual, interlocking rings, grooved together to give flexibility and reduce friction. This three-part construction is clearly seen in illustrations above. This is the only three-piece piston ring on the market.

If dealers do not carry EVER-TIGHT piston rings, Auto repair men should write us.

Jobbers and dealers wanted everywhere. *Write for particulars.*

THE EVER-TIGHT PISTON RING CO.

1428 CHESTNUT STREET ST. LOUIS, MO.

The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,

"Worn Out Tires Made New."

Please mention the size of your tires.

TRIPLE TREAD MFG. CO.

1542 MICHIGAN AVENUE CHICAGO

Factories: San Francisco, Chicago, Winnipeg

Make Your FORD

Doubles Value of a Ford to Physicians and Business Men, who must ride in every kind of weather



An All-Year Round Car

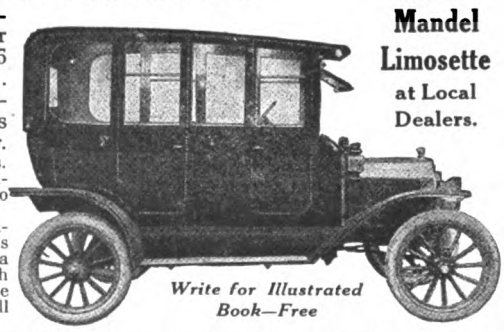
Have an open car for summer touring—a classy limousine for winter. Any Ford owner will be keen to appprecíate the limousine luxury, supreme elegance and beauty of the **Mandel Limosette** as well as the absolute protection from storm and wind it affords. It is a flush, snug fitting top, made of wood, metal and glass. For Ford Roadster and Touring Car. Equipped with automatic rain vision wind-shield, electric dome and handsome cowl dash. Full length doors operate with one handle. Generous over hang in front accentuates the length of the Ford.

Mandel TRADE MARK Limosette

See the Mandel Limosette at Local Dealers.

Built exclusively for 1913-14-15 Ford Cars. Can be attached in less than an hour. Adds about 40 lbs. to weight of Roadster. 75 lbs. to Touring Car.

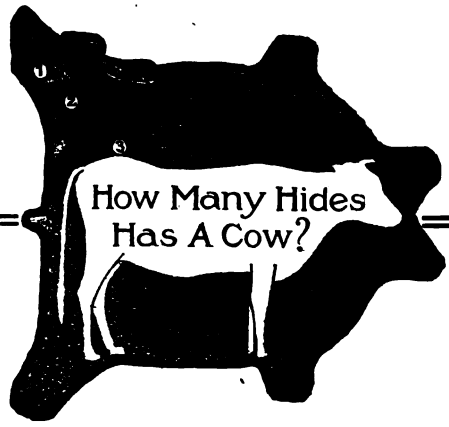
Gives Ford owners the luxurious convenience of a modern, high priced limousine at a very small investment.



Write for Illustrated Book—Free

MANDEL LIMOUSINE COMPANY,

1453-1455 Congress Street, Chicago, Ill.



IF all the cowhide used for upholstery purposes were real grain leather, the answer to this unusual question would be easy. Also the life, wear and service of most automobile and furniture upholstery would be longer. But such is not the case.

Only one-third of this cowhide is genuine grain leather. The remaining two-thirds are "splits"—weak underlayers of hide dyed, coated and embossed to look like the genuine article and sold as genuine grain leather. But they give neither its wear nor service.

The Ideal Upholstery Material

DU PONT FABRIKOID

REG. U. S. PAT. OFF.

Guaranteed Superior to Coated Splits

is not leather, yet has the luxuriant appearance and feel of the finest grain or Spanish leather. It is water, dust and grease proof and twice as strong as coated splits. It is guaranteed for one year, but built to last for many. And back of this sincere guarantee stands the century-old Du Pont reputation for integrity of purpose, superiority of product and financial responsibility.

If you want upholstery satisfaction, insist upon Motor Quality Fabrikoid for your automobile and Craftsman Quality for furniture. Fabrikoid Rayntite, both single and double texture, guaranteed not to leak for one year, makes the finest tops for both automobiles and buggies.

Write for booklets and samples

DU PONT FABRIKOID CO., Wilmington, Del.

Canadian Factory and Sales Offices, Toronto

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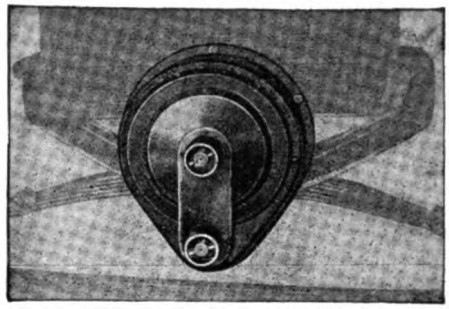


The Cleveland Spring Cranker For Ford Cars

Is now ready for the market.

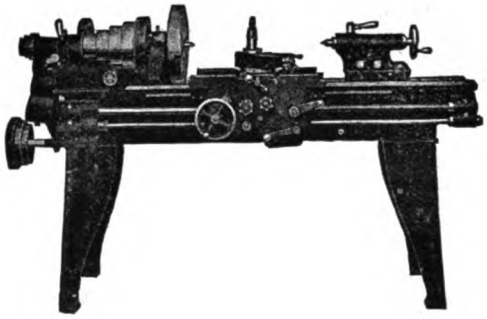
We give the dealers exclusive territory and liberal discounts.

Write for our proposition.



Designed and manufactured for Ford cars and sold to Ford owners through the dealers under the manufacturer's guarantee for one year.

THE FOREST CITY ELECTRIC CO., Cleveland, Ohio



14"x6' Monarch Lathe

Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

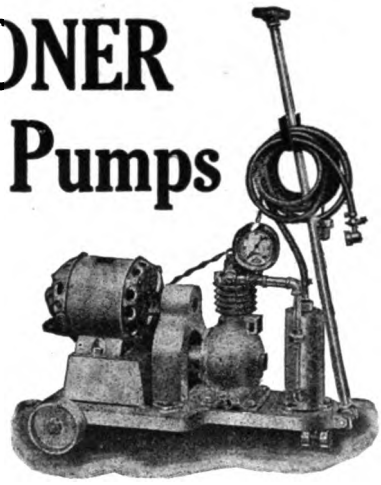
Send today for catalog No. 6 and prices.

THE MONARCH MACHINE CO.
SIDNEY, OHIO

GARDNER Garage Pumps

mean

Lower Costs
Better Service
Satisfied Customers



GARDNER "MIDGET" OUTFIT

The handiest, most convenient and complete outfit ever designed. Compact, small in size, light in weight, with large capacity. It is silent and efficient in operation and economical in power consumption. A simple air filter ensures absolutely clean, dry air.

Write at once for our special proposition. It will save you money.

THE GARDNER GOVERNOR COMPANY
Station R, QUINCY, ILL.

There's a Gardner for every garage—none too large—none too small.

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YOU'LL never be ashamed to raise your top if you apply

"F-S" "Evernew" Auto-Top Dressing

It makes old tops look like new, as well as weather-proof and long-lived. It is easily applied and dries quickly, and leaves the top pliable. Eight standard colors and special shades to order.

Write for color card and prices

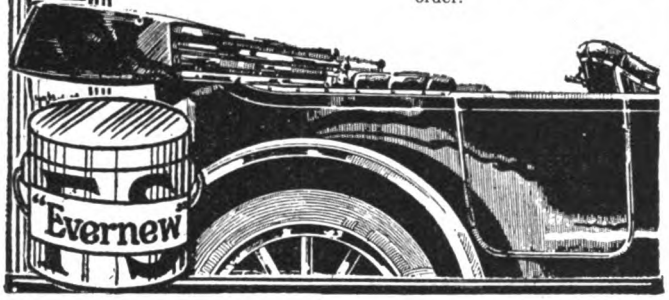
FELTON, SIBLEY & CO., Inc.

Mfrs. of Colors, Paints, Varnishes since 1863

136-140 North Fourth Street - - Philadelphia

"Evernew" Auto-Top Sizing is necessary as the first coat on unpainted cloth, mohair or canvas.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special shades to order.



Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED

Kansas City :: Missouri



Add $250.00 A MONTH EXTRA To Your Business

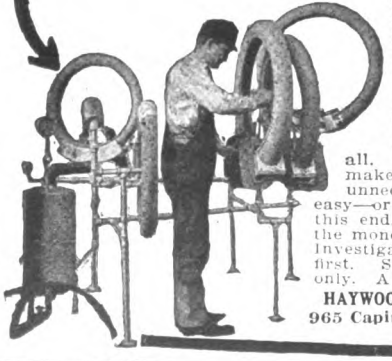
REPAIR AUTOMOBILE TIRES

Sounds like a whole lot of money to clear extra every month. Seems almost impossible, but that is what hundreds of men are doing who have added a Tire Repair Department to their business. **The investment is small, the profit large** and **returns quick and all cash**, besides the demand for tire repairing and retreading is constantly growing. Your garage is by no means complete, your business is not as profitable as it can be until you get in on the Tire Repairing and Vulcanizing end.

THE HAYWOOD TIRE REPAIR EQUIPMENT

Answers all the requirements to successfully handle this end of the business. With it and a little business judgment, success is certain. Every year adds thousands of new auto owners. They are looking more and more to economical tire service. The day of discarded tires is over, the Haywood Equipment makes this possible.

HERE IS YOUR OPPORTUNITY



Either as a side line to your present automobile business or as a business by itself, the Haywood Equipment will make money for you. **Tires go wrong all the time.** You know that. Keep them in tune. Give your customers complete service—repair their tires and all. This builds business and makes you rich. Experience unnecessary. You can learn easy—or teach a boy to handle this end. Be the boss and make the money. Learn the details now. Investigate. Act quick. Be the first. Send name and address only. A postal will do.

HAYWOOD TIRE & EQUIPMENT CO.
965 Capitol Ave., Indianapolis, Ind.

Ford owners stop the leaks of maintenance costs.

Increase every Comfort and Pleasure of Family Motoring.

It's all easy as A B C when you have the new Ford AUTOLOG.

A Book full of sensible, sane and simple suggestions.

Information which appeals to student and master alike.

Equally valuable for business or pleasure vehicle.

Mail coupon, mention type of your car and you will receive a copy of this revised copyrighted edition absolutely

FREE

KANSAS CITY AUTOMOBILE SUPPLY CO.
1500 Grand Avenue
Kansas City, Mo.

EFFICIENCY SPECIALISTS for Ford cars



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STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY

Specialists in Piston Rings

MUSKEGON - MICHIGAN

MODERNIZE YOUR FORD

With the installation of

AUTOMATIC · IGNITION

CONNECTICUT

on your Ford you can be sure of its ability to meet every condition of driving in a way to double your pride in its ownership.



"I climb 'em all now without even a start."

Correspondence solicited with Ford Owners and Dealers.

A. J. PICARD & CO., 1720-22 Broadway, New York

Sole Distributors

"NORMA"

BALL BEARINGS

Can you afford to set up your opinion as a small user of bearings, against the judgment of the makers of high-grade magnetos, lighting generators and starting motors who use bearings by hundreds of thousands? These makers use "NORMA" Ball Bearings in their machines. Isn't this the best of reasons why you should do the same? How about a small stock of "NORMA" Bearings, in the common sizes?

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

"NORMA"



MORE POWER GREATER MILEAGE

Show your patrons how to get full power in cold weather! Help them to avoid fuel waste and reduce carbon deposits by making combustion quicker.

Single Plug ignition won't do it. **Two Plug ignition will!** By starting the flame from **two points at once**, it makes combustion almost instantaneous.

A wonderful increase in power and mileage comes of using one

SU-DIG SERIES PLUG

per cylinder in connection with the regular plug. Spark manipulation is reduced, and leaner mixtures successfully burned.

No change is needed in magneto or battery system. Tap the valve caps if necessary.

Our national advertising is creating a demand. Write today for valuable dealer helps.

Superior Motor Power Co.

24 Irving Place New York City

Salesmen wanted to handle SU-DIG Plugs as a side line.

SU-DIG

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Schrader



FREE

AIR IS FREE—
Rubber Costs Money—
RIDE ON AIR

When the air in your tires falls below a certain pressure you no longer are riding on air, but **on rubber.**
Measure your air with a

Schrader

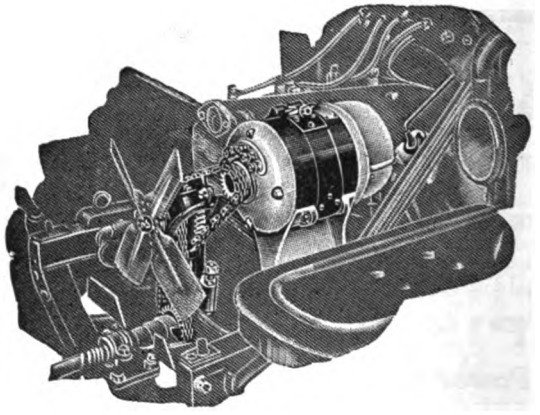
UNIVERSAL TIRE PRESSURE GAUGE

and save your tires.

Price, $1.00

at your dealer's, or

A. SCHRADER'S SON, Inc.
783-793 Atlantic Ave. Brooklyn, N. Y.



North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.
Ask for Bulletin 33-A

North East Electric Company
ROCHESTER, N. Y.

OLD SOL
Electric Spotlights



have so many important uses that up-to-the-minute Motorists find them indispensable. The growing popularity of these powerful lights has created an ever increasing demand throughout the country.

Very often the Motorist is introduced to an Old Sol Spotlight by an Old Sol Silent Salesman, as shown above, a handsome, illustrated colored display stand that immediately attracts attention and demonstrates how the Old Sol Spotlight, when atttached to windshield or nickel plate motor boat and truck plate, can turn at any angle and enable the Motorist to spot danger on all sides, read sign boards and house numbers, etc., by a turn of the wrist, and be quickly detached and used as a trouble light.

This attractive store fixture is given **ABSOLUTELY FREE** to Old Sol Dealers.

The large lamp shown on stand is the No. 70—seven inch model, large car, truck and motor boat type. Lamp with bracket complete, price **$6.50.**

No. 75 model—five inch lamp shown on stand is the Ford and light car type. Complete with bracket, price **$3.50.** Nickel plate motor boat and truck plate, **$1.**

Write today for our Dealer proposition and 1915 Catalog.

HAWTHORNE MFG. COMPANY, Inc., 4 Spruce Street, BRIDGEPORT, CONN.
Manufacturers of Old Sol Lighting Systems for Automobile, Motorcycle, Motorboat, Carriage, Bicycle and Hand Use.

WITHERBEE BATTERIES

are the kind you should stock, Mr. Dealer. We offer not only the largest and most complete line of Starting and Lighting Batteries, but by far

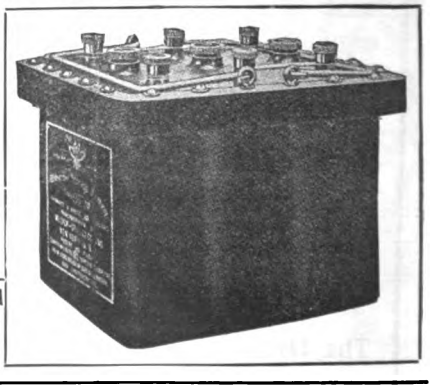
THE BEST VALUE

on the market. They are conservatively rated. Comparative test will show that they have nearly double the ampere hour capacity that can be secured from some others of the same rating. This means that

Your Customers get their Money's Worth
when you sell them WITHERBEE BATTERIES.

Satisfied customers are your best asset. Our liberal selling terms insure you a substantial margin of profit—write for full details and Dealer Proposition.

MEDER-STAUDT CO., Inc.
Sole Manufacturers
1876 Broadway, New York
Factory:
Springfield, Mass.
Distributors and Service Stations in the principal cities.



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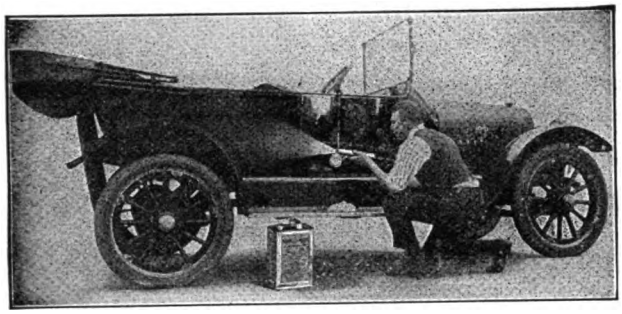
WONDER-MIST

Cleans and Polishes

It removes dust and stains and restores the original lustre to any polished surface.

It contains neither acid, gum nor any other injurious substance.

It preserves and protects the finish.



Applied with sprayer, which deposits the liquid in a fine mist evenly. Then polish with a cheesecloth. It is extensively used in Public Garages and by Automobile Owners. A trial makes a constant user.

If your dealer cannot supply you, send us his name.

The Wonder-Mist Co., 14 Federal St., Boston, Mass.

The ALLEN TIRE CASE

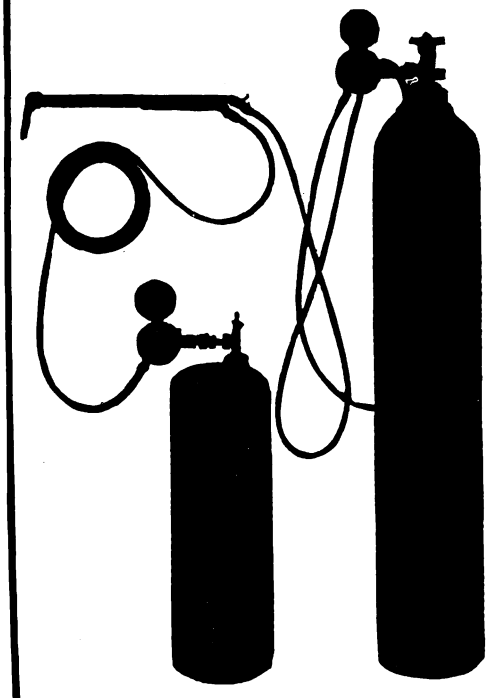
The tire case for spare shoes has come to stay, because it has a real reason for existence. The spare shoe must be protected from the deteriorating effects of sunlight, water and oil, and for this purpose the Allen Tire Case has demonstrated its positive value. The Allen Tire Case is made of highest quality enamel duck, in all sizes, and in all colors to suit. Prices $3.00 and up. Send for illustrated booklet.

$1.00 invested in the handy, accurate Allen Tyrometer, air pressure gauge, may likely save you many dollars in tire bills—it's the only way to **know** the air pressure in your tires.

At your dealer's, or write

The Allen Auto Specialty Co.

1926 Broadway, New York — 1627 Michigan Ave., Chicago



35 DOLLARS

Complete with Supplies

No Extras

Over fifteen hundred satisfied users testify to the reliability of the **DYER** OUTFIT.

See one before you buy. Will ship subject to your examination at our expense.

Write for Catalogue and Prices.

The Dyer Apparatus Co., Cambridge, Mass.

ENDURA

Special-Purpose Sheet Packing

makes Transmissions Noiseless!

Grease in the gear box is to *kill noise* and stop vibration and lubricate, and the only way it can do this is by staying in the box—not *squeezing* out of the joints.

Here's where ENDURA plays its part, for ENDURA—guaranteed and proven oil, grease, gasoline and hot-water proof—keeps grease in, won't let it out; keeps the transmission noiseless.

The demand for ENDURA is increasing steadily. Are you sufficiently stocked to meet it? Prices and free samples for the coupon. No obligation.

Endura Manufacturing Company

6305 Eastwick Avenue — **Philadelphia, Pa.**



In Sheets or Rolls

Mail This Convenient Coupon Now!

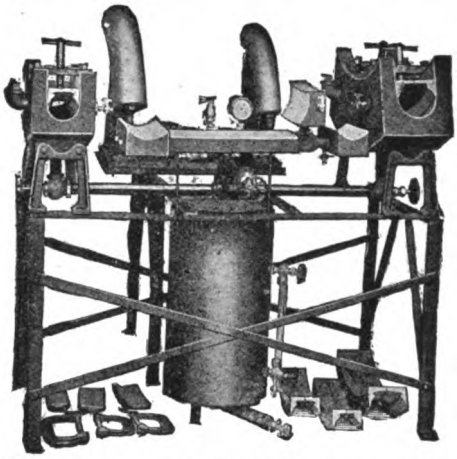
Please send me free ENDURA test samples without obligating me in any way.

Name.....

Address.....

City..... State.....

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Vanderpool Vulcanizers Satisfy

A. W. Childress, Richmond, Va., July 3rd, writes: "The machines that I bought from you have been in use every day, and the more I ***use them, the better I like them.*** I consider your Vulcanizer ***the equal of any on the market*** and ***better than most.***" Mr. Childress bought one Vulcanizer and after using it about 4 months, he sent us his order and check for a second machine.

Moler & Steward, Mount Orab, O., July 1st: The Vulcanizer is working fine. We have had no trouble with it since we got it. ***It is doing fine work.***

A. M. Johnston, Mechanicsburg, O., June 1st: The machine is doing good work. I am well pleased with it.

W. D. Patrick, Elba, Alabama, May 20th: Am turning out quite a nice lot of work with the Vulcanizer. Well pleased with it.

Wheeler & Wheeler, Columbus, O., June 24th: We have the machine set up and doing fine work with it.

A Vulcanizer that satisfies others is a good one to start in business with. They do good work in our shop and they will in yours.

Catalogue on request.

VANDERPOOL CO. - Springfield, Ohio

NATIONAL RUBBER TIREFILLER



An ingenious treatment of small Pure Rubber particles which holds them together in solid form—solid enough to carry the heaviest load your engine will pull—resilient enough to give that "ON AIR" feeling that brought popularity to pneumatics—cannot puncture, rim cut nor blow out—makes your tires cost less by wearing longer.

National Rubber Tirefiller in your tires is like Tire Life Insurance Policies—they insure you more miles out of your tires—complete freedom from all tire trouble—against serious accidents from blown out tires and the real tire service you are entitled to.

It eliminates the delicate and expensive inner tube entirely—it replaces uncertainty with certainty and makes your car absolutely dependable. Let us send you small sample and tell you more about them.

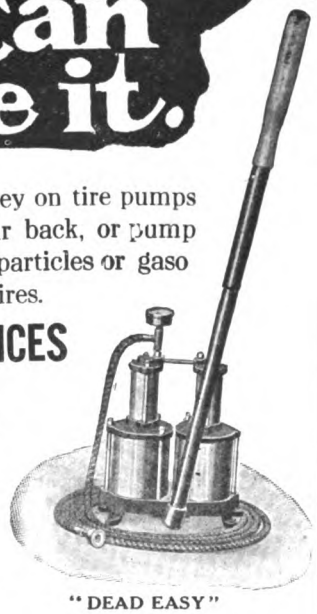
NATIONAL RUBBER FILLER COMPANY,
208 College Street, MIDLOTHIAN, TEXAS.

At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



"DEAD EASY"

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

Can You Use More Money?

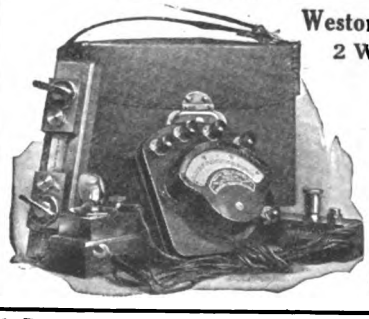
The Garage Man who can repair and adjust Electrical Equipment is going to get the cream of the garage business and make more money. The ever increasing demand for attention to self-starting and lighting systems will compel you to equip to handle this business.

Weston Model 280 **GARAGE TESTING INSTRUMENT**

Is your one great and urgent necessity, to enable you to quickly locate electrical troubles and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electric equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.



Weston Electrical Instrument Co.
2 Weston Ave., Newark, N. J.

New York	St. Louis
Boston	San Francisco
Philadelphia	Montreal
Buffalo	Vancouver
Richmond	Toronto
Denver	Winnipeg
Chicago	Berlin
Detroit	Paris
Cleveland	London
Cincinnati	Petrograd
Johannesburg, S. Africa	

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SAFETY FIRST

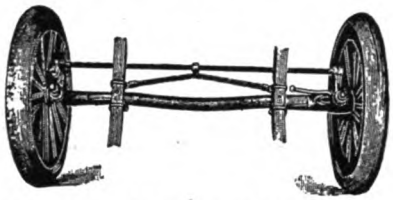
USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

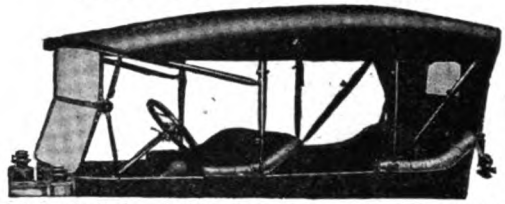
MODERN AUTO APPLIANCES CO.

Dept. D. CHATHAM, N. Y.

CRAY SLIP ROOFS $7.50

FOR OLD FORDS . .

MAKE THE OLD TOPS NEW



Think of all the old Ford touring cars in your vicinity that simply need a roof to make them look as good as new. Where frame and side curtains are in good condition it is not necessary to buy a new top, just **give us year of car** and we will furnish new roof, quarters, back curtains and stays stitched and ready to slip over the old top frame. This is our outfit "A" and at the special price we are quoting you can sell almost every Ford owner in your section and make a handsome profit on each job. We guarantee fit, quality and workmanship. Made for 1912-1913-1914 and 1915 Model T Ford Touring Cars.

Special Dealers' Price, $7.50

GET OUR FREE BOOK FOR AUTO REPAIR MEN

512 pages of bargains—about 3000 illustrations—a complete auto repairers' guide and a price maker—quotes lowest wholesale prices on first quality automobile supplies, auto repairers' tools, Tops for Fords, and in fact, everything used on an auto.

Write for a copy today, sending business card, letterhead or some other evidence that you are in the trade.

CRAY BROTHERS

Jobbers and Manufacturers of Auto Accessories

1119-1124 W. 11th STREET CLEVELAND, OHIO

SIMMS High Tension MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers unite in pronouncing Simms Products "Electrical Equipment Par Excellence."

The SIMMS MAGNETO *Co.*

East Orange, N.J.

SEES ALL TELLS ALL

MOTOR EYE



DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH

$2.50

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

COUPON

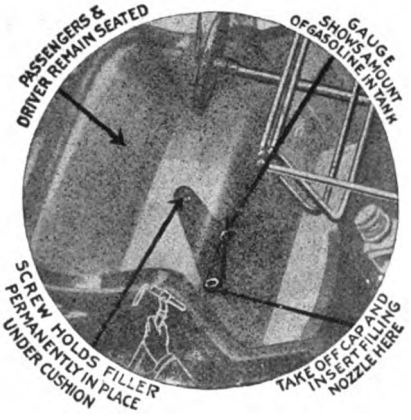
W. LEWIS MACK, General Distributor
"Department A," 26 W. Jackson Blvd., Chicago, Illinois

Gentlemen: Enclosed find money order for $2.50 for which kindly send me, postage prepaid, one MOTOR EYE.

Name.....

Address.....

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A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge. Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline. A Great Comfort Particularly In Stormy Weather.

If You Once Install a *"Fillometer"* You'll Never Part With It

THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

APEX ELECTRIC MFG. CO.,

1410-12 W. 59th STREET, CHICAGO, U. S. A.

The HUNTER

At Last, Mr. FORD OWNER! A SELF-STARTER For $10

Increases the Value of a Ford Three Times

NOTE THE ADVANTAGES

Powerful—The straight pull and powerful leverage enables a woman or girl to start it.

Simple—Installed in one hour. Nothing to get out of order.

Inexpensive—Costs little. No operating or installation expense.

Convenient—Easier to start motor from seat than from the crank.

Reliable—Entirely mechanical—can't fail to turn motor. Special attachment to close air intake of carburetor for easy starting in winter weather.

Appearance—Handle on dash all that shows. Crank not removed from front.

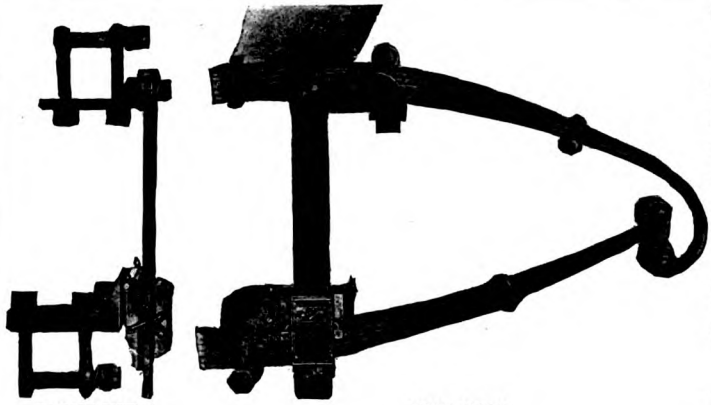
Every Ford Owner wants to make his car up-to-date and at the same time provide for comfort.

FORD OWNERS:—Write today for full description, or order through your dealer or direct from us.

DEALERS:—Don't fail to get our proposition at once. **Big money for you in this—the lowest priced reliable Ford Starter made.**

HUNTER LOCKS FOR FORD CARS:—A simple bracket and lock attached to steering column, making it impossible to steer car when locked. **Price, $1.00. Quickly installed. Sold by leading dealers.**

THE HUNTER AUTO SUPPLY CO., 4101-5 East Ravenswood Avenue, CHICAGO, ILL.



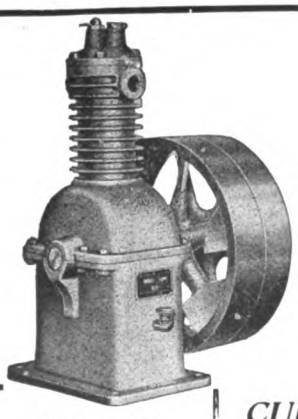
FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.



MADE IN FOUR SIZES.

AIR FREE FROM OIL—

THAT IS WHAT YOU MUST FURNISH TO YOUR PATRONS IF YOU WISH TO GIVE THEM GOOD SERVICE.

CURTIS GARAGE AIR COMPRESSORS

will furnish AIR FREE FROM OIL because unlike all other air compressors the amount of oil furnished the cylinder is controlled—only sufficient oil furnished to properly lubricate without excess to be carried over into the air line. Examine the cross-section illustrated and note that neither crank nor connecting rod dip into the oil and the oil is not thrown direct into the cylinder.

Write Us For Full Particulars Of Either Stationary or Portable Outfit.



Cross-Section of Curtis Compressor.

CURTIS PNEUMATIC MACHINERY CO., *1530 KIENLEN AVENUE, ST. LOUIS, MISSOURI.*

Chicago Office, Marquette Building. New York, 30 Church St.

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WHY REPAIRMEN SHOULD USE Marko STORAGE BATTERIES



It is an easy matter to convince Automobile owners that it is economy to use the best battery that money can buy.

Probably their previous experience with unreliable batteries will enable you to prove to their satisfaction that the "Marko" is the one they should use.

Now is the time when you should go after business.

Spring overhauling is at hand and batteries for starting and lighting purposes are an important item.

"Marko" batteries lead because of their great efficiency and reliability.

Write At Once for Our Proposition to Repairmen and Dealers.

PAUL M. MARKO & CO., 1191 Bedford Ave., BROOKLYN, N.Y.

SPITLER PUNCTURE PLUGS

The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

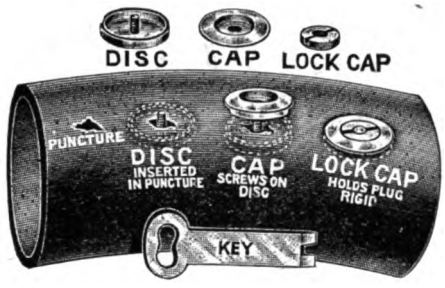
The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.



Write for Circular.

Price—Four to a Set, $1.00.

(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

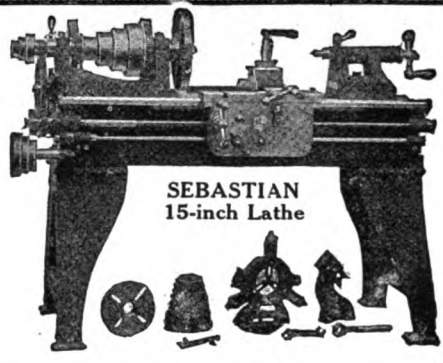
They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)

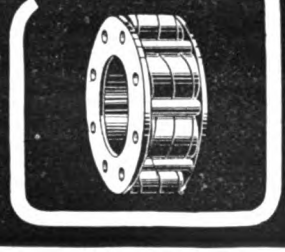
THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN
15-inch Lathe

How Far Has Your Car Run On HYATT QUIET BEARINGS?

$1000.00 for best Hyatt Service Records



Write for Entry Form to Dept. 22

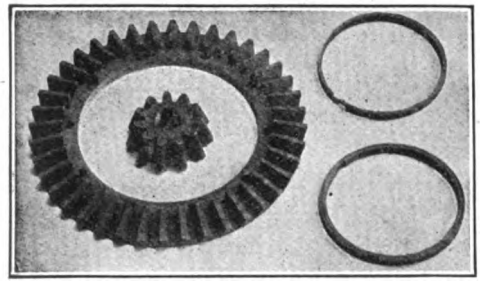
HYATT ROLLER BEARING CO.

755 WOODWARD DETROIT MICH.

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Repair Parts for Ford Cars at Cut Prices

☞ Dealers and Repairmen ☞ All Parts Guaranteed



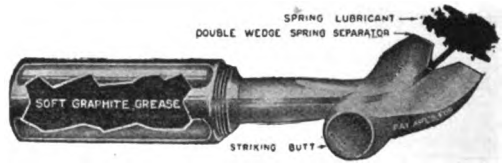
Differential ring gears, $3.00; differential pinion gears, $1.00; front radius rods, $2.00; rear axle shafts, $1.75; driving shafts, $2.75; plain piston rings, 10 cents; triple piston rings, 60 cents; front springs, $2.80; rear springs, $8.40; connecting rods, $1.00. Our prices on truss rods, valve springs, bushings and other parts will surprise you. We can furnish gears, springs and piston rings for over 40 makes of cars.

Write today for complete lists of parts and cut trade prices.

GROSSMAN AUTO PARTS CO.,
WHITE PLAINS, N. Y.

TOMAHAWK SPRING LUBRICATOR

Will increase the comfort of riding in your car 100% and stops the squeak



The simplest, quickest and most effective tool on the market for spring lubrication. Made of the finest drop-forged steel, hardened and nickel-plated. Graphite grease is fed from the container in handle. One blow of the hammer, a twist of the wrist and the trick is done. **PRICE, 75 Cents**

Write for Dealers' Proposition.

CHARLES W. MANZEL CO., 307 Beard Ave., Buffalo, N. Y.

DANGER JUMPS OUT OF THE DARK

The Nite Lite



throws an intense light 2,000 feet ahead, preventing head on collisions, and quickly locates unlooked for obstructions.

It can be adjusted to any angle, and is quickly attached to the windshield, or side of the car.

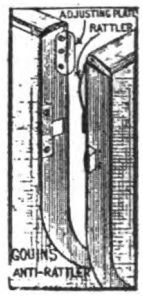
Write us at once, before you are hurt.

MANUFACTURERS DISTRIBUTING CO. OF AMERICA
246 West 56th Street New York City

Carbon removed by Oxygen a Specialty.

Gouin ANTI-RATTLERS for Ford Cars and Any Car With or Without Door Jambs

Every FORD owner is interested in this Device as it will stop that troublesome rattle of the car doors.
Send us your check or money order for a set of three for your FORD.
Price, $1.00 or send us $1.25 for a set of four if you have Four Doors and kindly mention your dealer's name.
Dealers, write for our prices and secure your share of this business.



ASK YOUR JOBBER

Manufactured by L. J. GOUIN COMPANY,
14 Roosevelt Ave., POUGHKEEPSIE, N. Y.

CHANSLOR & LYON CO., 1238 Van Ness Avenue, San Francisco, Cal., Distributors for the Pacific Coast.

TRADE APCO MARK

Specialties
FOR FORD CARS

Write for Catalog today

AUTO PARTS COMPANY
Providence, Rhode Island

Dario Resta, world's Speedway champion, uses



DIXON'S Graphite Automobile LUBRICANTS

Write for booklet No. 184-G

Made in JERSEY CITY, N. J., by the
JOSEPH DIXON CRUCIBLE COMPANY
ESTABLISHED 1827 G-79

Get Extra Mileage from Tires

Car owners can do this—it's easy—if you look over your tires weekly. Every time a small cut starts, stop it with Goodyear Repair Gum. If the tread is worn down, don't ruin the tire fabric beneath. Simply have the tire retreaded—then note the extra saving in tire costs and tire troubles.

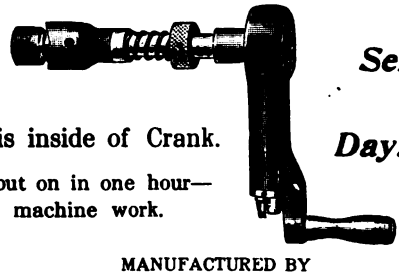
Get This Free Emergency Repair Book

You can get hundreds of surplus miles from tires by these simple and quick applications. We explain how to use these Goodyear Tire Savers and Money Makers in our Emergency Repair Book, gladly sent free. Address Desk 154.

GOODYEAR AKRON, OHIO

THE GOODYEAR TIRE & RUBBER CO., AKRON, OHIO
Makers of Goodyear Fortified Automobile Tires (2653)

DE LAUNTY TIRE PUMP AND CRANK—Combined



Pump is inside of Crank.

Can be put on in one hour—no machine work.

Sent on 30 Days' Trial

MANUFACTURED BY
CHICAGO AUTOMATIC MACHINE CO.
Oakley Ave. and Kinzie St., CHICAGO

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IMPERIAL WELDING AND CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS

For Every Garage

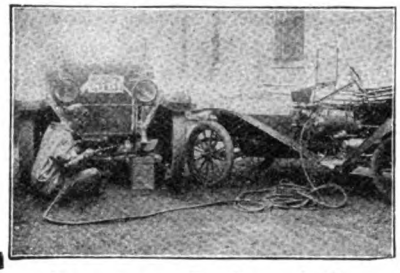
Cutting—welding—decarbonizing of gas engine cylinders—*all combined in one economical outfit.* Nothing like it. Repairs broken parts quickly and easily. Welds cracked cylinders, crank shafts, transmission cases, frames, axles and everything in metal quickly and permanently—*as well as new!* Cuts all kinds of steel and wrought iron quickly and accurately. Avoids delays—saves time, labor, materials. *Often pays for itself in one single operation.*

Write for New Catalog

Find out how little the No. 4 Outfit costs. Safe, reliable, portable—*always ready.* Far superior to any other method. No garage should be without it.

Send for interesting facts NOW.

Imperial Brass Mfg. Co.
520 S. Racine Ave.
CHICAGO



Repairing Broken Axle

The man in the picture went to the job—repaired the broken axle on the spot in a few minutes, *without dismantling the car,* simply by putting an Imperial Outfit and an oxygen tank in his car and hitching it to the acetylene tank used for lighting.

You are always prepared for emergencies with Imperial Equipment—*on the road or in the shop.* Removes every bit of carbon from cylinders easier, quicker and cheaper than any other method. Don't handicap yourself any longer. *Write us today.*



Experienced motorists readily see the extra value in

MICRO PISTON RINGS

Micro Piston Rings do not compete with inferior rings but they *do* permanently overcome leaky compression, cylinder scoring and breaks in fitting.

Our flexible close-grained special gray iron, our method of *individual casting and machining of each ring,* and our close inspection give a uniformity not obtainable with rings cast in tubes and cut off like slices of sausage.



Micro Piston Rings
The watchdog of a motor's power.

Their efficiency value is far in excess of the nominal price charged.

Micro-equipped motors soon demonstrate superiority in snappy start, steady pull and better hill climbing.

Write for prices and booklet, "How Micro Rings Improve Efficiency."

Micro Piston Ring Co.
1960 Broadway, New York

BROWN SUB-BASE OILER
FOR FORD CARS

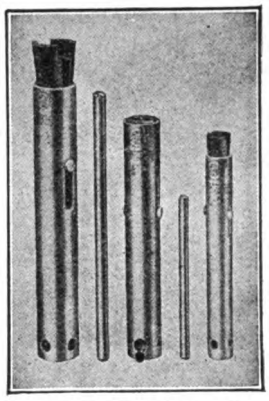


PAT. DEC. 8, 1914

The hit of the season. 450 miles on a filling of oil. No pump or sight feed drips—entirely automatic. Can be attached in 15 minutes—no holes to drill. 75 degrees difference in temperature of oil. Less oil and carbon. Cannot flood the motor. Send for booklet on proper lubrication.

Price, ready to attach, $6.00

THE BROWN CO., 100 Bellevue, SYRACUSE, N. Y.



Utility Socket Wrench Set

A set of three jawed socket wrenches that are instantly adjustable and will take all nuts that a set of 14 sockets will fit; fits all sizes and shapes used on motor cars; either square, hex, cock or wing, and holds the nut after it has been removed.

Price $2.50

Send for circular.

HILL PUMP VALVE CO.
18 E. Kinzie St., Chicago, Ill.

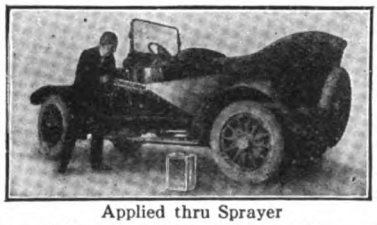
New York Sales Office, 115 West Broadway

Brighten Up Your Car With

Marvel-Mist

Removes Road Tar, Oil and Grease

Prevents Rain Streaks



Guaranteed Not to Injure Paint or Varnish

Non-Combustible Inflammable -poisonous

Applied thru Sprayer

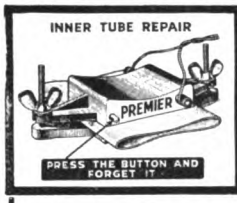
Keeps Your Car Looking New

Midget Outfit, With Cloth, $1.00 Giant Outfit, With Cloth, $1.25
Refillers—Pint, $0.75 Quart, $1.00 ½ Gallon, $1.75 Gallon, $2.75

1 Pint of Marvel-Mist is equal to 1 gallon of ordinary polish.

Write for our attractive Dealer's Proposition.

MARVEL-MIST MANUFACTURING CO., 56 Greenpoint Ave., Brooklyn, N. Y.



PREMIER AUTOMATIC ELECTRIC VULCANIZER

CAN'T BURN TUBES WITH THIS.

"Press the button and forget it." No watching—no danger from an open flame. Automatically cuts off heat when casing or tube is vulcanized—cannot burn repairs. Good profits for dealers in selling the portable Premier. Complete outfit $3.50. Operates from battery or 110 volt current for garage use. ***Write us.***

PREMIER ELECTRIC CO., 4038 RAVENSWOOD AVE., CHICAGO.

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Three Comforts for Fall and Winter Motoring

WOODWORTH TROUBLE-PROOF TIRE
EASYON TIRE CHAINS
WOODWORTH LIGHT WEIGHT NON-SKID TIRE COVER



Woodworth Trouble-Proof Tires are guaranteed against punctures or blow-outs for 5000 miles. By using Woodworth Trouble-Proof Tires you avoid the danger of having to freeze your hands repairing or changing tires in cold weather.

The Woodworth Trouble-Proof Tire is protected against punctures by a strip of chrome tanned leather which does not stiffen the tire and does not make it ride hard or overheat. If you do not find these tires ride fully as easy as plain pneumatic, we will refund the full amount paid for them. Think of the satisfaction of knowing that your tires are proof against trouble.

EASYON TIRE CHAINS

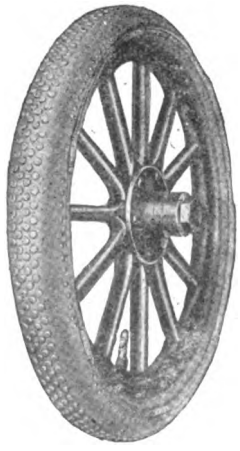


Every automobile should carry a set of Easyon Tire Chains. They can be put on in a moment to prepare you for slippery going. Even if you get stuck in the mud or snow, you can put them on easily.

They have leather covered fasteners that do not injure the spokes and specially designed cross chains that do not cut the tire.

Price $3.20 per set for tires up to and including 4 inches.
Price $4.00 per set for tires larger than 4 inches.

Sent prepaid to any part of the U. S. or Canada.



WOODWORTH LIGHT WEIGHT TIRE COVERS

are much lighter in weight than other covers; have studs of special steel that grip firmly on asphalt or brick pavements; have a fastening that automatically tightens them and have the leather on the inside finished by a special process which makes it adhere to the rubber, preventing chafing or wearing of the tire. These are very low in cost and are just the thing for a man who wishes to be protected from tire troubles in the winter and wishes to have a non-skid that will be always in place.

Send for full information and prices

LEATHER TIRE GOODS COMPANY

NIAGARA FALLS, N. Y.

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

Registered in the U. S. Patent Office

VOL. XX, No. 2 NEW YORK, OCTOBER 1915 PRICE { 10c PER COPY / $1.00 PER YEAR

FOR REPAIR WORK.

Why It Pays to Use a Lathe and a Milling Attachment.

From J. N. Bagley, Nebraska.—If one were to carry in stock all the repair parts for the different cars that come to his place he would have a large investment and also a stock that might never be used. In case of a couple of dozen different makes of car in the neighborhood it would be quite an item to carry in stock even the axles, although many of them are liable to break. The writer found a better way is to have the necessary tools to make some of the parts, such as axles, transmission shafts, etc. These are in no way difficult to make and to supply them will require only cold rolled steel which is a small item.

As to the tools for making parts, it requires only a small outlay of cash and when they are installed they can be used many times for general repair work. A lathe will be necessary, with a milling attachment, a few milling cutters, and an arbor for holding the wheels between the centers of the lathe while in use. The outlay for a 13 inch lathe will possibly amount to $200. At once one will remark that it will not pay, but the writer makes in his shop



Fig. 1.

more than one hundred axles of various kinds during a season and the price ranges from three to eight dollars. Many of these are made for the garage in the neighboring village.

But we will consider an investment of $200 for the lathe equipment and the interest on it at 8 per cent. as $16 per year in case the money is hired. Let the shafting be figured 1¼ inches for an average; some will be smaller and very little of it larger, so we will average it at this size. This will make the raw stock cost 45 cents for an axle. Complete axles run in price from three to eight dollars and it will take from two to four hours to make one of them on a lathe. Reckoned 3 hours at 60 cents an hour, it makes a total cost of $2.25. The axle sells for $5, leaving a profit of $2.35 per axle. Figuring 25 of these axles, which is a very low figure considering the number of cars in use, and we have a net profit of $58.75. We also have 75 hours labor at 60 cents to the hour that would not have been added to the profit column had it not been for the lathe equipment which amounts to $45, making in all $103.75. Now we will pay the interest on the investment which is $16, and we still have to the good $87.75. If the lathe has been cared for and oiled it is not damaged or worn enough to mention. All the while it can be used for the general repair business and bring returns on the investment. A tool, so far as value is concerned, is worth what it can earn, and its earning capacity depends on the ability and push of the mechanic using and operating it.

Then the question arises, can any one run a lathe and make an axle for a car? It is a very simple operation, requiring only a mechanic with average ability.

In Fig. 1, we have a drawing of an axle of a very common type and not at all difficult to make. The axle A, has a square at one end B, which slips or fits into the square hole in the differential gear. The

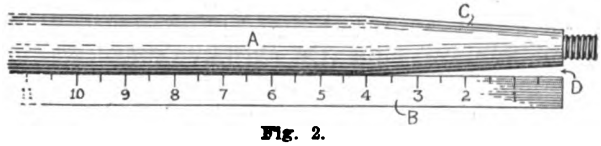


Fig. 2.

other end C, is tapered for a taper hub and is supplied with a key seat D, to key the wheel to the shaft to prevent it turning inside the hub. The end at E, is threaded for a nut which in turn prevents the wheel working from the shaft. Now it may look at first difficult to make such as the tapered end, and the square at the opposite end. Then there is the key seat and the thread on the end. A hard job, they will all say who have never made one. But stop for a moment and reason it out, and see what there is hard about it, after all.

We will first take the taper of the axle, as shown in Fig. 2. The axle A, is turned to size and we must turn the taper C. Lay the straight edge B, on the shaft as shown in the drawing and we find that the taper is 4 inches long and the space at D, is ¼ inch. Now we have it in a nutshell, so to speak, a ¼ inch taper in 4 inches. Now let's see how difficult it will be to find how far over to set the tail stock to turn the taper.

On shaft A, in Fig. 3, we have measured back from

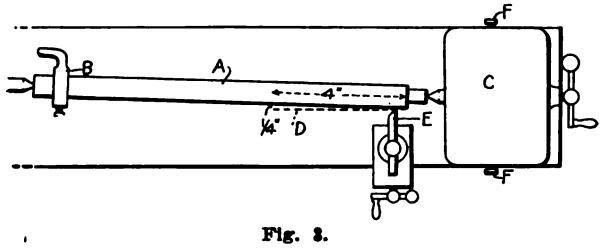


Fig. 3.

the end 4 inches, as shown at D. Now we will set the tail stock over until we can start the cutting tool E, at the outer end, and in running it 4 inches have a space of ¼ inch, at D. We are now set for turning the taper jaws in ordinary turning. The tail stock C, can be tightened, and locking or adjusting screws F, set tight on each side, and the lathe dog B, made secure and we are ready to turn the shaft. Continue to turn until the four inches is cut as marked and the taper is finished. A good plan when turning an axle for a certain car such as a

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Model 31 Buick, is to have a little tab and mark down the amount of the set-over of the tail stock and in the future this will save some little time in setting it by measurement each time.

Now let us see how difficult it is to cut the thread on the lathe. In Fig. 4, at A, we have the axle with the thread on it, or in other words, the old axle, and we must know how small to turn the end B, to be threaded. In this case I will set the calipers C, as shown in the drawing, on the outside diameter of the thread and turn the end B, of the axle to a size that the caliper C, will just slip over with the same pressure that it does over the threaded end. The end at B, should be rounded a trifle at the nose to permit of the nut starting easy after the thread is cut. Also the end to be threaded at B, should have the depth of the thread cut out at the shoulder, A. Now it will be necessary to know the number of threads to the inch to set the gears on the lathe to do the work. For this information we will use a thread gauge as shown at E, which is a little tool with notched blades. When the correct blade is found it will fit into threads F, perfectly and the number of threads to the inch will be found stamped on the blade. Consequently we have measured the shaft D, and find that the threads are so many to

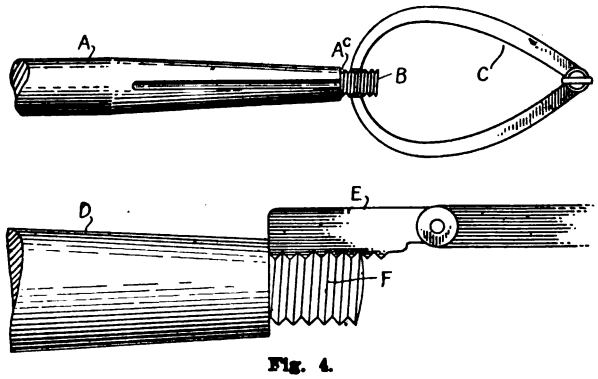


Fig. 4.

the inch. Now by referring to the thread gauge plate attached to the plate, the gears can be used in cutting the thread.

Grind the tool until the point will perfectly fit the notch in the thread gauge that we found the number of threads with, and smooth it up on the oil stone. Now we must place the tool in the post in such manner that the thread will be true and not have more of an agle on one side than the other. To do this we apply the little gauge D, to the shaft A, on its straight surface, as shown, and by setting the cutting tool E, into the notch on the side—still keeping the tool on the shaft—the position of the tool will be such that it will cut a perfect thread. The shaft will revolve on center B, at C, as in turning. Move the carriage back to the starting position and adjust the tool to make the cut. Start the lathe and allow it to cut to the shoulder and withdraw the tool from the work. Reverse the lathe and allow the tool to be carried back for the second cut. Repeat the operation until the thread is finished and the nut will screw on with very little crowding with the wrench.

The speed of the lathe should be quite slow in thread-cutting, especially on cutting a short thread, as one is liable to allow the tool to gouge the work before he can gain control of the machine. In case it is necessary to remove the tool for grinding during the operation, reset it again with the gauge as shown in Fig. 5, also being very careful to have it so set that it will enter the same cut exactly as before. In case the lathe is equipped with a compound rest the tool can be moved back and forth without loosening it from the post. The cut taken from the shaft should not be taken too heavy as it will tend to make the thread rough and ragged. The cuts should be made light and with just enough speed of the shaft to make the cut clean.

The milling attachment for the lathe consists of a vise arrangement which can be adjusted up and down, and which can be bolted to the carriage. These

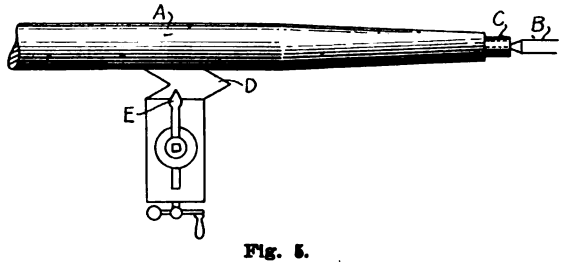


Fig. 5.

devices are not at all expensive and any lathe builder can furnish or recommend one suitable for the lathe they make. In Fig. 6, we have the arbor for carrying the wheels to do the milling. It consists of a shaft, one end of which is turned down and threaded as shown at B. As indicated by the dotted lines the shaft is smaller and over this is slipped the wheels, together with many rings, or washers as we call them, varying in thickness from one-sixteenth to one-half inch. These washers C, permit of the wheels being spaced to meet requirements. The milling cutters A, should fit the shaft B, perfectly tight, so that they will not tighten out of true. Each end of the shaft is supplied with a center G, to permit of it being hung between the lathe centers. The nut E, screws over the threaded end of the shaft F, holding the wheels from turning on the shaft when in use.

The wheels in this instance can be adjusted to cut the shaft D, on two sides at once, thus saving time by cutting one side at a time. These milling cutters are not expensive and one should have a variety of them on hand for special jobs, as well as the stand-

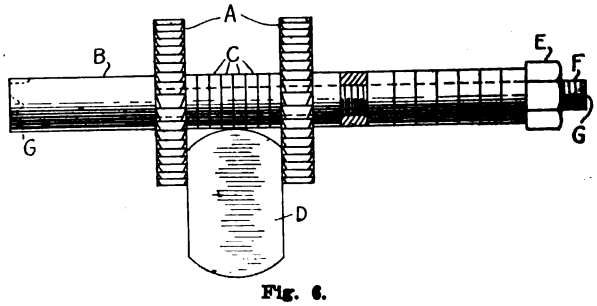


Fig. 6.

ard thickness for cutting key seats. The cutters should not run at an excessive speed or the cutting edges will be torn and broken. I have found that a key can be cut the full depth at one cut better than it can be cut shallow, and repeated.

Another method of squaring a shaft or cutting the key-way is shown in Fig. 7 in which the shell end mill is employed. This method, however, for squaring is not as efficient as the one just described but it can be done in case the other cutters are not at hand. The mill can be chucked, if a straight shank, or in case a taper shank, it can be used in the

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taper of the spindle. A represents the head stock of the lathe, and B the chuck we are holding, which is operating on the shaft D, cutting away on the side of E. In this instance as the cutter is smaller it will be necessary to feed the work against the cutter up and down as well as crosswise.

We have gone over the operations which are necessary in making an axle of an automobile and find it is not a serious undertaking, after all. When we consider the advantage such a shop has over one not equipped for this work, it bears quite heavily on the mind of the person getting the repair made. The shop that can turn the car out with the least delay

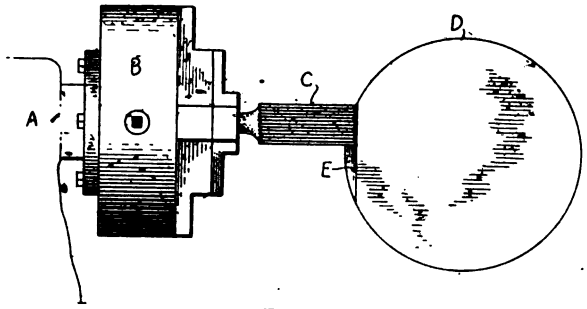


Fig. 7.

will invariably get the work. I have known of cases where cars have been held up for two weeks because of a broken axle.

As a matter of dollars and cents it seems that it would be a wise thing for every man operating a garage to get in touch with a lathe manufacturer and install a lathe outfit, and let the motoring people know he has it and can use it.

DRY BATTERIES.

Their Evolution and How They Can Be Made to Give Good Service.

BY SYDNEY F. WALKER, M. E.

No. 4.

The cost of renewing the whole of the cell was small in labor, and therefore the advantage, once the dry cell came within reasonable limits of endurance, was on its side. At the present time though wet cells of the various forms mentioned were made from gas retort carbon, and it was quite a common experience for a lamp to burn satisfactorily for some time and then to give a splutter and a blaze and be temporarily extinguished. The splutter and the blaze were caused by the presence of some impurity which had a lower melting point than carbon; and which was converted into vapor at a very much quicker rate than the carbon was, with the result given. The carbons employed for wet Le Clanché cells, while they are made with a considerable amount of care are still hardly suitable for dry cells. In the process of baking the carbons a hard scale is left on the outside. The scale tends to prolong the life of the carbon, but it introduced an unnecessary resistance into the path of the current, and into the path of the liquid which is so largely employed in carrying the current. In the writer's experience, in the best dry cells, pieces of arm lamp carbons and of the very best forms are actually employed. In the best arc lamp carbon again no glutinous substance is employed to enable the necessary cohesion to be obtained.

Dry cells are used generally for telephone work, for bell work, nearly always for mine signal work, and of course where primary batteries are employed for the ignition batteries of motor cars. But in order that the dry cell should take the place of the wet cell it was necessary that it should be able to perform the work hitherto done by the wet cell without requiring renewal at too frequent intervals. In order that this might be accomplished it was necessary to provide in the dry cell a certain amount of oxide of manganese and a certain amount of sal-ammoniac, also a certain amount of water. The sal-ammoniac must be in solution. Further, it was necessary to provide a containing cell of some form. In some of the early forms of dry cell a porcelain containing vessel was used, and those cells which adopted that method stood up to their work at that time much better than those which did not.

In all dry cells, however, the zinc has been made the containing cell, sometimes reinforced by a porcelain containing vessel, sometimes by a padding of various substances with cardboard on the outside. The zinc is made sometimes into the form of a cylinder, sometimes of square of rectangular section. In the early days of the dry cell it was not usual to close the bottom of the zinc. The zinc cylinder formed the containing vessel only so far as the sides were concerned. In the modern dry cell this has been changed. The bottom of the zinc containing vessel, whether it be cylindrical or square, is closed with a substantial foot also of zinc, the foot and the upper portion being carefully burnt together. In closing the longitudinal seam of the cylinder or rectangular vessel also care has been taken to burn the zinc together, not to solder it.

Fig. 14 shows two zinc containing cylinders, one cylindrical in form, and the other square in section. It will be noticed that a wire is connected to the top

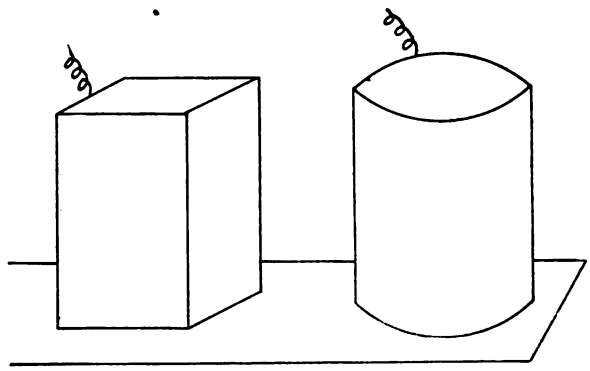


Fig. 14—Forms of dry cells square and cylindrical with wires attached to the zinc cylinders ready for connecting to the next cell.

of the zinc containing vessel in both cases, the wire is merely soldered on, and it is for connection to the next cell. Incidentally it may be mentioned that this connecting wire is often a great source of trouble. It is very apt to break off at the top of the zinc. That difficulty has been overcome in the better form of dry cells by making the connecting wire of fairly large gauge, No. 16 or even No. 14 copper wire, by having the wire of soft flexible copper and by very carefully "sweating" a fairly long length of one end of the wire to the zinc.

A point that should be mentioned here is that solder must not be used for completing the zinc containing vessel. The solder that is used for attaching the copper wire to the zinc must be kept well above the point at which chemical action can go on.

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There is no difficulty in doing this and in the best batteries it has been done. Another point that should be mentioned here is that with dry cells the water employed should be absolutely pure distilled water.

For the dry cell a pure carbon plate or rod of some form is the first desideratum. Again the substance of which the carbon plate or rod is made must be absolutely pure carbon. The same reasoning applies here as in the case of the oxide of manganese, and the crushed carbon that goes with it; any impurities, any foreign substances will tend to set up either additional resistance or opposing pressures or both. The carbons which are now used in ordinary Le Clanché cells are prepared in exactly the same manner as those for electric arc lamps. It will be remembered that for arc lamps the very purest carbon is required.

A point that requires considerable attention is how to provide the largest amount of water or the largest quantity of salammoniac solution. In the dry cell, once the cylinder of carbon and manganese is in its place, inside of the zinc cylinder, and with the salammoniac also in place there was nothing to cause it to get out of place, and so a very much lower compression could be employed and also a solution of salammoniac could be employed to act as a partial coherer. From what has been said it will be understood that the cylinder of carbon and manganese would be porous and that the pores, if the cell is to work satisfactorily, must be filled with a solution of salammoniac. Hence by kneading the carbon and manganese with a solution of salammoniac the path for the current is provided.

The process then is, the very highest grade oxide of manganese is obtained; it is crushed to a very fine powder, all lumps being removed, and all possible impurities that show being abstracted; carbon of the very highest purity is also crushed to a very fine powder; the powders of oxide of manganese and carbon are thoroughly mixed together, and they are kneaded into cylinders, around the carbon rods or

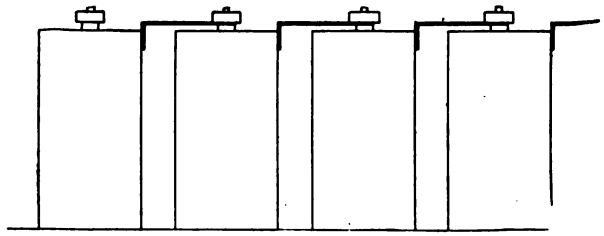


Fig. 15—Diagram showing how dry cells are connected in series.

plates, under hydraulic pressure, but with only sufficient pressure to keep the whole thing together, and to reduce the resistance to its lowest figure. It should be noted again, that providing the carbon and maganese are pure, squeezing them up together by hydraulic pressure, tends to lower their resistance. If it were not for the presence of the salammoniac employed in kneading them up into blocks, the close pressure would be against the continued work of the cell. Too close a pressure, even with the salammoniac used as a coherer would also tend to reduce the working life of the cell.

The block of carbon and manganese surrounding the carbon plate or rod having been made, the cell is completed by the addition of the very purest salammoniac that can be obtained, ground into a very fine powder, and mixed into a paste with distilled water, the space between the block of carbon and manganese and the zinc cylinder being filled as full as it is possible by pressure from above, with the paste. The salammoniac paste is not carried up to the top of the cell. It is kept below the point at which the wire is attached to the zinc rod, and usually some little distance farther down. From ½ to 1 inch is usually left free of salammoniac at the top of the cell.

Now comes in the other measures that have been taken to increase the working life of the cell. It will easily be understood that as the supply of liquid in the cell is strictly limited, it is of the greatest importance that none of it shall be allowed to evaporate. It is all required for use in the chemical actions of the cell itself. The practice is to fill in above the salammoniac with some substance that absorbs

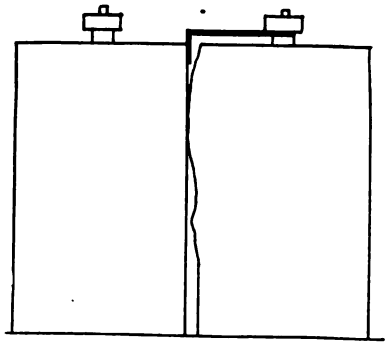


Fig. 16—Diagram showing the zinc containing cylinders of two dry cells touching.

water, and then to pitch over the whole of the top, from the carbon block to the zinc cylinder, and in some cases to fit the glass vent tube. The cell is completed by protecting the zinc plate on the outside with some cardboard wrapping. The object of the cardboard wrapping, which is also made use of as an advertisement of the cell, is to prevent the connection between the zinc cylinders of adjacent cells. When cells are working together, they have to be connected zinc to carbon, zinc to carbon in succession, as shown in Fig. 15. If two zinc cylinders touch, as shown in Fig. 16, one of the cells is cut out of action, and the current furnished by the battery as a whole is less by the pressure of that cell, divided by the resistance of that cell, practically by the pressure of the cell.

What Dry Cells Will Do.

It will be understood from what has been said that what a given battery of dry cells will do, depends directly upon the amount of oxide of manganese and salammoniac that the individual cells contain. It is probable that the work done in furnishing current for ignition of a six or eight cylinder engine, through an induction coil, is at least as great as that involved in furnishing current for lights. The difficulty is, that it is not easy to estimate the current required for the ignition work, while that required for lighting is well known, and is easily calculated. For lighting purposes, there are now two kinds of lamps on the market, viz., the one watt lamp, and the half watt lamp; and the latter, as the writer understands, has been used with considerable success for motor car work. It is a peculiarity, as he understands the matter, of the manufacture of the half watt lamp, that it lends itself to very high powers, from 500 C.P. upwards, and to very low C.P.'s, such as those required for the lights of motor cars. The reason is, the pressures in both cases are low. With very high efficiency incandescent lamps,

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those in which the temperature of the filament is at a very high figure, the lower the pressure at which they are run, the easier is the problem involved in making them. The higher efficiency lamp, the half watt lamps, in which very fine filaments are curled into small helices, as shown in Fig. 17, the lamp bulb is filled with the inert gas nitrogen. The higher the pressure at which the lamp is worked, the smaller is the size of the wire forming the filament; and the higher the C.P. again, the longer is the filament. It will probably be seen how these two qualities lend themselves to the making of lamps for motor car work. In the writer's view also, they lend themselves to working with dry batteries, because the current required is so much smaller.

Lamps employed for motor cars range from 2 C.P. up to 16 C.P. For headlights a lamp of 8 C.P. focussed in a lens of the proper curve, will give a powerful beam of light over the arc where it is required. It will be remembered that by the aid of a reflector, and a lens, the back rays from the lamp and the side rays are utilized, the back rays being reflected out to the front, and the side rays being refracted in the same direction. For 8 C.P. lamps, with the wire filament, an efficiency of 1 watt per candle is required; that is to say, 8 watts, or with a battery furnishing 8 volts, 1 ampere. With the half watt lamp only half that amount of current is required, with the same pressure; that is to say, the 8 C.P. lamp requires only 0.5 ampere with a battery furnishing 8 volts. Taking again the requirements of an automobile as two 8 C.P. lamps for headlights, one 2 C.P. for the tail light, and a 2 C.P. for the dashboard, we have a total of 20 candles required.

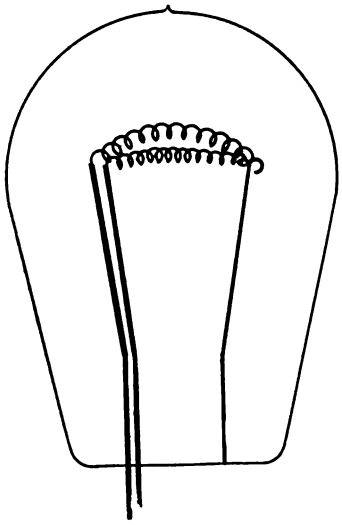


Fig. 17—Diagrammatic representation of the filament of a half watt lamp The filament consists of a very thin wire coiled in a spiral.

The practice with accumulators is to work either 6 volt or 12 volt lamps. This would mean that the combined 20 C.P. of the four lamps would require 10 watts, and at 12 volts 5/6 of an ampere. The 12 volts can be obtained by a battery of six accumulators. The 6 cell accumulator only gives its 12 volts just after charging, and it is allowed to work down until each cell gives 1.8 volts; that is to say, till the 6 cells give 10.8 volts.

(To be continued.)

Electric cables that rub on sharp edges of battery box or other parts, will soon wear through the insulation from vibration of the car, and a short circuit will occur that may be hard to locate.

NOW SEE AMERICA.

It Is Worth the Cost and Europe Is a Good Place to Stay Away From.

From J. J. Cole, President of the Cole Motor Car Company.—Christopher Columbus in 1492 simply located the continent of America. The summer of 1915 has marked its real discovery. And in the great enterprise that has brought America into her own, the present conflict in Europe and the motor car have been the two big contributing factors.

Ever since the first clash of arms on the continent across the Atlantic, the American tourists have been forced to look elsewhere for their summer rambles, and with the warfare carried to the seas, came the knowledge that they would have to content themselves within their own land.

Robbed of their Paris, their Berlin, their London, their Karlsbaad, their Ostend, their Heligoland, their Rome, their Florence, their Alps, their Tyrol, their Monte Carlo, the American people have turned their gaze from the lands across the seas and have concentrated it on their own shores. From a nation of curiosity seekers abroad, they have become a nation of domestic explorers, and the land which had remained hidden from them, because of its very proximity, to their surprise has opened before them like a treasure cave, revealing new beauties, new splendors, new opportunities, new paths of adventure, of which they little knew, or seemingly cared to know.

The reports of the great 42-centimeter guns on the battlefields abroad have been as a thundering "Open Sesame" to these modern American Ali Babas in search of excitement. From the art and culture of Europe they have turned to the natural beauties of their own country—and in them have found a rich reward.

From Maine to California, from the pine clad forests of the Northern Peninsula to the tropics of torrid Texas, they have found the fulfillment of the prophesy that sent the medieval adventurers forth from the ports of the Old World. America, the Promised Land, the dream of Europe four centuries ago, in its twentieth century reality, has been revealed to them as a land of even greater promise.

During the last three or four months there has been more touring over the highways of the United States than ever before in its history. The great rush to the West in '49 fades into insignificance beside the westward flow of the summer of 1915.

The slogan of a few years ago—"See Amercia First"—has been changed to "See America Now" and the American people are promulgating the doctrine as a national policy.

Aided by the good roads campaigns, waged so assiduously in all parts of the country, the American tourist has found the open road a veritable boulevard. Distances which before loomed up forbiddingly, now skim unnoticed beneath the wheels of the motor car. Miles seem meters and the great American out-of-doors has become every man's front yard.

I have just returned from a trip by rail to the West, and as I glanced from the window of the passenger coach, wherever a highway paralleled the track, I saw happy, dust laden American automobilists—not by the dozens, not by the scores, but by the hundreds. The roads were alive with them, day and night, and there was not a one that did not fairly buzz with the drone of busy motors.

The American people have taken to the road.

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They are searching the very heart of the continent. And America, who, like a great bird, has been hovering with wings outstretched, beckoning for four centuries to a brood that always turned a deaf ear to her call, has received them at last, bestowing upon them rewards more glorious than Europe, the fascinating, ever could boast.

The great European war, though it is disintegrating the Eastern Hemisphere, is amalgamating America—it is Americanizing it. As we have often heard, it is an ill wind that blows nobody good. The wind that is bringing to our ears the sound of suffering from abroad, is carrying out to the world from America the call of a new nationalism—the patriotic anthem of a newly discovered America, played by the auto horn.

Though the European war precipitated the situation, there were some who sensed it some years ago. We felt that inevitably the American people must come to a greater recognition of their own land and its possibilities.

At that time the Cole Motor Car Company was about to produce a new model. We sent it out into the West—into the very heart of the Rockies to test it.

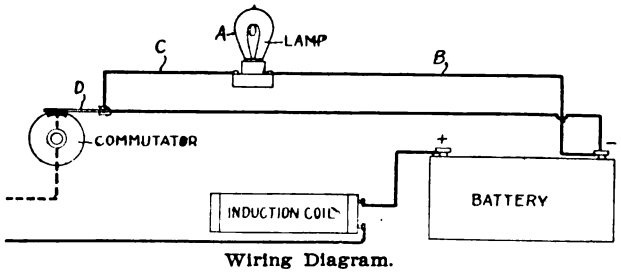
Our engineers accompanied it, and when they returned they knew first hand what demands would be made of a car that was to travel this continent through and through dependably.

As a result, when we produced our Cole Eight, which was built to master every sort of road condition, we were forearmed. Coming as it did at the beginning of the year that would see more touring in this country than ever before, it was adapted perfectly to the demands of the time, and its success everywhere we have attributed to the foresight of those men who urged us some years ago to go out and test our model in the heart of the continent, where America exacts her greatest toll from a motor car—where only absolute efficiency can endure.

And now that the American people have come to know their land and appreciate it, and the builder of motor cars knows how to build his mechanism to withstand every test that touring in this country can impose, we look forward to a continuation of the era of prosperity which the motor car industry is enjoying. Though stimulated by the war in Europe, it will be fostered and furthered by the Americans who now understand.

Wire Testing from Commutator to Battery.

The illustration shown is a simple method to find out if the wires are in perfect condition from the



Wiring Diagram.

commutator to the battery, by placing an ordinary lamp, A, in a porcelain socket, and running a wire B, to the post of the battery, the wire C, to the commutator brush D. If the circuit, and the wires, are in perfect condition the lamp will light. The lamp method has proven a satisfactory way for testing.

COMPRESSION.

A Few Points That May Be of Interest to Inquiring Car Owners.

Frequently readers ask how much compression their engine cylinders have, or how much they should have. In every instance of this kind, we are obliged to give what may seem to them an unsatisfactory answer. To estimate cylinder compression with anything more than an approximate figure is impossible, without the use of a compression meter, and if a car owner wants to know how much compression the manufacturer aims to give, he should write to him for the information.

Normal compression in any given design of motor would be the compression (cold) fixed by the designer by the relation of the sweep of the piston to the clearance space. Normal compression is not the same, as measured in pounds per square inch, in all motors. The normal compression as against loss of compression would be evident to a motorist in the act of cranking. Were the compression to become abnormal, as a result of carbon deposit, it would be rendered manifest by knocking on a hill, or by way of pre-ignition.

The cold compression can be found by means of a gauge reading to about 90 pounds per square inch. Screw the gauge into the threaded hole, normally used for the spark plug. Another way is to use a spring balance, hooked to the starting crank, and by a steady up pull, against the compression, the pull in pounds resultant of the compression may be noted.

Assuming that the design is good and that a motor is in good working order, the allowable compression depends upon several factors as follows:

If liquid gasoline is entrained, upon the latent heat of evaporation of the liquid, of which gasoline is composed considering its complex character. The specific heat of the mixture, which will differ as the composition changes, it being the case that all the contents entering into mixtures are not of the same specific heat. The extent of scavenging, and the heat of the spent products of combustion, in the absence of complete scavenging. The temperature of the water in the water-jacket, or the efficiency of the air-cooling process, if air is used direct for purposes of cooling. The design of the cylinders, and the extent to which the surfaces maintain an even temperature; if some one zone on the surfaces is at a high heat, pre-ignition will follow, it being the case that this heated zone will be at the bottom of the trouble, nor does it matter if the zone is of small area. This trouble is most likely in cylinders of relatively large bore, in which the piston is likely to heat up at the axis of the head, which is the greatest distance away from the cooling medium, and it generally is the part in which the heat conductivity is a minimum because the metal is coated with a crust, due to elevated temperature, and the metal in the head is thin in order to have the piston as light as possible.

If the valves are not properly water-jacketed they are likely to heat above the desired temperature, and pre-ignition will be due to such overheat.

In some cases to make the motor as short as possible the water-jacket is so designed that but little of the cooling liquid will circulate over the dome of the combustion chamber, which is just the part that

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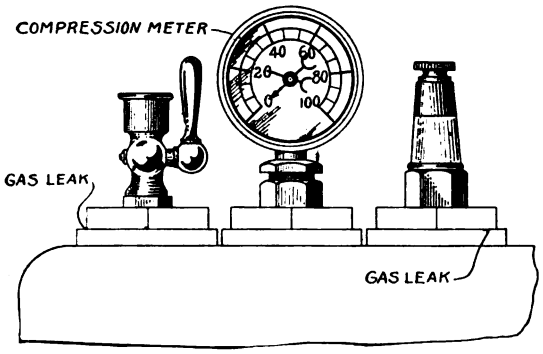
requires the greatest amount of cooling, and pre-ignition will be eminent in all such cases.

Fins, seams, protuberances, etc., due to defective designing or misplaced cores in the foundry process, will heat up and they will be the direct cause of pre-ignition.

If the water circulation is not good, or if the amount of water circulated is inadequate, pre-ignition will follow. In some cases the water is enabled to short-circuit across from the inlet to the outlet without passing over the hot surfaces, and this is a prolific cause of pre-ignition.

Increasing compression tends to increase the terminal pressure, thus allowing and engendering an increase in speed of the motor without pre-ignition because the conditions of scavenging improve as a result.

Running on a "retarded" spark results in over-



How a Compression Meter is Used.

heating, and pre-ignition is likely to follow if the other (remaining) conditions are favorable.

Running on a mixture that is too rich will cause excess heating, which is indicated by a steaming cooler, and pre-ignition is likely to be one of the manifestations.

Although the compression of the charge during the second stroke requires the abstraction of considerable power from the flywheel, the work done upon the charge in compressing it is more than returned, during the power stroke. It is therefore found that with a high degree of compression, a high fuel economy is obtained, and a large output is secured from a motor of relatively small size.

Much of the increased power for equal cylinder capacity is due to compression of the charge, because the most powerful explosion of gases takes place when the particles are in closest contact.

Another advantage of a high compression motor is that on account of the smaller clearance, less cooling water is required than with a low compression, as the temperature, and consequently the pressure, falls more rapidly. The loss of heat through the water-jacket is thus less in a high compression than in a low compression motor.

The difficulty about obtaining high compression is that if the pressure is too high, the charge is likely to ignite prematurely, as compression always results in increased temperature.

With gasoline vapor and air, the compression cannot be raised much above 85 pounds per square inch, but with the heavier fuels, such as kerosene, a compression as high as 200 pounds per square inch has been used economically. It has been the advantages of high compression that has turned the designer of automobiles toward the heavier fuels; but, with the increase of compression, there are many troubles in regard to loss of power and increased fuel consumption, owing to the wear of the valves, pistons and cylinders, which produces a loss in compression and explosive pressure, and a waste of fuel by leakage.

The compression in atmospheres of a motor may be found by dividing the cubic contents of the piston displacement by the cubic contents of the combustion chamber in cubic inches, and then adding one to the result.

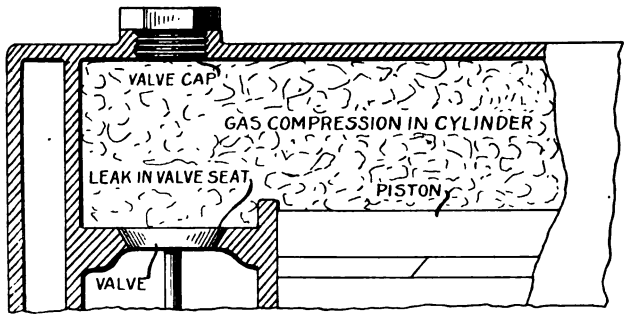
To ascertain the compression in atmospheres of a motor, when the cubic contents of the combustion chamber are known: Let S be the stroke of the piston in inches and A the area of the cylinder in square inches. If C be the contents of the combustion chamber in cubic inches and N the required compression in atmospheres, then

$$N = \frac{S \times A}{C} + 1$$

Example: Find the compression in atmospheres of a motor of 4-inch bore and 6-inch stroke, whose combustion chamber has a capacity of 18 cubic inches.

Answer: Six multiplied by 12.56 equals 75.36, which divided by 18 gives 4.19 and 4.19 plus 1 equals 5.19, or the compression in atmospheres required. One atmosphere equals 14.75.

If it is desired to ascertain the compression in atmospheres of a motor, the combustion chamber of which is of such shape that its dimensions cannot be accurately calculated, its cubic contents may be found by filling the combustion chamber with water, and after removing the water, ascertaining its weight in ounces, and then multiplying the result by 1.72. This gives the capacity of the combustion chamber in cubic inches. The compression of the



Where Compression Leaks May Exist.

motor can then be readily calculated from the formula given herewith.

To discover if there are any leaks in the compression of a gasoline motor, a small pressure gauge reading up to 75 pounds should be fitted into the spark plug opening in the combustion chamber by means of a reducing bushing. When turning the starting crank of a motor slowly the gauge should indicate at least 60 pounds per square inch if the compression is in good condition.

To test for leaks, fill a small oil can with soapy water and squirt round every joint where there may be a possible chance for leakage. Get an assistant to turn the crank and watch for bubbles at the joints.

If the joints are all tight, next examine the condition of the admission and exhaust-valves and if

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either of them needs regrinding, it should be done, first with fine emery powder and oil, then finished with tripoli and water.

When the valves have been ground to a perfect fit, if the compression still leaks, the piston rings should be examined, as the trouble will be found to be with them.



CONDUCTED BY M. KEITH DUNHAM, OXY-ACETYLENE ENGINEER, 50 CHURCH STREET, NEW YORK.

Readers are requested to state their questions clearly and fully, but as concisely as possible. It is hoped the information given will be of general interest as well as of value to each inquirer.

To Readers of This Column.

Questions need not necessarily be confined to how to use the oxy-acetylene apparatus. Owners or drivers are invited to make use of this department regarding practicability of welding or carbon burning. A proper understanding of these principles will often save considerable money and annoying delays. Subscribers who have equipments which they are unable to operate are invited to tell their troubles. Perhaps the thing which bothers you most may be very easily remedied by a simple suggestion.

Construction Dangers.

From E. H. Hanscom, Maine.—I would like to inquire a little about oxy-acetylene welding. I have a compound blow pipe that was used in an oxy-hydrogen stereopticon some years ago. I was not interested in welding then but it gave a very brilliant lime light with gases which I generated with my own outfit. What I wish to know is, can I not do welding by substituting acetylene for hydrogen and combining this right from the generator (without pressure) with the oxygen under pressure and how heavy welding could probably be done in this way with the oxygen under 200 or more pounds pressure from gas bag (as produced this lime light) and this acetylene from a small generator such as would feed a lamp? I think I read in some of your back numbers that acetylene was safer without pressure. The blow pipe I have has an aperture of about 1/16 inch. Would this be large enough to do light welding and brazing? By answering the above through your paper or otherwise, you will oblige a subscriber for five years.

Answer.—Yes, you can undoubtedly weld with such an apparatus as you describe. Just how long you will, however, depends on just how lucky you are—eventually your friends will decide just how natural you look. Your chances of continuing business, if you use such an equipment, are just about as good as if you stood in front of one of the 42 centimeter guns of the German army while it is in action.

I sincerely hope that everyone using a home-made apparatus or whose ingenuity leads him to attempt its construction will read this reply and digest it—remembering that I have no apparatus to sell and that my advice is disinterested in this regard. Unless you have a very complete understanding of the qualities of acetylene and oxygen, don't attempt to make an apparatus or you will be flirting with the undertaker.

Undoubtedly there are a large number of readers who have contemplated similar outfits. Quite a large number have undoubtedly constructed equipments along this general line, so that a detailed reply to Mr. Hanscom's question may result in considerably prolonging some lives.

The acetylene generator contemplated is one which is ordinarily used for lighting. Such a generator would probably deliver as much as five cubic feet per hour, yet the consumption of the welding torch would at times be several times this; therefore, it would be necessary for the generator to deliver largely in excess of the capacity. There is considerable heat created in the generation of acetylene. In a properly constructed welding generator, this is taken care of but in your case the temperature would keep rising to a point where acetylene becomes explosive and then, bang! and the next morning we would read of the dangers of acetylene.

The fact that such a gas is impure and very difficult to use to effect a weld is a secondary consideration.

Every generator for welding purposes, to effect safety, must be equipped with a water seal to prevent the return of the oxygen (or flame) into the generator. Check valves, muffler devices, springs, etc., are useless and the proper construction of a water seal is a matter of considerable knowledge. To use a generator without such a seal invites an explosion.

The oxgen generator you describe evidently is one using chlorate of potash and manganese dioxide which, when heated, give off oxygen. The present price of these chemicals is so high that your oxygen would cost four to five times as much as that which you can buy in cylinders and the latter, in addition, is considerably purer. This fact alone should discourage the generating of oxygen but here also is a danger element—the storing of oxygen under a pressure which is self generated.

The torch used for the oxy-hydrogen lime light certainly would be unsuitable to use with acetylene for several reasons. First, the weights of the two gases are very much different—therefore, your mixing chamber would be wrong. Second, you should understand that acetylene mixed with oxygen will burn backwards—against the flow—unless the mixed gases are traveling at a certain speed. Third, the construction of a welding torch to use acetylene under little pressure is one of very exact technical knowledge, demanding just the right size openings for each gas and having exactly the correct speed for the oxygen. (The latter feature would be impossible in your case, as you have no oxygen regulator.)

You are correct in your statement that acetylene is safer without pressure. To be exact, acetylene over 15 pounds begins to be dangerous—if it is in a free state. Dissolved, however, as it is in Commercial, Prestolite or Searchlight cylinders, it may be considered safe.

It would take a book of considerable size to properly show you the dangers you invite in the construction of such an apparatus. In this limited space practically all I can do is to point out the chief dangers.

Aside from the fact that life is precious and that a primary consideration always should be safety,

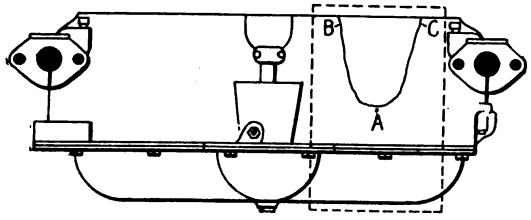
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a properly constructed oxy-acetylene apparatus is always cheaper to use. With it you secure the right results, build your business and make customers and friends. Without it, and with impure gases, the weld is brittle or weak, you lose your customer and your business suffers.

Aluminum Welding Difficulties.

From Frank Erxleben, Indiana.—1. How can I avoid hairline cracks in aluminum? 2.—Give the proper way to weld a crankshaft. 3.—Also the proper way to weld a break in an aluminum crank case (Chalmers) broken as sketched below. Where should the weld be started, at A or B? Should the crank case be preheated? What action on the weld when welded inside and outside? A job of this kind always will crack on one side or the other when pretty tight patch is fitted.

Reply.—1—Hairline cracks are caused by the metal at that point not being strong enough to withstand the strain set up by welding or by improper heating. In aluminum cases, these cracks are most common where the alloy contains a large percentage of zinc, which metal tends to make the casting brittle. An aluminum casting with a high percentage of this metal must be very carefully supported when being preheated to avoid any stresses, as a jar or shock when the casting is hot, will form these cracks. Particularly notice that the casting is



Broken Crank Case.

heated evenly—remembering that it takes more heat for one inch metal than it does for one-eighth. If the break is close to a heavy lug, boss or bearing, bear in mind that this heavier section will absorb heat, or conduct it too quickly from the thinner adjoining section, which would result in the thinner metal cracking, unless you have kept the heavier section hot with other heat than the welding torch—that is charcoal or a gas torch, charcoal preferred. Of course you understand that your welding rod should be approximately the same alloy as the case and that the casting should be shielded from draughts while being preheated, during welding and when cooling. 2.—See answer in this column in the August issue to the Garden City Garage, Florida. If this does not cover your case, be more explicit and state make and model of car and in your sketch show clearly where the break is. 3.—Read carefully article on Page 51 of the August issue to get a better understanding of expansion and contraction. Of course a break of this kind requires preheating and it is very natural that the case will break "either on one side or the other" if you don't do this, for contraction must take place and cold metal must occupy a smaller space than when hot. Weld the patch (tack it) at points A, B and C. If you understand aluminum well enough, it is not necessary that you back up or support the heated area; but if you have trouble in the metal collapsing or your flame breaks through the weld often, make a mould consisting of 2/3 asbestos fibre and 1/3 plaster paris, well dampened, and put this back of the weld, and for a considerable distance each side of it. Allow this to dry thoroughly. Now see that the case is in alignment—you can determine this by fitting the cover plate in this instance.

In a charcoal fire, with the case covered with asbestos paper to protect it from draughts, heat slowly and carefully that section shown by the dotted lines, being careful that any heavy section in this general area gets more heat than the thin sections. When the case gives off a dull sound when tapped lightly with a hammer, you are ready to start welding. Keep the case in the fire when welding and keep all portions of it covered with the asbestos paper, except that section which you are welding.

If there are no heavy sections adjoining the weld and the case is properly preheated, it makes no difference at which point you start welding. I believe you will find in this case, however, a heavy section near A, which is used as a bearing and also along the general line A to C. Weld this first, remembering that a good welder will always bond that section adjoining a heavy one first, which will allow the "pull" caused by the heavy section to take place without causing a contraction crack. (Because there are still some sections unwelded and these sections will open up instead of the weld cracking.) Always study each cast, with this idea in mind, leaving until the last the weld which will join equal thicknesses.

Admittedly, the weld made from both sides is the best looking and if you can keep your case evenly heated all the time you are welding both sides, this is undoubtedly the best. But unless you have a very good helper, it is very difficult to avoid setting up strains by inside welding and alone you can easily weld from one side and make an absolutely strong weld.

You will find that you will not be troubled with the case cracking if you follow out these suggestions. Cracks don't just happen—there's always a reason.

Lugs on Cylinder.

From J. R. Cruikshank, Michigan.—In welding the lugs on a cylinder, broken off close to the holes, how can I preheat the cylinder without warping it?

Reply.—In a break of this kind, no preheating is necessary. Grind off the break, and have the metal at the weld and each side of it thoroughly clean. Be careful in "tacking" the broken piece that it is in alignment. Weld without preheating. After finishing, you will find that the cylinder is slightly out of round at this point, due to the pull, caused by the cooling weld. By using a portable grinder or a file, finishing with emery cloth, you will be able to fit the piston without machine grinding. While the cylinder is not absolutely round at this point, there is no particular harm done as it is considerably below the piston rings and the compression of the cylinder is unaffected.

Gear Welding.

From A. D. McLeod, Ohio.—Would you advise welding in a broken tooth in a pinion gear? How can I finish it and will the welded tooth stand up?

Reply.—Certainly. If only one or two teeth are broken, finish with a file. For a welding rod, use

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one with a fairly high percentage of carbon—not the ordinary welding rod of Norway iron or mild steel. After welding and finishing, caseharden the entire gear in the usual way.

Welding Malleable Housings.

From Frank Erxleben, Indiana.—Please tell me in the October issue the best way to handle malleable housings, such as transmissions, rear differentials, an axle housings. 1.—When spelter wire is used it makes a job on the cracks, but when any strain such as body or springs or vibrations, even Tobin bronze does not seem to hold. 2.—What about some of the rods on the market called malleable rods? 3.—Will Norway iron with copper wire wrapped around it make a spring weld, or had it best be left alone entirely? 4.—Some welders say that a high heat puts malleable iron back to cast iron.

Reply.—1—Tobin bronze as a welding rod for malleable castings is by all means the best. Properly speaking this is a brazing job and not a welding one—therefore the casting should be hot enough for the bronze rod to flow readily, but not melting, as would be the case in a welding operation. I should not advise brass wire for several reasons too long to give here. Properly executed, malleable iron can be welded with Tobin bronze with the best of success. Your failure may be due to improper welding or a strain set up by welding, throwing the casting out of line and resulting in a break in use. Remember that while malleable iron is ductile and will not break easily, it certainly will warp unless you take the proper means to hold it in line.

Clean the break thoroughly, after grooving out the same as for any weld. Cleanliness in this case is even more important than in welding, as the bronze will not adhere to the iron if there are any foreign elements present. Preheat the casting if the break is such that there will be a strain set up by welding. Bring the break up to a bright red heat with the welding torch, without bringing the cone in direct contact with the iron, and be very careful that you do not melt any portion of the casting. Use plenty of flux and flow the welding rod into the break, without the cone of the welding flame touching it. Be sure the bronze really attaches itself smoothly—not in the form of a bubble. If the casting was poorly designed originally and was too weak for the purpose, you may reinforce it by laying wrought iron straps at right angles to the break and bonding these straps to the casting with Tobin bronze; but you will find this latter course I think wholly unnecessary if you properly execute your weld.

2.—Leave them alone.

3.—It will not. Some theorist originally advised this mixture for malleable iron. You can make a spring weld by using a welding rod of a slightly higher carbon content than the spring. The spring must be re-tempered, of course, after welding.

4.—If malleable iron is re-melted, it becomes a very hard, brittle iron—not the grey iron of castings you are familiar with. It is for this reason that you must be careful not to melt any portion of the malleable casting while you are brazing it.

Grinding aluminum is easily accomplished by using ordinary machine oil as a lubricant. It has no effect on the grinding wheel, which will last longer when grinding aluminum in this way than when grinding cast iron.

BATTERY TROUBLES.

Why Some of Them Occur and How to Guard Against Them.

Battery trouble as a rule is to be traced to want of attention on the part of the motorist, for, although it is undoubtedly true that defects do develop, a little attention and immediate action will usually serve to eliminate them. A golden rule is to observe the maker's instructions at all times and to avoid overloading the battery with accessories—electric horns and the like, for we may rest assured that no pains have been spared by the battery expert to ascertain the best running conditions for their productions.

Buckling of plates, sulphating, short circuits, broken and corroded terminals, leaky containing

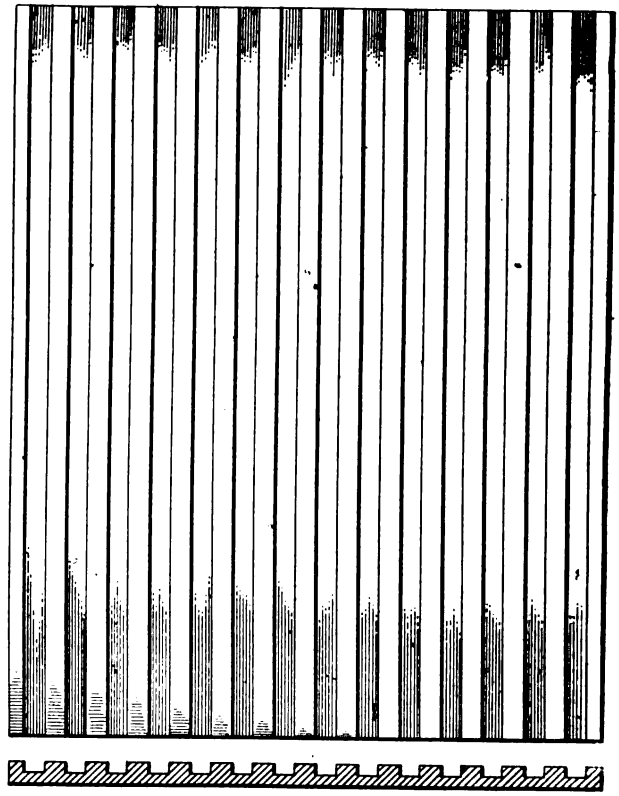


Fig. 1—An Exide non-acid wood plate-separator. On the bottom is an enlarged section.

boxes, and loss of charge are a few of the troubles that at one time or another may beset the battery user. The list sounds a fairly formidable one, but battery progress has been so rapid that, with the exception of sulphating, buckling, and occasional terminal troubles, all others are more or less absent from present-day batteries of repute. The three defects referred to, however, can usually be traced to ill-usage, and, since the best batteries are liable to be so attacked, some information on the subject seems necessary.

Buckling, or bulging, of the plates is almost unknown in well-managed installations. It may be caused by too rapid a discharge, while a very sudden large discharge will tend to drive the paste right out of the plates. Again, if too large a charging current is used for the area of the plates, buckling is very likely to ensue, and very rapidly, if the positives are in a bad state. Short-circuiting, due to plates touch-

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ing, is then established and paste lost, and the battery capacity seriously diminished.

Buckling is due to unequal expansion of the plates, and may occur under the best of circumstances if the makers have not given the plates the correct form, and, further, so designed them that the expansion and contraction of the paste on charge and discharge is provided for.

A starting battery works under abnormal conditions, exceedingly heavy and rapid discharges being demanded from it. Buckling and short circuits would then inevitably ensue if proper precautions were not taken to avoid it, and it is found necessary to separate the plates by continuous one-piece separators of the type illustrated in Figs. 1 and 2. The plates and separators are tightly packed together and form a semi-solid mass. The grooving of the separators permits free acid circulation and rapid escape of the gas generated, and, in conjunction with the porous ebonite diaphragm, prevents buckling and loss of paste.

Sulphating.

Sulphating is perhaps the most prolific source of accumulator trouble, and, together with local action, occurs chiefly during idle periods. On this account, then, all cells should be kept in regular service and as fully charged as possible, for it is found that the best results are to be obtained when the system has been so designed and constructed that the battery is normally kept well charged without excessive over-charging. Bad sulphating is indicated by the chocolate color of the positives turning whitish grey in patches all over the surface, or by a red scale appearing as mentioned previously. There should always be a marked difference in color between the positive and negative plates if the cell be in order, and, if not, immediate examination is necessary.

Bad sulphating results in the destruction of the cell, since the paste falls out; buckling and shorts may also take place, and the grids usually become rotten. The causes may in general be traced to the use of an incorrect acid solution, overcharge or too rapid discharge, or to the fact that the cells have been left standing idle when in a partially discharged condition. The cure for a partially sulphated cell is to subject it to a lengthy overcharge at a moderate rate. Such is only to be undertaken at a charging station, and, since the active plate area is much reduced by the sulphating, the charging current must be only a fraction, say one-third to a half of the normal rate. The process is a tedious one, but must not be hurried or the positives will be injured.

Very badly sulphated plates are covered with an inert skin of white lead sulphate, and it is usually cheaper to replace them than to attempt a cure.

A cure is sometimes effected by cleaning out the cell. After a good charge, the plates are removed and the white deposit scraped off the positives with a wire brush, the plates meanwhile being washed with electrolyte. That in the cell will suffice, and the plates may then be reassembled in new electrolyte and the batteries charged up.

It is important to note that, during the cleaning process, the negatives must be left in the acid, otherwise they will be injured by exposure to the air. Buckled plates may at the same time be restraightened by pressure between wooden blocks, but not under any circumstance by the aid of hammering or the paste will be removed.

Many methods have been proposed for the restoration of sulphated cells, and, while not advocating any in particular, one method is worthy of note. The damaged plates are charged at normal rate for a period of sixty hours while placed in a solution of pure sodium sulphate, made by dissolving 2 pounds of sulphate in one gallon of water. After this charge, the solution is replaced by acid electrolyte of the correct strength, and, after a preliminary charge and discharge, the cell is said to be ready for service once more.

To Avoid Sulphating.

The complete cure of a sulphated cell is always a doubtful matter, and, since sulphating may be avoided by the exercise of a little care, the following hints may be of service: Fully charge a battery that has to stand idle for any length of time, since local action and sulphating occurs chiefly during idle periods. To keep a battery in condition and ready for service, give it a freshening charge at least once every two months, and a thorough charge until all cells gas freely before placing it again in service.

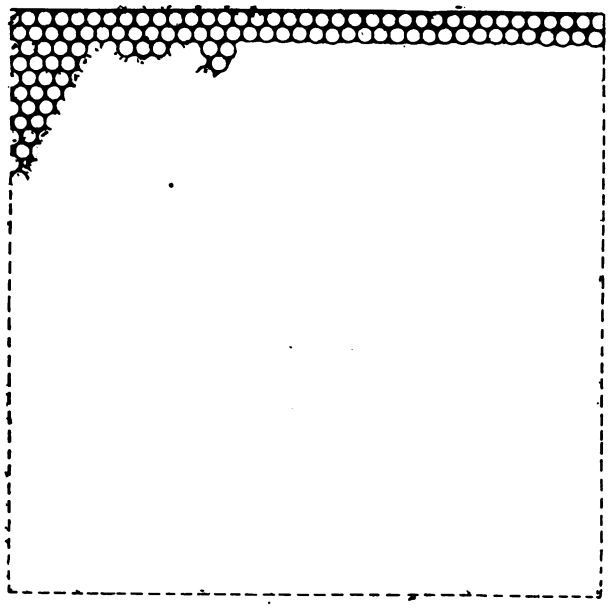


Fig. 2—A porous ebonite plate-separator, section only of pores being shown.

It should be possible to perform this operation at home, for the dynamo can always be used for charging purposes, the car engine running light for the purpose. If the cutting out speed is such, however, that it is necessary to race the engine, the batteries had better be put out of commission altogether for the time being, unless the local garage can undertake the charging or an apparatus is available. Never use a battery that has been standing idle for a considerable period without first giving it a thorough charge. During long idle periods disconnect all wires to avoid leakage through the car wiring. Avoid heavy working immediately on replacing the battery in service. To decommission, or lay up, a cell, syphon out the acid after a full charge, and then, after filling the cell with water, short circuit it to cause it to discharge. The cell may be left in the water for a day or two, and then the plates taken out and washed and well dried, and afterwards stored in a dry airy place.

The acid is drawn off first to preserve its density and to prevent the formation of lead sulphate on the plates. Small cells are frequently sent out with the

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plates formed but discharged, while some makers send the cells out filled with water.

Burns and Acid Stains.

It is always advisable to keep a bottle of ammonia handy when working with batteries, for the application of strong ammonia solution to clothing neutralizes the acid and prevents a hole from being burnt in the material.

Dilute ammonia, or, failing this, washing soda or lime water, must be applied to the hands, etc., if acid accidentally reach them, and, if a splash enter the eye, wash with water, warm if possible, and then use a drop or so of olive oil. If olive oil be not available immediately, use any oil that is handy—engine oil, for example, answers better than nothing.

SPARK COIL REPAIRS.

Broken Insulation and Loss by Rewinding—An Instrument for Ignition Testing.

BY JAMES F. HOBART, M. E.

When you get into trouble with a spark coil it is about as good a way to send the coil back to the factory where it was made and have repairs made there but occasionally there are times when repairs are needed "day before yesterday" and sending to the factory is out of the question unless another coil is substituted. And this is a very good way, too, but sometimes even that will not answer, and the "know-how" of making coil repairs becomes worth a good bit of money to the garage man.

Repairing an ordinary spark coil of the make and break variety is a pretty easy job for you can take the coil down and put it together again, winding and all, without much trouble. But when you attempt to repair a secondary winding of an induction, or jump coil, then your work is cut out for you and you will earn your wages if you succeed in making the needed repairs.

But keep one thing in mind: After the winding of a coil is removed and wound on again, the coil never will be as good as it was before unless new wire is used for the rewinding. The reason for this is: Each time a wire is coiled or uncoiled the bending back or forth hardens the wire, increases its resistance and correspondingly cuts down the efficiency of the coil. Were it possible to anneal the wire after it was unwound from a coil, the increase of resistance through bending would be prevented and the coil would be as good as ever, after the winding was put back again.

In "wipe" coils and in the primary winding of "jump" coils, there will be but little loss through winding and rewinding the wire, but in the secondary coil there is a good deal to be lost by bending the wire back and forth in the winding on and off. In some coils where the wire is used bare and separated by means other than by insulation wound upon the wire, then it is possible to anneal the wire after it has been removed from the spools, but, believe me, you will do well not to "monkey" with one of those secondary coils wherein the convolutions are separated by air space instead of insulation. Even if you could get the wire off in good condition you could hardly rewind the coil again so it would be of much use without the use of special machinery similar to that upon which the coil was originally wound. To be sure, if you have rigged up for secondary coil winding then you can do it as well as the maker provided you know how.

Usually the chief trouble with a "wipe" coil lies in the breaking off of the inner wire. It is often possible to dig into one end of a coil of this kind, bring out the broken wire, splice it and then return the wire to its proper place after repairing the insulation thereon. By lapping and soldering the No. 18 or No. 16 wire used in a spark coil it can be wound back by omitting one turn or a part of a turn and if you are too busy to mend the insulation by winding in thread until the bare place along the joint is covered, you can fix it very quickly by winding on a bit of paper string. As the string is wound on, give it just turning enough to untwist the paper strip so it will lie flat and thin on the wire, but it takes up lengthwise space on the splice very quickly. A rub with shellac after the paper has been wound on soon makes the wire ready to be wound back into the coil again. Be very careful in doing this that you do not break the insulation. Never use a metal tool in pushing the wire back into place in the coil. Use soft wood or a bit of celluloid or hard rubber and make very sure that nothing is torn or broken during the operation.

When you are given a jump spark coil to repair spend a little time in finding out the cause of the trouble before you begin to take the coil to pieces. If it is a mere break of the wire, either of the primary or the secondary winding, it will not be a very bad job to make repairs—unless you do other damage—but if the winding seems intact then look to the condenser before tearing up the coil.

The condenser consists of sheets of tinfoil separated by sheets of paraffined paper. The foil sheets are divided into two equal packs, each sheet an inch or so longer than the strips of paraffined paper between the foil sheets. Half the foil sheets project beyond one end of the paper strips and half the foil sheets project at the other end of the paper, alternate sheets projecting to right and left through the thickness of the condenser.

It is well before disturbing anything else, after you are sure the coil wires are intact, to disconnect the condenser, connect it temporary with another coil and see if the other coil works well with this condenser. If it does not there is probably trouble in the condenser. But if the new coil works well with the old condenser then just attach another condenser to the coil you have under repair and see whether that coil will work with the new condenser. If it does, and the new coil won't work with the old condenser, then you have pretty good evidence that something is wrong in the condenser and not in the coil.

Having made sure by several tests that the condenser is at fault, dig down into it and be very careful that you do not tear any of the strips of tinfoil. Use a dull knife or a bone letter opener for straightening up the pieces of foil where they have been clamped together outside the paper strips. Don't try to remove the foil until each strip has been gently worked loose from the paper.

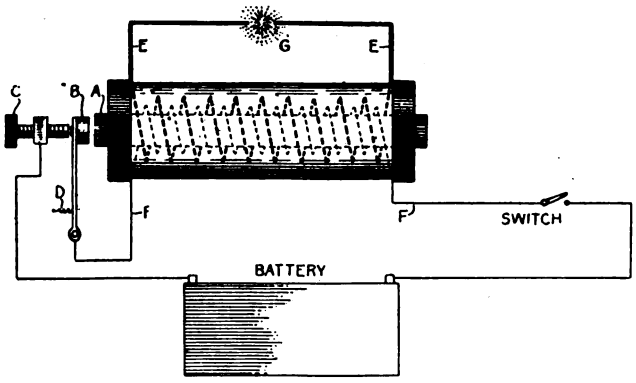
As soon as you get three or four of the strips of paper free, examine each one very closely. Hold it between your eye and the light and see if you can find any holes in it. Just the merest pinholes if there be any. If many of these holes are found then you have discovered the probable cause of the trouble with that condenser. It has been broken down—perforated—by internal discharges and instead of acting as a spring, so to speak, for the electric discharge at the instant the circuit is broken,

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the damaged condenser lets the electric discharge right through and instead of acting as a sort of shock absorber the faulty condenser is an actual by-pass for current and robs the coil of most of its power.

Sometimes the trouble may be cured by coating the slips of paper with another coat of paraffin. Dip each strip of paper separately into melted paraffin and then hang to dry or cool, in a warm place, heated enough to make sure that the superfluous paraffin drains off before it freezes. The paper will be of little use if it is lumpy with paraffin. It is a tedious job to recoat condenser paper in this manner. The paper when originally coated was in large sheets and the labor of coating was therefore much less. But with patience it can be done, each sheet being hung up to drain and dry by means of a pin thrust through one corner and suspended from the pin, in the oven or dryer, in such a manner that the paper strip can touch absolutely nothing save the pin which supports it.

It probably will be cheaper to procure new strips of paper and to discard the old ones. But if you do this, do not lay hands upon the first paper you get hold of. The paper for condensers must have been tested out for conductivity. Some kinds of paper don't insulate much better than thin strips of German silver, so great is the difference in the resistance of various kinds of paper. In fact, paper varies in resistance nearly as much as slate, and that substance should never be taken for switchboard use until it has first been thoroughly tested out and found to be of high resistance. And same with the paper.



Sectional View of a Jump Spark Coil.

Every condenser, when stacked up, with the pieces of paper between the sheets of foil, should be tested for resistance before the condenser is closed up and finished. Sometimes the pressing of the parts together breaks down the insulation and instead of there being thousands of ohms resistance between the terminals of the condenser there may be a short circuit or a very low resistance which breaks down under tension when the condenser is operated.

It is well to first test a condenser for ohmic resistance before taking it down for examination and repair as above noted. The use of the Wheatstone Bridge upon condensers and many other pieces of electric apparatus will often save a good deal of work and search in the wrong direction. Wheatstone Bridges are rather costly instruments and not every automobile repairman feels that he could afford one, but you can make one and the writer has one which he built several years ago and it has been in use since without requiring a moment's repair or adjustment. The writer has complete working drawings and instructions for building a good Wheatstone Bridge and if you desire you can arrange through the editor for the use of the drawings and instructions.

A good Wheatstone Bridge, applied to electric circuits about automobiles, often enables obscure but vexatious leaks and short circuits to be located and corrected with very little trouble. These instruments are invaluable for testing coils, wiring and suspicious spark plugs, etc.

Ten to one that with the terminals of the coil all right, and the condenser in good working condition, the jump spark coil will be found to work well. But if it does not and does not give as good a spark as it should, then there is a strong possibility that the insulation has been broken down between some of the coils and that the spark, or a portion of it, jumps across there instead of continuing as current through all the winding. When this happens rewinding is about the only cure which you can be sure of.

The illustration shows a section view of a jump spark coil, also called an induction coil, high tension coil or secondary coil. It illustrates the primary and secondary winding on the core and the magnetic vibrator, also illustrating the flow of electricity from battery through the primary wire circuit. When the current flows from the battery through this primary wire wrapped around the core or bundle of iron wires, A, the bundle of iron wires become magnetized and draw the vibrator, B, away from its connection with screw, C. The moment this vibrator is drawn away from the screw, C, the circuit is broken and the bundle of wires, A, loses its magnetism, therefore the vibrator, B, is drawn back to screw, C, again by spring, D, but the moment the contact is made again, A again becomes magnetized and again draws the vibrator, B. This is repeated so fast the vibrator, B, simply buzzes. B is a secondary wire wrapped around the primary wire, F. The greater the buzz the greater the spark and more current consumed.

When this vibration takes place the current is induced into the secondary wires, E, by "induction," and this induced current is intensified, that is, the pressure is raised to such a high voltage it will jump the space at the point of the spark plug, as at G.

Tight Tire Valve Caps.

When a very slight leak is present in a tire one instinctively suspects the valve, and is disposed to screw the valve plug and its cap hard up with pliers. Eventually, on the road, when the tire has to be pumped, it is not easy to remove the cap if the pliers have been left at home. The cap can in most cases be removed with the help of a piece of string or a boot lace. The end of the string should be unravelled and slightly moistened. It is then rolled tightly round the cap in the direction the latter is to turn until it forms a hard ball two or three times as large as the cap. The extra leverage thus obtained will usually enable the fingers to start the cap moving, as the ball of string is much softer to the fingers and easier to grip. The roughening on the cap effectually prevents the string from turning on it.

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Laying Up a Car for Winter.

From G. E. Greenleaf, New Jersey.—Although the majority of automobilists continue to use their car throughout the year, in some localities the rigorous climate renders it necessary to lay up the car for a couple of months or more. This is not necessary for the most part in cars used under urban conditions, but to users who live in the country, a period of "jacking up" is unavoidable. If the owner is fortunate enough to possess a heated garage, the difficulty is not a matter of moment. For motors housed under these favorable conditions will be in no way disturbed by the advent of cold weather. During a stretch of unfavorable conditions, the car may be jacked up so as to relieve the tires from weight and a cover thrown over the whole machine.

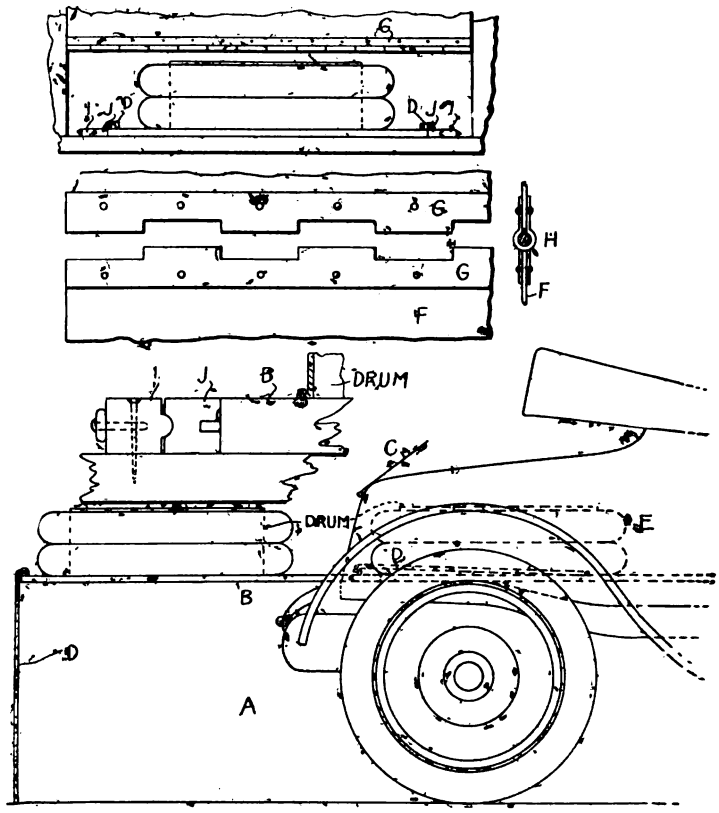
To the motorist who has no heated garage and who does not care to incur the expense of storage, the problem is a more laborious one. The most important precaution to be taken is that of drawing off all water from the cooling system. After all this has apparently flowed out as much as possible, rock the car to force any remaining within the cylinders outside. After doing this it is a good plan to pour about a quart of denatured alcohol into the radiator and leave it there while the car is in storage. In order to remove all possible danger from fire, drain off all gasoline by the petcock in the gasoline tank and plug in the bottom of the carburetor float chamber. This will wash out the sediment collected in the gasoline system and leave it clean for the next supply. Inject about a pint of kerosene in each cylinder and turn the motor over with ignition off so as to thoroughly work it into the moving parts.

This treatment will tend to clean out carbon deposits.

Remove all oil from the motor crank case, differential and transmission, but do not rinse any of these with kerosene as the oil left on the metal will effectually prevent rust. In order to relieve the tires of all strain during their period of inactivity, the wheels should be jacked clear of the floor, the air pressure in each tire reduced to 10 lb. or so, and they should be washed with soap and water and carefully dried. It is important that the whole car be thoroughly washed before the storage period, for if any mud be allowed to remain it will stain the varnish. All bright parts of the car including the control levers ought to be given a complete coating of vaseline which will prevent tarnishing. When all has been completed a cotton cover or enamel cloth should be thrown over the machine and the owner may rest assured that deterioration will be very slight.

A Compartment for Tire Shoes.

From E. G. B., New York.—Spare tire shoes should have protection from deteriorating effects of the sunlight, rain and all weather conditions. The suggestion shown in the illustration will meet this requirement. It can be constructed at a low cost and applied to most every roadster of any make that has not a rear hinged door. By referring to the large view, A, this will show the convenience and operation of the tray, B, is pulled outward as shown in full lines, and the legs, or supports, D, at the end hold the tray as shown. The shoes are easily removed, or replaced, as they fit around a drum, which also keeps the shoes in place. Other articles can be placed in the drum, which is provided with a cover. When the door is closed the tray is entirely hidden in the rear of the car, as shown by the dotted lines, E. In the construction the writer has provided a tray large enough to carry a 32 or 36 inch shoe. In order to place this construction on your car, cut an opening in the rear of the car body, about 3 feet 8 inches by 12 inches. The piece of metal, F, cut out is used for the door and is riveted to a hinge, G. An end view of the hinge is shown at H. There are two beaded strips, I, which are screwed to the floor boards in the rear of the car, and are 1½ by 1½ inches by 3 feet 9 inches. The tray is made from two pieces of boards each 1½ by 18 inches by 3 feet 9 inches, glued together. On the outer edges of the tray are two



For Spare Tires.

strips, J, ½ by ½ by 3 feet 9 inches, glued to the edge of the tray, which are grooved out to fit the bead on the strips, I. A catch can be provided at the end of the tray to prevent it pulling all the way out. When pushing the tray back into place, all that is necessary is to grasp the sides of the tray and at the same time swing the legs, D, up, and they will rest on top of the tray near the edge, and the tray slides easily into place.

Protection for Rubber Mats.

Most of the wear on rubber mats comes at certain points, particularly where the driver's heels bear, just below the pedals. Some drivers who like to maintain the good appearance of their cars cover these parts with a piece of thick leather or aluminium matting. In the case of the near side running board, all the wear comes at two points (one in a two-seater), and when these begin to show signs of long usage it is worth while fitting a cocoanut step mat over these parts.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1688 **Valve Grinding.**

From A. J. Morel, Rhode Island.—I have an Overland model 79, 1914 car which has run about 8,000 miles, and I have not had serious trouble, but I will ask you a few questions. I have had the valves ground twice, and also the carbon burned out by oxy-gas process both times, and by a man in whom I have full confidence, but as I would like to grind and adjust the valves and tappets myself I would ask you the correct way, as plain as you possibly can tell me, why for instance, very shortly after having the valves ground, I find that there is poor compression in two of the cylinders? 2—The right wheel on my car seems to throw out grease, in spite of what I have done so far. Upon telling the garage man about the same, he told me to take out some grease from the differential, because I had too much. I thought there was a washer to hold grease, but he claims not. Can you advise me on this? 3—As my car has a grooved set of pulleys for the fan belt, I have been using those riveted piece belts, but as they are expensive, having a patent on same, can you inform me if I could not use different belts, and how and where could I obtain same? 4—My car is not equipped with a generator, although it has electric lighting system with Willard storage battery. I obtained a rectifier and it worked pretty well for a while, but now it does not seem to buzz as usual when charging, and I don't think it charges the battery right. Could you inform me if a small generator to keep the batteries charged would be practical and would it be a very expensive thing to do? Remember, I have no starter, but just keep the battery charged for lighting.

Reply.—1—It is a fact well known to those who really know, that the operation of grinding the valves involves a relatively higher skill than very many motorists realize. It is not unusual to find some one advising the use of a breast drill brace to rotate the valve on its seat. It is not unusual to see skilled mechanics who should know better use a drill brace and rotate the valve several times before lifting it to get some of the abrasive material between the valve face and valve seat. As a matter of fact such methods wear ridges which it is absolutely impossible to grind out, and which have to be pounded out by explosions during the running of the engine following imperfect valve grinding. If this operation is properly done the compression in every cylinder should be better—not worse. If there is a slot in the valve to take a screwdriver, nothing is better than a good heavy one for the purpose. For grinding use a very fine grinding paste, flour of emery, or the dirt which accumulates under a grindstone. Soap, oil or grease may be used to hold it upon the surfaces to be ground. After smearing these surfaces grasp the screwdriver firmly in the right hand (if right-handed) and the lower end of the valve stem in the other. Lift both screwdriver and valve an inch or two and bring them smartly down against the seat, give a twisting motion back and forth once, lift and repeat. This will avoid the formation of scores and ridges and is the surest and quickest method of grinding the valves. Care should be observed that none of the grinding material gets into the inlet valve chests or into the valve stem guides. A very small amount of abrasive material will be needed. When the valve seat and valve surface are dull all over evenly, the job will have been completed properly. 2—Your garage man advised you correctly. 3—The belts you are using are the best to be obtained for the purpose and considered by wise motorists to be well worth the price. 4—Many cars have been equipped with battery charging generators, usually driven by friction contact with the engine flywheel. To prevent discharging the battery through the generator windings a magnetic relay is absolutely necessary, for were the engine to be stopped without opening the charging circuit you would ruin not only the battery but the generator.

1689 **Oil and Smoke.**

From S. W. F., Pennsylvania.—I drive a model F, 1914 Ford, and am having trouble with oil and smoking. 1—The motor and inside of the hood are badly smeared with oil. It appears to be thrown by the fan or belt. Can you tell me where it escapes? 2—After floating down a hill and throwing on the switch it smokes very badly, perhaps for a half a mile or more. In fact it smokes more all the time than it should. I have put Perfection piston rings in pistons No. 1, 2 and 3 in one groove each. Plugs 1, 2 and 3 appear oily. I have used both light and medium oils but it don't make any difference.

Reply.—1—Probably through the front crankshaft bearing. 2—You may have overheated the engine and scored the cylinders and piston rings. This would cause excessive smoking as would an improperly adjusted or defective carburetor. The fact that the plugs in three of the cylinders accumulate oil would seem to indicate scored cylinders, which no type of piston ring would cure. Ford cars should not use light oil. Use medium or heavy.

1690 **Needs Overhauling.**

From A. A. Durham, Illinois.—I am having trouble with a Maxwell 2-3, 1910 model. The engine runs well enough when not pulling but when changing gear will miss two or three cylinders at a time and causes the car to jump. There is a continuous spark between the breaker box and the spark control lever when the engine is running fast. Should this occur, if not what is the cause of same and how would you remedy it?

Reply.—With a car running five or six years almost anything is liable to happen. Looks as if it needed a general overhauling and renewal of worn parts that would probably cost more than the outfit

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would be worth. Probably the valve stems and bushings are so badly worn that the cylinders fill with air when you close the throttle to change gear. No continuous spark should appear, such as you describe. The magneto should be returned to the maker for overhaul and repairs.

1691 **Differential Types.**

From T. I. S., California.—1—After a heated argument with a friend, we decided to leave the question up to you as to whether all differential gears were of the same type. 2—And does the two wheels pull the same on a curve?

Reply.—1—Nearly all automobile differentials are of the bevel gear type, although some are of spur gear design. At least one differential is on the market which utilizes worm gear construction. Another operates without gears, a lever slidably mounted on a pin set at right angles to the axis of the axle serving to distribute the load evenly to the two half axles. 2—The maximum pull is the same to each wheel, with the exception of the friction in the differential itself. This frictional resistance may be little or much, depending upon its construction and condition of wear.

1692 **Magneto Trouble.**

From Walter A. Burns, Nebraska.—I have a Ford touring car, 1914 model, which has never caused me any trouble until a few days ago it suddenly stopped and would not start. I installed batteries and it started nicely and runs as well as it ever did, but when I switch to the magneto it does not run smoothly, and misses all the time. The trouble must be in the magneto, but I can't conceive just what the trouble is. The car has run a little over 3,000 miles and the magneto has been used for ignition purposes only, and therefore I don't think it is weak. I will be pleased to see a solution of the problem.

Reply.—If you will remove the small brush at the top of the magneto and clean the small hairy-like carbonized fibers from it you will probably have found and remedied the trouble. A peculiar thing about magnetos is that if used continuously they will last longer than if only used occasionally. We do not believe that Ford magnetos can be injured by using them for lighting as well as for ignition.

1693 **Descending a Hill.**

From S. D. Evans, Oregon.—1—Will it damage the motor, when going down a long, steep grade, to throw it in low gear, throw off the spark and assist brakes by the compression? I know it is all right to do it in high gear, but have been told it injures the motor if done on low gear and run the motor at a high rate of speed. 2—I have a 1914 Reo that I have driven about 6,000 miles. Recently I have had much trouble with water boiling on any little hill. I formerly had no trouble. A man with the same kind of car told me he had the same trouble, and found the slotted coupling between the motor and the generator worn and this allowed the spark to "lag." Mine has a play of about ⅛ inch. Is that enough to cause trouble, and do you think that the cause of the trouble? 3—Why does the motor lose power when the water boils?

Reply.—1—Probably not, unless you are foolish enough to run down hill at an excessively high speed. 2—Late spark causes excessive fuel consumption, and this in turn generating more heat in the cylinder the circulating water collects more heat than the cellular construction of the radiator will radiate to the atmosphere. Taking up more heat than it will give off means eventually boiling. One-eighth inch play is a whole lot. 3—Usually because the motor is so hot that the entering charge of gas and air is expanded, thus reducing the quantity of explosive mixture in each charge. If the motor is too cold the combustion is too slow, and if too hot too rapid, this being another bad feature, causing premature ignition at low and intermediate speeds unless the spark is considerably retarded, with loss of power as a result.

1694 **Storage Battery Ignition.**

From F. J. G., Washington.—In your answer to Geo. K. Weller—No. 1662—in the August number, you make the following statement: "One cannot start and furnish current for ignition from the same storage battery." This seems to be at variance with my experience. My friends have Apperson, 4-45 cars. One has a National magneto, low tension and coil. The other has changed to the Bosch dual system. Neither car had dry cells. Both are equipped with Gray & Davis lighting and starting system, Willard battery. The car with the National magneto and coil starts hard unless the switch is placed on the battery side. The other car is easy on either side, except in cold weather when it is easy on the battery. Both cars draw their ignition from the same battery that runs the starter. This I think is proved by the ammeter showing no deflection when the car is started with the switch on the magneto side, but 5 amperes if started when the switch is on the battery side. If I am in error I would like to know but we certainly use no dry cells.

Reply.—Both National low tension and Bosch dual ignition systems use separate ignition batteries of three cells. The current from the ignition battery is not used to operate the starter, there being in reality two batteries of accumulators, or dry cells, although all the cell containers may be in the same group, one three-cell container being wired to the battery side of the switch, and the others forming a battery for starting. As ordinarily looked upon by motorists, an ignition storage battery consists of three cells wired in series, these three cells of battery being in a container. If there were, say, eight of these containers, they could be wired in anywhere from one to eight or more separate circuits—one to eight or more batteries in fact—for all the eight containers may be in a single compartment in the car. These eight three-cell containers may be so wired, be there from one to eight circuits, that the generator will charge them all when up to speed, this method of wiring for charging being known as multiple parallel-series, in this case eight in parallel of three in series. The ammeter is placed in the ignition circuit and not in the starting circuit, as evidenced by the fact that it shows zero when drawing current for starting and 5 amperes when using current for ignition.

1695 **Driving Cramps.**

From Harvey E. Harris, Connecticut.—In the July number, on page 69, Mr. H. S. Scott writes, asking about chauffeurs' cramp. At this writing both

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calves of my limbs are so sore I can scarcely stand on them. Does not seem to bother me any while driving, but when I go to bed it is then that the cramps start. Sometimes when driving any great distance there seems to be a slight cramp of the thigh, which I have always thought was caused by sitting in a fixed position. I purchased a rubber cushion of the pneumatic kind and think it relieves me somewhat of the cramp. Have heard of no accidents caused by cramp while driving.

Reply.—Cramps of the kind referred to are undoubtedly caused by sitting for some time in a confined position. The tendency is more liable to ensue in the case of an automobile than in driving a horse-drawn vehicle because of the necessity of keeping the body and limbs in practically one position, and also owing to the necessity of keeping the mind as well as the body fixed upon the work in hand. Fortunately, cramps while driving a car or after having driven one are not dangerous; they are merely unpleasant, and they are caused by lack of blood circulation, which may be more frequent when one has caught cold.

1696 **Gets a Shock.**

From Patoka Garage, Illinois.—Can you tell me what is the trouble with a Maxwell car, model 1911, Splitdorf low tension magneto system, old model Kingston carburetor? The magneto and coil were repaired at the factory. We get a good spark, but when touching the coil switch, while running, we get a shock both from the battery side and magneto side. We have changed the wiring with no results. The motor misses and runs better on the battery than on the magneto. I think the missing is the fault of the carburetor, but I cannot account for the shock received from the coil switch while running. Kindly advise me what the trouble is, if possible.

Reply.—With a car five years old one should not expect results possible with one of later design, even if it has not been run at all. The switch is undoubtedly defective. It may be a leak of high tension or secondary current, as it probably is, and is possibly due to an imperfect ground connection. The secondary circuit uses a part of the primary wiring to complete it, and if this metallic circuit is imperfect the resistance of the spark gap at the plugs will cause it to leak this induced current of high voltage and low amperage. You should equip the motor with a more modern carburetor, one with sufficient capacity to supply double opposed motors. As a matter of fact the old model D Scheblers and the early Kingstons give fully as good results with double-opposed motors as some later designs and types of carburetors.

1697 **Uses Too Much Oil.**

From Coy P. Smith, Texas.—I am making inquiry as to the Maxwell, model 35-4, 1913 car. This car has Splitdorf ignition, and Stromberg carburetor. The trouble is that it uses too much oil. A half gallon will not run more than 30 or 40 miles. Everything is in first class shape, piston rings, valves and everything, but still it uses too much oil. The grade of oil does not have anything to do with it at all. I have tried everything I know of, and would appreciate any help you might give me, or any suggestions. Probably some owner of a Maxwell 35-4 could suggest something. Anything that will help will be appreciated.

Reply.—As a remedy for excessive oil consumption our suggestion would be newly fitted pistons and rings, and probably reground cylinders, as we believe no other cure will be found efficient. Loosely fitting pistons, badly worn piston rings and scored cylinders may be looked upon either separately or combined, as the cause in approximately 90 per cent. of such cases. Manufacturers and repair shops equipped to do such work usually charge $10 per cylinder. This of course does not include disassembling and reassembling the engine.

1698 **Magneto Fails on Slow Speed.**

From Merritt B. Harmon, South Dakota.—I want your advice on a Ford car that I have here and cannot fix. The magneto on this car will run the engine slow, but when we speed the engine up it cracks like a cannon. If we switch over to four dry cells it runs fine. I have taken the engine apart twice, and found that the flywheel magnets rubbed on the coils. I put a piece of pasteboard under the flywheel to hold it away from the coils and then it cleared about the thickness of a blotter or a table knife. It will light 6 volt 6 candlepower lamps, but they are not bright as they should be. Please answer right away as I am anxious to get it fixed.

Reply.—Looks as if the magnets had worn through the insulation of the coils by rubbing against them. It may be that the magnets of the magneto are partially demagnetized. You have not the voltage that you should have, as evidenced by the dull lamps.

1699 **Ten Questions.**

From W. T. K., Connecticut.—1—I would like to know if the spark coil takes ½ ampere, how can I ascertain whether it is giving full result? 2—Does a voltmeter indicate this and what should be the voltage? 3—How can one ascertain the power of a Ford magneto? 4—Supposing a Ford car is making 10 miles or 15 miles per hour on dry cells, will a voltmeter tell whether it is up to standard, and if so what should be the voltage? 5—In working around the coil connecting with the dry cells (4) the man who put it on grounded the 4 dry cells through the magneto. Would this injure the magneto? 6—If a Ford car is running on dry cells, what becomes of the electric energy that is being developed or is there none? 7—Will you explain this matter? 8—I have one of those electric heating coils placed on the gasket of the manifold and carburetor. It runs to take about 4 amperes when ammeter is connected up with it. Is this as it should be? I have not been able to discover any great results as regarding easier starting. 9—With a master vibrator, should not all the coils show the same results? 10—If spark plug points are only 1/64 of an inch apart, what are the advantages or disadvantages over 1/32?

Reply.—1—On a dead short circuit it should take more than ½ ampere. We are wondering how you were able to accurately measure the amperage of the ignition current when using vibrating coils. 2—A voltmeter measures the voltage only. Might just as well try to measure the volume of a quantity of gasoline by means of a gravity gauge, as to attempt to measure voltage by an ammeter, or amperage by

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a voltmeter. 3—By trying it out on a bank of lamps, using the battery for ignition, would be one way. But what would be the use of such a procedure, providing of course you were prepared to install new magnets, coils, etc. 4—You could connect a voltmeter across the two leads and short-circuit the magneto. We advise you not to do it. The Ford magneto generates about 12 volts ordinarily. 5—A crazy thing to do. It might not injure the magnets or coils. It certainly could not do either any good. 6—None generated unless the circuit is short-circuited. 7—Metallic circuit must be at least partially completed, as through the filament of a lamp, before current will flow. 8—We were never sufficiently interested in the device to make any investigations or experiments. We are not surprised at results obtained. 9—If coils are in proper condition and of same strength and construction—not short-circuited—yes. 10—One-sixty-fourth may be so close that carbon will accumulate and short-circuit, or the gap may be so wide that the spark will not jump it. One-one-hundredth of an inch is the thickness some magneto manufacturers advise. A thin dime is frequently used for a gauge. Battery ignition, for best results, takes a slightly wider gap than magneto.

1700 **Re-Boring Cylinders.**

From Frank Erxleben, Indiana.—1—In reboring cylinders, which is the most economical and also quickest way? Of course, there are no pistons of the same size and you have to turn out from an average 2½ to 5 inches. 2—Is there a collapsible core box on the market for the different sizes?

Reply.—1—The very best way is to have them reground in a cylinder grinding machine, such as the Heald. In this case it is necessary to take out a minimum amount of material and stock piston castings, or those sent out for repair or replacement, have sufficient metal to make a proper fit for the slightly enlarged bore. 2—Never heard of any such core box and do not see how such a device could be made of any practical use.

1701 **Car Stops.**

From Louis Benson, Michigan.—I have had considerable trouble with my car for some time. It is a Patterson, Model G, 1911. I have had trouble with my engine. I sent my carburetor away and had it all rebuilt but it did no good. When the engine starts it will only run for a short time and then stops, and when it stops it seems to throw the gasoline out through the carburetor. Now I have sent my magneto and spark coil away thinking that the trouble may be there. When I test my plugs with a screwdriver, Nos. 1 and 2 plugs seem to fire all right and the engine will slow down, but when Nos. 3 and 4 are tested in the same manner, the engine will not slow down. I think the trouble may be in the valves, and I wish you would give me an idea how to time the valves.

Reply.—If the carburetor is the one which was used when the car was new you cannot expect it to operate satisfactorily with the present heavy and hard-to-vaporize gasoline. The throwing of gasoline through the carburetor indicates too lean a mixture—too small a proportion of gasoline vapor to the air. You probably have the Nos. 3 and 4 cylinders wired improperly. It is possible that you have not the correct firing sequence, which is probably 1-2-4-3 or possibly 1-3-4-2, although the Nos. 1 and 2 cylinders are probably wired correctly. As to the timing of the valves those in Nos. 1 and 4 cylinders should open and close at just the same relative position of the flywheel, while Nos. 2 and 3 should both open and close alike, and exactly one-half revolution ahead or back of Nos. 1 and 4.

1702 **Misses on High.**

From T. A. H., Iowa.—We have trouble with our car missing fire. It is an Apperson four 1912 or 1913 model with Rayfield carburetor. It fires well on low speed, but when pulling hard, or when shifting from high to intermediate, it will begin to miss badly. Raising the choker a little helps it some till it is well heated when it must again be closed. We are using Standard gasoline. Higher grade seems to help it some, but does not remove all of the trouble. We think the ignition system is working quite well. What can be done to improve the working of the car?

Reply.—It is rather unusual for a motor to fire regularly on low engine speed and give trouble on high engine speed. From the wording of your query we are not just sure whether you refer to low car or low engine speed. It is further confusing to us to read that it misses when pulling hard, etc. From which you should observe that it is frequently hard to answer inquiries which tell us what we want to and should know, and unsatisfactory to all concerned when the inquiry itself is not clear. Broadly, however, we have to say that you will have to install a carburetor of more modern design before you can hope to have the engine fire regularly at the usual running engine speeds. You probably will have to re-bush the inlet valve stem guides to prevent leak of air into the mixture at low engine speed. Other than this we are not able to give you any further information.

1703 **An Offensive Noise.**

From a Reader, California.—I have a 1913, 25, Studebaker car. The car has never given me any trouble. A short time ago a peculiar noise developed in the motor. It sounds like the vibration of a sheet of tin when you shake it. The noise is sometimes louder at times than others. I have had all connecting rods taken up, new piston pins put in, and also new push rods and bushings. Still I didn't get rid of the noise. I have been told that it is a piston slap and the sound is very similar to the slapping of the hands together. The noise comes from the inside of the motor. Can you suggest any remedy for the difficulty? In fact, what is a piston slap, and what remedy is there and what is the cause? The car runs like a top outside of this annoying noise.

Reply.—If the hole through a piston in which the piston, wrist or gudgeon pin goes, is not absolutely at right angle to the bore of the cylinder, the upper end of the connecting rod will alternately hit first one side of the piston and then the other. If the piston is very loose and has insufficient bearing above the wrist pin, it will flop around the cylinder. Either of the above conditions will cause what is known as a piston slap. A sure indication of the former is a bell-mouthed condition of the crank pin bearings—small at the center and larger at the ends. The remedy is new and more perfectly machined pistons to replace defectives.

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1704 **Magneto Trouble.**

From A. R. Tolhurst, Ohio.—1—I recently had a Ford car in for repairs that was very hard to start on the magneto, but when started would run fairly good until the lights were switched on, when it would almost stop. A magnometer test of the magneto showed a reading of very good, without the lights on, and very poor when the lights were drawing, although the lights burned brightly. Thinking that perhaps the magneto had drawn too far away from the coil assembly, I took the motor out and found that the magnets on the flywheel were rubbing against the coils instead of having a space between of 1/32 of an inch. I corrected this trouble and found that the magnets had plenty of magnetism, rang out the coil assembly, using two No. 6 dry cells, connected in series, with a door bell, and coils apparently were all right. After putting the engine together, and making sure that the spark plugs and wiring and spark coils were all right; carburetor in good condition; valves ground in and carbon removed; entire commutator and wires new, the car still gave trouble about starting on the magneto. I connected up the dry cells and tried both close and wide adjustment of spark coils but with no better results, and the engine still would not run good when the lights were switched on. The best results were obtained with the spark lever about halfway of quadrant, advancing or retarding from this position causing the engine to fire very irregularly, but not confined to any particular cylinder. I set the gaps of the spark plugs closer together and tried every expedient known to me, but am at a loss to locate the trouble. 2—Was my system of ringing out the coil assembly with dry cells and door bell correct? 3—If a coil was defective, insulation burned through or short-circuited in any manner, would the bell have rung when connecting wires were held to opposite sides of coil connections? 4—What, in your opinion, is the best, simple and most practical way of testing out the Ford coil assembly to find defective coils?

Reply.—1—It is probable that you were using lamps of too high candlepower, the result being that there was insufficient current left for ignition. With the insulation rubbed through your coils may have been partially short-circuited. 2—Your method of ringing out the coils did not show you anything except that the wiring was not broken. 3—Yes, why not? 4—Try a set of coils from a car which you know is O. K. A galvanometer is the proper instrument, but expensive and usually not easily obtained.

1705 **Battery Repair Work.**

From G. A. Bernard, California.—1—Why short-circuit a shunt wound generator to prevent its burning out when the battery is removed from the system? 2—Does this hold good with a compound wound generator? I should say, shortcircuit its shunt field. Please explain in full. 3—Can you suggest a simple means of constructing a hydrogen generator and burner to be used for lead burning in battery repair work, or some other suitable means of effecting the same result on a small scale?

Reply.—1—Because, with the battery removed, all the current generated will pass through the shunt to the field coils. 2—A compound wound motor being a combination of series and shunt connection, the voltage would not run so high as it would with a shunt wound generator at high engine speed. 3—For lead burning hydrogen gas is generated by the reaction of sulphuric acid and zinc. If you have some means of controlling the submergence of the zinc in the acid, such as a water sealed gas holder with the zinc suspended from the top of the floating inverted part, it might do the trick. We do not advise that you do any great deal of experimenting with such a device unless you do it in the outer air, rather than within a building, for hydrogen gas with the correct amount of oxygen as in the air, is very explosive. For a burner you need a piece of brass with a small hole through it fastened into a small strong rubber tube.

1706 **Water in the Cylinder.**

From A. Neumann, Wisconsin.—The writer some months ago purchased an 18-foot launch, equipped with a 6 horsepower, two-cylinder Detroit engine, the boat being purchased from the Detroit Boat Co. These people have never furnished instructions covering the operation of the engine and I do not feel like asking them for any more. The trouble seems to be that the water gets into the lower cylinder somehow, short-circuiting the spark plug every little while. I am using Reliance spark plugs, but even these seem to short-circuit. From this meager description can you advise what the possible trouble is?

Reply.—Water probably leaks into the cylinder through a sand hole in the cylinder casting which permits water from the water jacket to seep into the chamber communicating with either the inlet or exhaust port openings, this being the most usual constructive defect. Of course it is barely possible that you have installed the engine with an under water exhaust, the top of the cylinder being slightly lower than the outside water level. You can be quite sure to find the fault in either a defective cylinder casting or an improper installation. Water in the cylinder, except in minimum amount, will short-circuit any make of spark plug, or any electric ignition system, battery or magneto, jump spark or make-and-break.

That Magneto Trouble.

From Reader, Rhode Island.—Noting that H. P., Delaware, No. 1665, in your September issue is experiencing trouble with his Remy magneto, I am contributing a few suggestions. In the first place the answer to H. P.'s question is not correct. It is stated in the reply that the magneto is not a low-tension instrument. I am very positive that the Remy Electric Company did not manufacture anything but low-tension magnetos up to and including the year 1913. The magneto has but one winding, a coarse or primary wire, and the electricity generated is therefore low-tension. This low-tension or primary current is intensified by a coil, and the coil is therefore utilized to intensify both the magneto and battery current, not used merely when the source of current supply is the battery.

Unless I am mistaken, the trouble experienced by H. P. is in the contact points of the cam housing or breaker box. If he will carefully examine the components he will find that one is a fixed and the other a movable member. The first named is adjustable by means of a knurled nut or screw on the outside

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of the cam housing. The other point is pivotally mounted and is moved when the cam, integral with the armature shaft, comes in contact with the movable lever. This lever should move freely and easily. The contact points should be perfectly clean and all foreign elements such as a red colored dust displaced.

The adjustment of the points on the Remy R. D. type of magneto, which I presume is the magneto used by H. P., should be so made that the maximum break is between .025 and .03 inch. If the motor misses with the spark retarded and the skipping is more pronounced at low rather than high speeds, the contact screw should be screwed in a notch at a time. The adjustment is easily made, and if H. P. will slightly alter the adjustment and note results, it may assist him in locating his trouble.

The test for the ground wire, as suggested in your answer, is best made by removing it entirely, making sure that if it be not entirely disconnected both at the magneto and ground connection that the free end does not come in contact with any metal. To stop the motor after making such a test, make a connection between the ground wire connection of the magneto and any metal part of the motor by using a piece of metal, a screwdriver blade, for example.

It will be well for H. P. to carefully examine the gap of the spark plugs. This is a point generally overlooked but it is very important. Different motors require different gaps but .025 or .03-inch is held by the Remy Company to afford the best results. If the motor misses when running idle or pulling light, the gaps should be increased. If the engine misses when pulling heavy at slow speeds, decrease the gaps. It is equally important that each plug have a similar gap.

It is doubtful if the Oldham or other coupling taking the drive for the magneto, be worn enough to cause a late break of the contact points, though an instance of this kind came under the attention of the writer a short time ago. The advance of the spark lever is another factor that should be considered by H. P. I trust the few suggestions will be of service and will be pleased to hear further from him.

Has a Good Car Record.

From R. J. Roe, Illinois.—I drive at present an eight-cylinder Cadillac. I bought it against the advice of numerous friends who said that they wouldn't oil, the cylinders would wear oval and lose compression; they would eat up tires, use too much gas, and about a hundred other reasons were advanced why the car was a failure. Now let me straighten things out. The car has gone 6,575 miles at this writing. I've averaged 10½ miles to a gallon of gasoline, which I buy in 100 gallon lots. The oil runs about 525 miles to a gallon. Not half bad to my notion, and I've had absolutely no trouble of any kind with the oiling system. Now the tires are Goodrich Silvertown Cords and I'm yet to have my first puncture. Surely a good record, and they look good for at least 10,000 miles and maybe more. The only trouble was with the Delco distributor. One Sunday the engine stopped dead, and no amount of cranking would get even a cough out of one of those eight cylinders. Upon careful investigation I found the platinum points were frozen together in the breaker. A little sandpapering put them in condition to get home again. Then I took them out and ground them smooth on an oilstone. I only wish everyone had as few troubles with their cars as this one has given.

Synchronous Firing.

From E. E. Larson, Iowa.—There are many drivers of Fords and other cars using individual spark coils that have trouble in getting synchronous firing. The object of this article is to show the cause and the remedy. Fig. 1 shows a vibrator set on a new coil. You will notice that the armature, A, lies very close to the core, B. Fig. 2 shows the

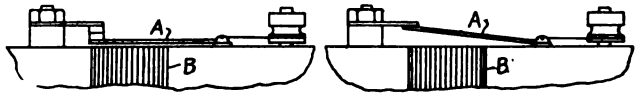


Fig. 1. Fig. 2.

same set with the contact points badly worn, thus doubling the distance between the armature and core, causing the magnetic pull to be decreased to one-fourth that of Fig. 1. It is obvious that if the contact will brake at all it will do so later than in Fig. 1. By examining the coils in a Ford car that has been used some time you will never find the armature an unvarying distance from the core because some points burn quicker than others.

One remedy is shown in Fig. 3. The bar, C, is bent as shown. A better way would be to make the insulator, D, out of thin sheets and remove one each time the points are dressed. I hope this will correct

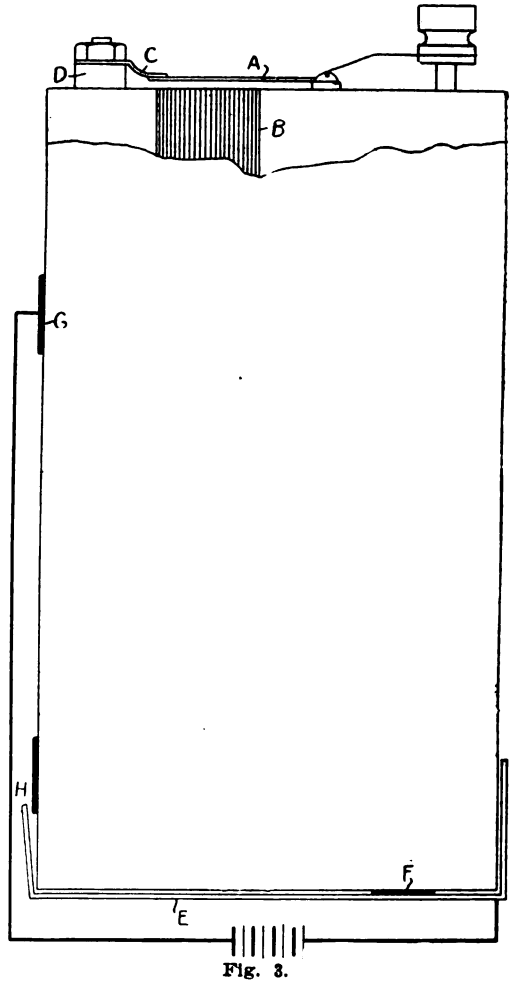


Fig. 3.

the fallacy held by many that synchronous firing can only be secured by the use of a master vibrator. Fig. 3 also shows a handy way to test coils. A sheet of brass, E, is bent as shown and placed in contact with the ground, F, when the wire from the battery is in contact at G, the spark will jump at H.

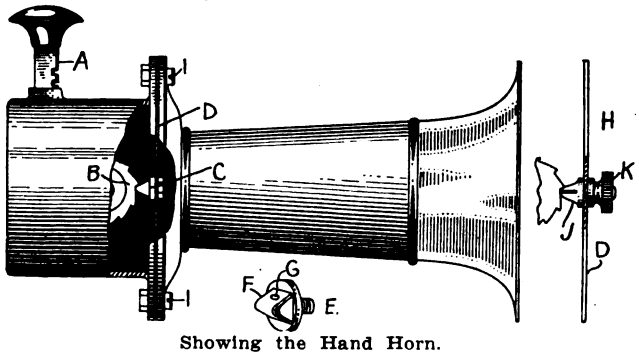
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Painting the Car.

From H. A. Kidwell, Indiana.—To the carriage and automobile painter who wishes to turn out first class work, that will have a beautiful surface free from specks and dirt, I suggest that he will take great care in preparing the job for paint. Very often you hear a painter say, "I wonder where that dirt came from; I had the gear clean, a clean duster, my brush in order, and I was very careful in removing grease. Also I had the doors and windows closed against the dust." And yet he wonders. In my opinion no paint shop is complete where there is no study of harmony and beauty. Let the painter remember that the only way to bring out a handsome appearance is to start right and he will have little trouble. I will now give my best method of preparing the job for paint. This work should be done outside of the paint room, so that no particle of dust be allowed in the room. For cleaning the gear I have found a piece of burlap answers the purpose best. For removing grease or oil, take a cup of gasoline, using a stiff brush, not necessarily a new one. Be sure and clean thoroughly around the belt heads. These places should be thoroughly cleansed. It is not necessary to remove the body of the machine from the gear, but the fender and hood should be removed. After giving the gear a good washing, rub down with pumice stone. A second washing and dusting and the job is ready for the paint room. The body should be taken through almost the same process, rubbing it down with pumice. Above all see that there is no loose paint or varnish left on the job. Before putting on the lead coat, look around and you will no doubt find places where the paint has scaled off. Touch these places up with primer, and let the job stand four or five days.

How to Repair a Hand-Operated Horn.

From E. G. B., New York.—The hand-operated horn is really an outcome of the electric diaphragm horn, having the same essentials with the single exception of the means of imparting motion to the diaphragm. Often times the tooth in the center of

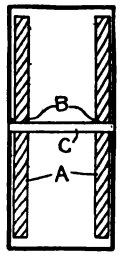


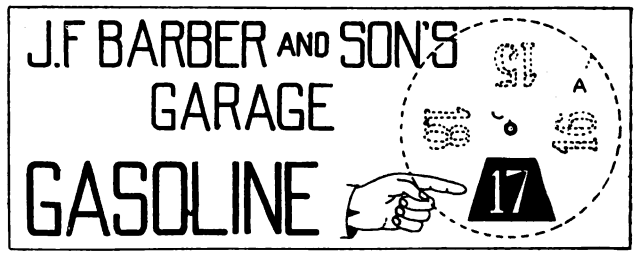
Showing the Hand Horn.

the diaphragm will become so worn that when the plunger handle is pressed downward the sound is rather faint, and one will try to imagine what the trouble is. This trouble is illustrated in the drawing. The pressing down on the plunger, A, revolves the toothed wheel, B, the teeth rapidly passing over the end of the tooth, C, which is secure in the center of the diaphragm, D. If the end of tooth, C, is worn off, the teeth on wheel, B, will never strike hard enough to produce the proper sound. The writer will give two simple ways of repairing the tooth, C. The small view, E, represents the worn tooth, C. Take a small piece of steel, F, drill a hole through the tooth as well as through both ends of the steel, and insert a pin, G. This lengthens the tooth to give the proper sound. The second repair is by the use of the post on a worn out dry cell battery, which is shown in view H. Remove the screws, I, shown in the larger view, and take out the diaphragm, D; then remove the worn tooth, C. Now with the battery post, J, put the screw end through the diaphragm, D, and then place the post screw head, K, on to hold it in place. These repairs can be done in a few minutes and will give the same sound as before.

Gasoline Price Signs.

From S. P. C., Rhode Island.—The price of gasoline fluctuates, compelling the garage and repair





For Price Variations.

shop to change their prices, raising or lowering according to the market. Many garages are content with painting the price on a piece of cardboard and attaching the display to the side of the building or sign. Other shops employ a blackboard utilizing chalk for marking up the figures.

These methods do not make for neatness or convenience and many times the figures are not easily read by the passing automobilist. The arrangement shown in the accompanying illustration not only saves time when changing the selling price but is attractive. It consists of two circular pieces of wood, A, about 18 inches in diameter. These are painted white or black and on their face is painted in black or white four prices, the figures being spaced equi-distant.

The center of the discs are drilled as shown in the sketch at B in the sectional view and the dials are supported in the sign proper by a rod, C. As the discs can be totated it is a simple matter to move them so that the desired figures will show in the opening of the sign. For example: If the price of the fuel is raised one cent by the producer, the dials are rotated clockwise until the desired figure shows in the opening. The arrangement displays the price on either side of the sign and two or more sets of dials are made up to care for any possible variation in the retail price. The dials can be painted from 11 to 14, 15 to 18 and 19 to 22, inclusive. If an illuminated sign be desired, the dials can be constructed of an opaque material and the figures painted on or made of glass with a black background.

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Cause of Serious Trouble.

From a Repair Man.—Not long ago I was sent to examine a car which was suffering from a peculiar complaint. There was no clearance at all between the valve stems and the valve tappets. This had, of course, resulted in bad starting, overheating, loss of power, and other troubles. The owner could assign no reason for this trouble, but I eventually elicited from him that the cylinder heads had been removed to decarbonize the engine. The engine was of the detachable head type, with the valve chambers, etc., cast in one piece with the head. I soon discovered the cause of the trouble to be that the old cylinder top packing had been discarded, and a new one cut from jointing material that was thinner than the original packing. When this had been inserted and the joint nipped up it had caused all the valve stems to come lower down and rest on the tappets, thus giving rise to the conditions mentioned above. The owner had not tested the clearances after reassembling the engine; this should always be done even when the old joint washer is used.

A Help to Starting.

He stopped the motor and failed to get it to start. As he always carried a block of wood, which just clears the back wheel off the ground, he was able to get the momentum of the free back wheel to assist the intensity of the spark, for in the Ford this increases with the speed of the magneto. The jacking up of the back wheel also makes the work of turning the starting handle much easier. The reason for using a wood jack is to prevent the car jumping off the ordinary metal jack with its small base, an accident which has happened to him and others.

On all occasions when a preliminary turn or two of the starting handle fails to produce a spark after jacking up the back axle in the manner stated, always proceed along certain lines of investigation. The cover of the vibrator is removed, and it is noted if any spark proceeds when the handle is turned. If there is none, then the cause must lie between the magneto and the coil box. If altering the adjustment of the vibrator blade does not remedy matters, then an examination is made of the wire running to and from it for looseness of terminals, touching of copper ends and, of course, not forgetting the switch.

Throttling Down the Ford.

From R. S. Morey, Connecticut.—I wish to say in regard to statement in the August number, about throttling down the Ford car, that last summer by adjusting my carburetor carefully and having the motor clean, I was able to run my Ford car, with four passengers, on a level macadam road, at the rate of four miles an hour, on high, with the clutch fully engaged. I could do this any time I wished. Several times I slowed it down to three miles an hour, but it did not always pull steadily with that speed.

In Case of New Bearings.

After making new crankshaft and connecting rod bearings for an engine, a repairman may well run the engine light for periods totalling up to an hour or so before he will throw the burden of propelling the car upon it. If this running-in process be omitted for any urgent reason, the owner should avoid racing his engine; he should keep it well throttled down for at least a hundred miles, and observe extreme care in starting, gear changing, and the use of his clutch. Preferably, he should confine the work to short runs, giving the engine long rests at frequent intervals, so that any heat caused by the friction of "high spots" may be dissipated, until the microscopic projections have been smoothed down by gentle work.

To Steering Knuckle Bushings.

From R. Strehorn, Colorado.—I have owned a Ford car for the last four years, and being a machinist do all of my own work. I have often noticed mechanics in applying new bushings in the steering knuckles, put a jack under them, then get a punch or chisel and drive the old worn bushings out. I have also seen arms bent and sprung. The same applies when they put new bushings in, and I have seen bushings spoiled by being started crooked, and others spoiled by being too tight. I have invented a tool that does away with all this trouble. I have put in new bushings and taken out old ones in 15 minutes, without damage of any kind. In fact, it is impossible to bend or spring the arm. In removing the old bushing, the steel stem is put through the bushing, the 9/16 part fits in the hole in the bushing, the plain part being 1/32 smaller than the hole in the steering arm. The sleeve is placed on top of the arm, the hole in the same being 1/16 larger than outside of the bushing. The nut is put on the stem and tightened. This will pull the tightest bushing without any strain whatever being placed on the arm. In putting in new bushings the operation is reversed. If the bushing is too tight after starting, reverse the tool and pull the bushing out and file to fit. I think every Ford owner should have one of these tools, as these small bushings wear after a few months use. The cost of bushings from the Ford factory is only 10 cents each. It will cost at any garage to apply these bushings not less than 50 cents or $1.00. I would like to dispose of this tool to some auto supply house. It can be used on any automobile by increasing the sizes to suit the make of cars. I do not have this device on sale as yet and would dispose of the right to manufacture and sell to some enterprising supply house.

(Note.—Mr. Strehorn's address is Pueblo, Colo.—Editor.)

That Noise in the Buick.

From D. Bennett, South Carolina.—I notice in your September number complaint No. 1664 from Frank Revelette, Jr., Kansas, about the B-37 Buick. The noise is caused by worn bushings at the front end of the torsion member. There is a large ring with four bearings with bushings at the front end of the drive shaft housing or torsion member. It looks like a large universal joint. A new drive ring and four bushings will correct this man's trouble. He needs these parts: One part No. 30455 drive ring and four No. 30458 drive ring bushings. After installing these parts, grease them.

The Humming Noise.

From Reader, Rhode Island.—Perhaps the hum in the gearing noted by Frank Revellette, Jr., No. 1664, may be due to the mesh of the pinion and crown gear. The correcting of an improper mesh requires

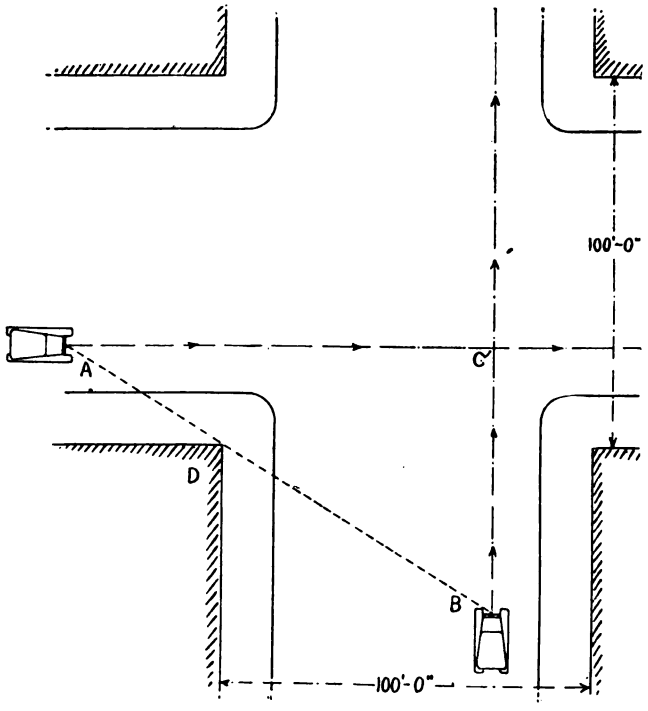
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experience and is best undertaken by the service station. Humming gears, as experienced by Mr. Revellette, are not uncommon. The sound being attributed to the gearset may be due to the drive shaft housing acting as a transmitter of the noise.

Speed on City Streets.

From N. G. Near, New York.—When you are running at top speed, how much distance do you need in which to safely stop? By a safe stop, I mean a stop that will not in any way hurt the car's brakes, tires or unduly strain any part. I ask this question because it is evident by a study of this diagram that there is a certain maximum speed at which you can safely drive through streets.

I have chosen a street that is 100 feet wide between buildings. Cars A and B are running toward the street intersection, both at the same high speed, and are equally distant from C, where they will very



Speed Dangers.

likely collide if they cannot stop before reaching C. The car drivers cannot see each other until they reach points A and B, on account of the building, D, which obstructs the view. They will then see each other along the dotted line, A B, which is the shortest distance possible and is therefore the most dangerous.

It will be noted, by studying the diagram further, that the distance B C is exactly equal to the width of the street, or 100 feet. And no matter where the cars run, if both are running in the middle of the street, this distance will still be 100 feet. The width of the sidewalk therefore makes no difference, the only requirement being that both cars must run strictly in accordancee with the city's road rules.

Therefore, generally, the width of the street is the criterion. You must always be able to stop within that distance. Make it half the width and you will be even safer. The above, of course, ignores pedestrians entirely.

Novel Device to Teach Driving.

A novel device to aid women motorists, and men for that matter in learning to control their cars without the necessity of getting out into the traffic, has been developed by Bishop, McCormick and Bishop, Dodge Brothers dealers in Brooklyn.

All four wheels are jacked up and the pupil takes the driver's seat and is instructed in starting the car, etc. A semaphore with several arms is placed in front of the car. These arms are controlled by the salesman who stands beside nearby. By pulling the proper cord he causes an arm with the phrases "Road Closed," "Steep Hill," "Bad Curve," etc., to be thrown before the car and the pupil is required to do the proper thing in handling the car in this emergency.

The device has proven a great help in instilling confidence in people who wish to learn to drive in a short time and it has been adopted by a number of motor car salesmen in the East.

That Leaking Carburetor.

From C. S. Venable, Kentucky.—In looking over the July, 1915, number, page 55, question No. 1644, Joseph Pernot, Wisconsin, asks the cause of his Kingston carburetor on a Ford car leaking. I had the same trouble myself some time ago, and tried exactly the same remedies, in exactly the same order as he did, with no result. The trouble lies in the valve that admits the gasoline to the carburetor. Unscrew the pack nut that connects the gasoline pipe line and the bottom nut on the bottom of the carburetor, which will admit of the bowl being taken off. Then carefully introduce some fine valve grinding paste around this valve seat and grind the valve exactly as you would an engine valve, using a small screwdriver, being very careful when through grinding to wash out all the grinding paste with gasoline from a squirt can before replacing the bowl. The trouble comes from this valve being slightly worn on the side, preventing it from closing the hole completely when the float is at its highest point. Perhaps he has found the trouble by now. Anyway, I know it worried me quite a bit, not because of the loss of gasoline, but for fear of fire in leaving the car standing on the street. Mine acted exactly as he describes his, and this seemed so near an absolute parallel case that my sympathy went out to him. Don't be afraid to grind it good, as the first grinding I gave mine was not enough, necessitating a repetition of the process. Use only fine paste, but that needle is "some hard" material.

Turning Garages.

Some one suggests that the person who built a private garage on a turntable so that he can always drive his car head in and head out, would have saved some expense if it had provided a cheap turntable in the garage itself.

The advantage of the turning garage rather than the inside turntable is that automobiles are far longer than they are wide. With an inside turntable, the garage must be as long one way as another, and this of course adds something to the bill for construction. Yet this plan will hardly offset the additional convenience of the turntable in the garage, which does not require a door at each end.

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NEW YORK, OCTOBER, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

WARNING!

Our readers are cautioned to pay no money to a party by the name of A. H. Love. He has been soliciting subscriptions for the Automobile Dealer and Repairer in California and the far West. He was formerly a representative of ours but is no longer in our employ. Parties paying money to Love will do so at their own risk.

PRICES AND PROFITS.

No one should imagine that because some of the automobile stocks have had a recent unprecedented rise in price in the open market following reports of abnormal earnings, that the business offers attractions for investors, either in new enterprises or in those already existing.

Even if a better car at the same price or as good a car at a less price could be produced, the chances of the success of a new enterprise would be extremely doubtful without almost unlimited capital. To occupy a field not already occupied, producing something for which there is a demand, may not be difficult; but to drive others from a field already well occupied is a venture fraught with uncertainties and dangers.

The automobile of to-day is pretty well standardized. The novel or irregular form of construction has pretty well weeded itself out automatically. What variations exist in automobile construction are largely a matter of taste, and there is no complete consensus of opinion as to whether one form or matter of detail is better than another or not. The advantage of choice largely consists in price, material, and the way it is put together. And in this the difference in value as compared to price is less than is usually imagined.

The abnormal profits made the past year by a few manufacturers have been largely due to their export trade on account of the European war or to the advantage of enormous production, or to both.

The price of standard cars may be somewhat reduced within the next year or two, but not enough to warrant any one holding off from purchasing now provided he needs a car.

HOW MORE CARS MAY BE SOLD.

Do automobile manufacturers want to sell from 10,000 to 15,000 more cars right here in New York City and the same proportion according to size in many other large cities?

It can be done by the requisite effort. The reason why many do not purchase cars who want them and who can afford to buy them in this and probably many other large cities, is owing to the garage expense. They can afford the purchase cost and they can afford the cost of running. When an automobile is used but once or twice a week, the running expense is not prohibitive to a man with a comparatively small income. Salaried men or wage workers who have incomes of from $1,200 to $3,000 a year can afford to own pleasure cars, and living in a large city they need them more than if they lived in the country.

A trip into the county or suburbs of the city once or twice a week would be more beneficial to body and mind than any other pleasure that could be enjoyed at anywhere near a similar expense. But the garage cost makes this at present prohibitive.

Possibly a lower cost should not be expected as long as the garage-keeper does the car washing and attends to the other little care that it may need, for this necessitates the employment of more or less help who may sometimes be overworked and at others have absolutely nothing to do. But they must be paid, whether they work or not, and their wages are a serious addition to the cost of garage-keeping.

On the other hand, many who would like to own automobiles and who can afford the purchase price, would be willing to wash and care for them and thus save this heavy expense. In fact, the physical exercise of washing a car and overlooking it to keep it in good running condition would be a positive advantage to many. Quite likely, too, when the owner and driver washes and cares for his own car, the washing and the care may require less work than when he is obliged to pay someone else for the work. He will avoid the mud and water in the road and ride more judiciously over bad places when he knows he himself must keep the car in presentable appearance and in good running order. Recently, while taking a Sunday walk, we ran across a man in an out-of-the-way place in the city suburbs who had his runabout pretty well dismantled by the roadside. He said he took his car out there frequently, believing this was the best place and the best way to care for it himself, and that the expense and time was thus comparatively small.

There should be, and there can be, in this city,

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garages where the owner washes his car and otherwise cares for it, thus paying for storage only, no help being needed by the garage owner save possibly a watchman at night. The car owner or driver might have simply a stall for his car, and when it requires cleaning, let him roll it over to one of the washing stands provided for this purpose, and do the work himself. Three or four such washing places might be needed, in order that there would be no unnecessary delay.

A garage of this sort to store 100 cars might be built for from $15,000 to $20,000, even in this city of high building and land cost, and the revenue of $5 a month for storage charge would provide ample income on the investment. A return of $6,000 a year would provide for the entire expense of ground rent, taxes and whatever help might be needed.

It is true that many car owners would under no condition wash or care for their own cars, but the number who would do so, and who could afford to own cars if such provisions were at hand, would be twice as great as the class first named.

The attention of automobile manufacturers is directed to this field for the disposal of thousands of pleasure cars. Let them inaugurate a concerted movement to supply this garage need in this and other cities.

It is the garage expense in large cities that acts as a deterrent to thousands who can afford to purchase automobiles and who would gladly purchase them if a way be provided whereby they might have them stored at a reasonable cost.

NO ROOM FOR THEM.

That most worthy association, the American Society of Mechanical Engineers, has recently held a discussion of soldiers made cripples by the European war. In a notice sent out by the society it was stated:

"There are 2.000,000 men living in Europe, who have suffered the loss of limbs, faculties or both as a result of injury in the great war. The study of adapting these crippled men to machines for manufacturing operations, or of redesigning the machines to fit the men, is a problem which the mechanical engineer will have to solve in the near future, not only in Europe, but here in the United States where a great number of the helpless will migrate."

Much as these mutilated men may deserve sympathy, to allow "a great number of the helpless to migrate" here would be an injustice to our own people, and if favors cannot be bestowed upon the few without doing an injury to the many, they should be invariably withheld. For the countries for whose flag they fought to care for them is simple justice; for this country to care for them is simple charity. And justice has a far higher claim than charity.

If any benevolently inclined citizens of this country feel disposed to send funds abroad to contribute to their support, by all means, let them do so. It will redound to their credit. But for the countries which are responsible for the two millions of cripples to send them to this country, or even to allow them to come here, would be heartless and contemptible.

But from an economic point of view there is a far more important reason why these unfortunate cripples must not be dumped into this country. When the war has ended and things in the industrial world settle into their normal condition, there will be no more work than our own cripples and non-cripples need. Even under present conditions of enormous output for foreign countries, there is no special scarcity of labor here. In fact, there never can be, when there is such a plethora of labor that the uneconomic and purely benevolent idea of a "minimum wage law" has obtained such headway.

THE MATTER OF WEIGHT.

That the less the weight of an automobile the less the cost of fuel, oil and tires, goes without saying. But weight reduction must be made, if at all, with a good deal of discretion. Many of our readers will remember in the good old bicycle days, the craze for light weight was such that finally the wheel began to have such a writhing and distortion, and so much vibration, that its propulsion was harder than that of a heavier and more rigid wheel.

Among the parts of an automobile that will bear reduction in weight to the limit of needed strength, are tires, pistons, piston cranks and the body or tonneau. The lighter these can be made the easier the car will propel. But any reduced weight of the frame, the axles or the wheels, that adds the slightest to their distortion or vibration, is a decided disadvantage. Not only will this increase the power needed for propulsion, but it will make the car more uncomfortable to the occupants and hasten its final destruction.

It will be found that in different cars the comparative weights of each bear less relation to the amount of fuel consumed in a given distance of travel than may be imagined. In the case of tires, the relative wear as compared to the weights of different cars is practically the same, no matter what the difference in design and construction may be. But here the difference in wear will not be in exact proportion to the difference in weight. That is to say, a car weighing 2,000 pounds will not wear out tires twice as fast as one weighing 1,000 pounds.

BUYING A CAR.

It must not be assumed that the look of a car or the look of the house organ of the company that manufactures the car are much of a criterion of the car's value. Paint and varnish can be made to cover a multitude of sins of omission and commission, and a well printed pamphlet is often due to the talent of a printer plus a satisfactory emolument in payment for the work rather than to ability in automobile designing or construction.

Paint and varnish as well as good printing are useful in themselves; the two first add to the appearance of a car, and the second to the appearance of whatever is printed. But they have no other effect whatever upon an automobile.

In an expenditure of from $400 to $4,000 a man should first know all about the material and construction of his intended purchase; he should insist upon getting a demonstration of the proposed car, and if he is not familiar with the riding qualities of other automobiles of about the same class or price, he should share that demonstration with some one who is familiar with them, and in whom he has confidence; and he should get in touch with other owners of the same model of car if possible.

Of course, the reputation of the manufacturer is

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important, but it must be remembered that this does not come like a mushroom in a night, so to speak; it is something of slow growth, and even the most meritorious may be handicapped by the lack of it. Nothing should be condemned simply because it is new, but anything new demands a closer investigation and a more thorough test than if it were already established.

STREET DANGERS.

Automobile accidents continue in New York City with alarming frequency. During the past month scores of children have been killed or maimed by them, and this of course is due to allowing the youngsters to play in the streets. When any one makes a protest against the use of the streets as playgrounds, the reply of the fond parents is usually to the effect that they must "play somewhere," and that in view of the rule, either written or unwritten, that they must not loiter on the stoops of the tenements or apartments where they reside, and that there is no room for them in the parks even if it were practicable to send them there, the question arises, "where can they play?"

Well, for the children's sake and for the parents' sake, inconvenient as it may be, more families with young children should live in the suburbs. It is often inconvenient, it is true, but the lives, to say nothing of the health, of young children, is worth inconvenience. If not, then they should not be brought into the world. Nor is this all. In altogether too many cases, parental discipline as to carelessness in using the streets as playgrounds, seems to be "more honored in the breach than in the observance."

Nothing can be more exasperating to automobile drivers than the gross negligence or the bumptious indifference of some of these youngsters to all warnings of danger. The fact is, such children have been spoiled by "sparing the rod," and it is useless to disguise it.

But automobile drivers have another just grievance, and although it is less exasperating, it is none the less real. When a pedestrian is using or crossing the street, and sees a car approaching, instead of continuing to walk if he were walking or to stop if he were stopping—without change of movement, he often dodges one way or another, until it confuses the driver of the automobile so that he scarcely knows which way to turn.

Pedestrians should not forget that the driver of an automobile constantly has his eyes fixed ahead, and no one or thing can be before him without his knowledge. It is only when a pedestrian or some vehicle suddenly appears directly before and quite near his car that he is unable to avoid a collision, and even in such case he can usually avoid it if he is driving judiciously.

The remedy for so many automobile accidents in city streets is not a fixed slow speed law; a safe speed law applicable to all places and at all times would vary from three to forty miles an hour. The most practicable remedy would be to leave the matter of a dangerous speed to the police force, and as policemen have not the power of ubiquity or of being at all places at all times, possibly it might be well to include the members of the street cleaning department as speed officers. It is true that the street cleaners may not in all cases possess ripe judgment, but almost anything is better than leaving the streets in their present dangerous condition, and discreet drivers would not be likely to often suffer from such surveillance.

The main consideration is that the streets be fairly safe, and that whoever jeopardizes this safety, whether it be old or young, pedestrian or vehicle driver, should be punished without mercy. The streets are for the convenience of vehicles and not for loiterers and much less for playgrounds. Pedestrians have the side and cross-walks for their use, and as for playgrounds, no matter how much they may be needed, the streets must not be given over to them.

NOT FOR CITY DRIVING.

Many imagine that a horse is displaced for every automobile that is sold. Nothing could be wider of the fact. Quite likely that more than fifty per cent. of the car owners of the country did not own a horse and never would own one.

This situation is specially apparent in the large cities. At the upper part of this city there is a large field where the ball games of the two leagues are played. With approximately the same number attending a few years ago there might be from 25 to 50 horse-drawn vehicles standing at the entrance, where to-day there are four or five times as many automobiles.

It is a fact that the automobile has increased enormously the pleasure riding in the large cities. The horse is well adapted to horseback and park driving but when it comes to taking a trip from the central parts of large cities to its suburbs or far into the adjoining country, he is unfit for it.

RISKY PUBLICITY.

Requests are frequently received at this office to publish notices of suits having been filed or begun in relation to some alleged patent infringement. Of course, any one has a right to enter such a suit, no matter whether the case be a substantial or a flimsy one. But no discreet periodical will publish the fact that such a suit has been filed or begun, for the reason that if it should not be successful, or be withdrawn, the defendant can sue the periodical for damages and get from it all the damage that such publishing has caused him.

It is plainly an injury to any business when the public, or its customers, are given an idea that it is being done in an unlawful manner. Our invariable refusal to make mention of suits of this sort can be accounted for by the facts as stated.

Concrete Roads.

California has built 800 miles of concrete roads during the last three years, and New York State ranks second. They are also being laid extensively in Michigan, Illinois, Wisconsin and Iowa. The cost per mile for a 15-foot road is about $7,750.

A loose terminal on a plug can cause intermittent firing, and a not properly tightened plug center can do the same, but, what is worse, can lead to a serious backfire, with the chance of a broken wrist.

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LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Crossing Partially Obscured.—At Grenada, Oregon, a family of five were killed at a railway crossing which is partially obscured by a house and a line of trees. The driver could not get a view of the track until right upon it. The car stalled as soon as it struck the track and the express train crashed into it. Several serious accidents have been narrowly averted at this point in the past.

Snake Causes Accident.—Near Eagle Grove, Ia., a bad accident occurred, when some malicious youngsters threw a snake at a car filled with young lady passengers. It wrapped itself around the driver's neck and when he grabbed for it with both hands the car turned out of the road and collided with a tree. One of the ladies was thrown through the windshield sustaining a severe cut in the back and face.

Slid Down Hill Onto the Track.—One man was killed and two others injured near Racine, Wis., when the car in which they were riding slid down a mud and gravel hill on to the car tracks. The driver applied the brakes as he heard the train coming but they would not hold and the car was struck with results as stated.

Talking With Companion.—A young lady in Chico, Cal., received painful injuries when she was jammed against an iron fence in front of the school grounds. It is said that the lady driving the car was talking with her companion and did not notice she was approaching the entrance to the school grounds. She turned the wheel quickly, but as the gate was closed she crashed against the fence, breaking it and striking the young woman.

Loses Control of Car.—Three boys from 15 to 16 years, near Clinton, Wis., started on a midnight ride in a big touring car. A long hill proved an incentive to the boys to speed and the car went down the hill at a fast rate. The boy that was driving lost control of the steering wheel, the front wheel struck a rough, sandy road and the car turned over the embankment. One of the boys was found underneath the machine dead and the others escaped with injuries.

Made a Quick Turn.—A man, two women and a baby were injured near Youngstown, Ohio. On coming to a turn in the road the driver saw a car ahead of him, going in the same direction. In making a quick turn to avoid a collision with the car ahead, the automobile was overturned and the occupants thrown out. The other car started ahead without offering any assistance.

In an Attempt to Reach a Hat.—One man was instantly killed, his wife severely injured and two other occupants of the car hurt near Council Bluffs, Ia., when the driver in attempting to rescue a hat of one of the passengers lost control of the car and the occupants were hurled into the ditch and pinned beneath it. The driver was caught with his face buried in the ground and suffocated.

Killed by a Locomotive.—Three women and a man were almost instantly killed near Montague, Cal. At the point where the accident occurred there is an abrupt curve, and the approach of railway trains is not noticeable. The driver undertook to stop his car and reverse when he saw the train almost upon him and thus became stalled directly in the path of the train.

Struck by a Second Trolley Car.—At Richfield Springs, N. Y., a young man was instantly killed and a young woman seriously injured when the car in which they were riding was struck by the second passing trolley car. It is stated that the crossing was obscured by brush and the approaching car could not be seen until it was too late and the driver assumed, as one car had just gone by, that the track was clear.

A Bad Spot in the Road.—Near Salem, Ohio, a woman received injuries in an accident from which she died soon after, when the car in which she was riding struck a deep depression in the road and was ditched. It is said that the condition of the road at this point was called to the attention of the trustee before the accident but he neglected to have it repaired.

Tried to Pass on Narrow Road.—Near Mayfield, S. D., a woman and her son were killed. The road was steep and narrow and the driver attempted to pass a car going in the same direction and drove too close to the edge of a grade. The car toppled over, made a complete somersault and stopped right side up. The woman's head was crushed and the young man's back broken.

In Explaining the Operation of the Car.—At a bad turn in the road near Sacramento, Cal., a woman was thrown 20 feet from a car and killed almost instantly and a man died soon after, when struck by a train at the crossing. It is stated that the driver had the party out for a demonstrating ride and was explaining the mysteries of the car to prespective buyers.

Failed to Carry Sufficient Water Supply.—Failure to think of evaporation in an automobile radiator brought death to one man and tortures to two others in the Imperial Valley, Cal. The car stopped in the sand, the radiator was empty and they had no water. One of the party made his way to Mineral Springs and formed a rescue party. When he returned one of his companions was dead and the other unconscious.

Jumped from Moving Car.—At Enid, Cal., a young boy was killed when he and two others were riding to school. The driver slowed down as they neared the school and the boy jumped. His foot slipped and he fell beneath the car and a wheel passed over his neck. He died on the way to the hospital.

Driver Falls Asleep.—Four men were injured, two seriously, when the driver of the car in which they were riding fell asleep and the machine struck a concrete bridge and rolled over into the ditch. The car was completely demolished.

Inspect Your Tool Box.

An inspection of most motor car tool boxes, for instance, will bring to light a collection which usually includes several broken parts of sparking plugs, nuts and bolts that have lost their threads, and spanners that ceased their useful life years ago, etc., and the motorist considers that, in carrying this heterogeneous assortment, he is well provided as regards the question of "spares." The usual result of carrying this unnecessary impediment is that when anything is wanted quickly it is difficult to find. It would, therefore, be a good idea were motorists to devote a wet afternoon to going carefully over the tool box, and throwing out all the obsolete litter.

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THE STARTING SYSTEMS.

And Their Possible Ultimate Effect Upon the Use of the Magneto for Ignition.

From J. T. C., Motor Magazine, London.—The present condition of the motor trade, owing to the difficulty of obtaining British-made cars, has brought American-made cars into greater prominence than ever before. It has also casued much attention to be given to the American practice of combined electric starting, ignition and lighting. This elimination of the magneto has caused many to question the wisdom of the British firms that have undertaken its manufacture. If the magneto is really doomed it means a great financial loss to those concerned. The utility of self-starting and electric lighting are accepted facts. The question is centered on the wisdom of combining the ignition with the electric system and dispensing with the magneto.

One of the most important points, especially at the present time, when few skilled driver-mechanics are obtainable for private service, is the simplification of all parts of the car and the elimination of all unnecessary complications. The owner-driver must be especially considered, and should himself give particular consideration when purchasing a new car to complications that would need skilled attention. To examine one American system, characteristic of most others, is sufficient for our present purpose. This particular system has a combined starting motor and lighting dynamo. It is necessary in this case to have a double-wound armature, which, although it simplifies the machine in appearance, actually complicates matters in the case of a breakdown. In the event of either winding failing it is almost certain to affect the other. The lighting dynamo actually generates the current for the high-tension system, and is called the magneto, when charging the accumulators. In the case of failure of this motor-generator one has to fall back on the low-tension system. The low-tension circuit depends on a set of six dry cells to supply electric current through a relay and an induction coil. In the case of the dynamo failing to charge the accumulators, which is somewhat frequent, it is necessary to fall back on the dry cells. If the latter have been in the car some time their condition is uncertain.

In addition to and combined with the foregoing are a cut-out relay, voltage regulator, ignition relay, magneto induction coil, battery induction coil, magneto timer and distributor, battery timer and distributor, a junction box containing the magneto resistance, a magnetic clutch, ammeter, voltmeter and a three-way switch. This formidable array of delicate instruments all need attention at some time or other. Their proper adjustment is the work of a skilled electrician. Not one garage in a hundred would care to undertake tuning up such a system. Compare the foregoing with a high-tension magneto that has only one adjustment, and the question of simplification is answered.

The Question of Breakdown.

It is most important that any car owner should have freedom from the risk of breaking down on the road. In the case of such a misfortune, the ease of quickly finding the trouble is of great advantage. The reliability of the magneto is well known to all having any connection with motoring. It is not an exaggeration to say that there are many thousands of car owners with years of experience who have never yet had ignition trouble that caused a complete breakdown. In any case the magneto is simplicity itself, and the trouble is easily found should it occur. There are only five wires on a four-cylinder engine that can cause a short circuit, and all are accessible. On the combined system being discussed there are 53 wires, each of which may cause trouble and affect one or other of the ignition systems. The majority are more or less exposed to the oil and dirt which accumulate around most engines.

As already mentioned the armature has two windings. Being a low-tension direct current machine it necessarily has two commutators, one for the dynamo and one for the starting motor winding. Each winding is made up of a large number of coils. The two ends of each coil are led out and connected to separate segments in the commutator. The segments of the latter must be insulated from each other, and, of course, from the armature shaft. Taking the machine as a whole the number of insulated parts must be well over a hundred. Each insulated part is a likely cause for future trouble that will affect the high-tension circuit, making it necessary to fall back on the doubtful dry cells. The insulated parts of the many instruments named, which are included in the ignitions, are too numerous to detail, not forgetting the terminals of the 53 wires.

The insulated parts of the ordinary high-tension magneto are negligible in comparison. At the same time it is admitted that the machine itself generates at a very much greater voltage, but experience extending over a number of years has eliminated any points of weakness and added greatly to its reliability.

The Question of Cost.

The comparative cost of installation is in favor of the magneto. A new high-tension magneto of the best type costs about $50. A dual ignition set costs 50 per cent. more. An electric light set, including dynamo, battery and lamps, cannot be installed for less than about $150. A combined lighting and starting set costs more. It is somewhat difficult to arrive at the possible cost of a set combining starting, ignition and lighting.

When buying a cheap car which includes starting, ignition and lighting, it is well first to deduct the possible cost of the electric installation; then consider if the difference is sufficient to guarantee the sound mechanical construction of the chassis and good bodywork.

The convenience of self-starting is certainly very pleasing, but it is a dispensable luxury. Electric lighting has great advantages over oil lamps, and is an improvement on acetylene gas as regards cleanliness and convenience. Its only fault, up to the present, is the somewhat doubtful reliability of the dynamo. As a generator of electric current it is far from the perfection attained by the high-tension magneto. It is for the latter reason inadvisable to rely upon the lighting dynamo to generate current directly, or indirectly, through accumulators for the high-tension ignition system. If the dynamo is reliable why are special directions given in the instruction books for charging the accumulator from an outside source, and why is an alternative ignition system provided? In the case of the high-tension

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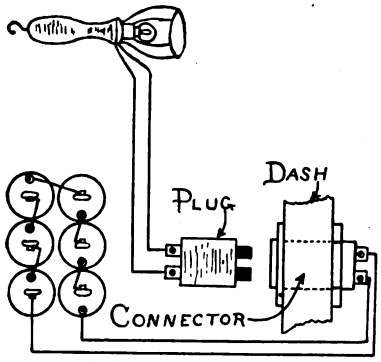
magneto reliability is so sure that very few cars carry a dual ignition set. When the latter is provided it is not a "stand-by," but a convenience for easier starting.

If the matter is given careful consideration only one conclusion can be arrived at—that the magneto will continue to hold its own. Especially so in the case of owner-drivers where simplicity and reliability are the controlling considerations.

Installing Handy Trouble Lamp.

Owners of cars not equipped with electric lighting can install a convenient trouble or inspection lamp at a slight cost. The usual method consists of attaching the wires of the lamp to the battery or dry cells, an arrangement requiring the removal and replacement of the battery terminals, an operation taking more or less time.

The installation shown in the accompanying illustration eliminates the work and with it the lamp may be connected very quickly and easily. The material required is a dash plug and connector and these come in two forms, for metal and wooden



Trouble lamp permitting of easy and rapid service and permanent connection with battery.

dashes. That shown is a wood member and one section is installed by boring a hole in the dash and fitting the connector. The terminal ends of the connector are placed on the motor side of the dash and to these are led the two wires from the battery or dry cells. The plug is attached to the wires leading from the trouble lamp. The convenience of the arrangement is obvious. When use of the lamp is desired the plug is inserted in the connector which closes the circuit, supplying current to the lamp. The connector can be permanently wired to the battery or cells employed for ignition or other purposes without interfering with the operation of the motor or other electrical units. As the connector is flush with the dash it does not detract from the appearance of the latter. The installation can be made in less than 30 minutes. The material can be obtained at any supply house, and as above stated is inexpensive.

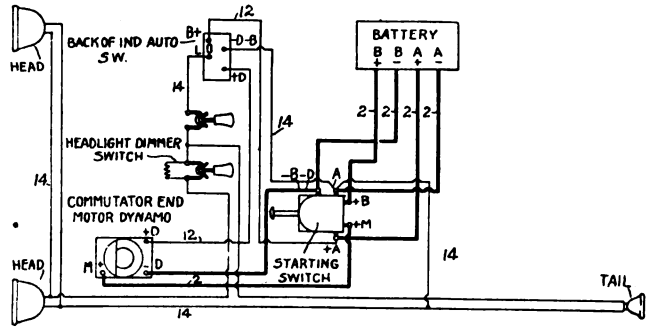
No Horse-Drawn Vehicle.

One of our correspondents writes that he recently spent Sunday in Cleveland, Ohio, and the room he occupied in one of the hotels overlooked the famous Euclid Avenue. He said that for two hours he watched the procession of automobiles go back and forth and didn't, in all that time, see one horse-drawn vehicle.

This little incident illustrates to what an extent the automobile has supplanted the horse in one of the principal cities of the country.

Wire Testing with a Bell.

A method employed in wire testing is shown in the illustration. With the use of an electric bell and a dry cell battery, it is an easy matter to find if the wire is broken inside of the insulation, from the

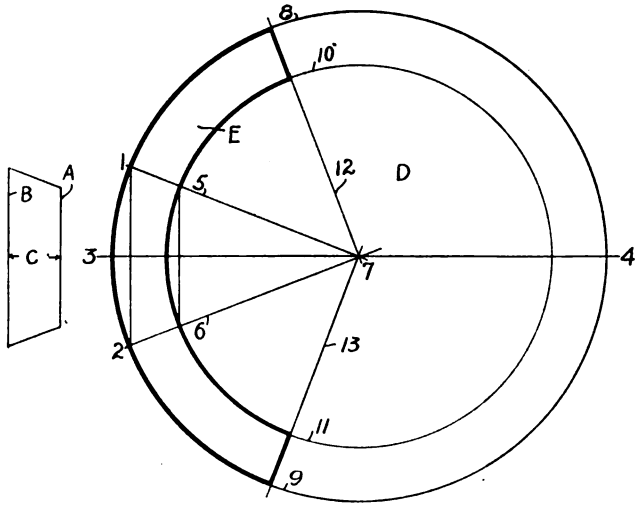


Battery Test.

lamps to the battery. Connect wire A to lamp from one side of the bell, and wire B to the post of the dry cell. Then from the dry cell to the wire of the storage battery, as shown at C. If the bell does not ring the wire is broken and the cause has been discovered.

A New Leather for the Clutch.

Owing to the shape of the surface of a cone clutch it is not an easy task to cut a new leather to fit the cone properly. In the first instance take off the old worn leather surface and rivets and be sure to clean out the rivet holes thoroughly. Now that this is accomplished, measure the cone, first taking the diameters of the small end, A, and large end, B, then find the width, C. D represents the projection of the cone in a flat plain. Draw the line 1 and 2, then draw the center line 3 and 4, at right angles to 1 and 2. Now prolong the two tapered lines, 1 to 5, 2 and 6, until they meet the center line as at 7. The point 7 represents the apex of the cone, if it were completed, and gives the correct protection of the development of that portion of the conical surface. With 7 and 1, 7 and 5 as radii, draw the two circles 8, 9, 10, 11. Also draw radial lines 12 and 13 to pass through 7. The figure in solid lines, E, can then be cut out of



For Fitting the Leather.

the paper used for the pattern and placed on the leather. Now use the shears and cut close to the edge of the pattern, E, and the proper cover has been made. Before putting it on the cone soak the leather good in oil. In putting it on the cone, rivet the one end first, next the leather is drawn down past the

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next rivet holes, which are then driven into place. This is continued until the other end of the leather is reached. Before using the clutch let the leather dry gradually and this will give a tight fit.

Watch your compression. If there is a leak by the piston, it will be shown by a gradual yielding to pressure when turning the engine over by hand. Look after it at once. Rings that fit poorly or are stuck in their grooves, leaky valves, and leaky joints are the principal causes of compression losses. Soapy water or oil will locate an outside leak.

OUTFIT FOR REPAIR WORK.

Some of the Tools and Machines Needed and What They Will Do.

From "Automobile Repairing Made Easy," by Victor W. Page. Published by The Norman W. Henley Publishing Co., New York.

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There are so many small items of equipment entering into the outfit necessary to carry on repair work economically and efficiently and so many supplies are needed that it is difficult to distinguish be-

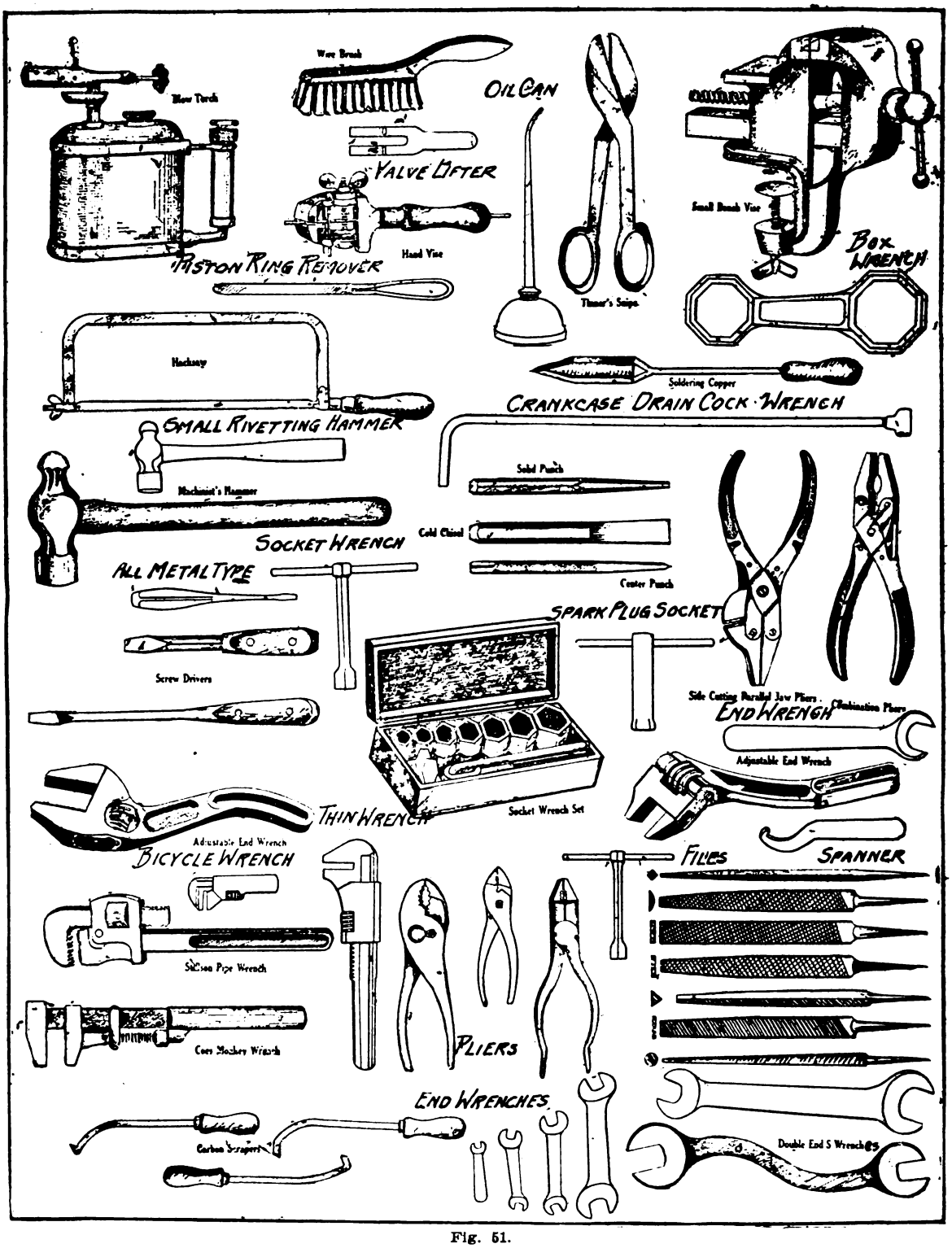


Fig. 51.

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tween the tools used only on the car and others which serve a general purpose about the garage or repair shop.

Machine tools in themselves are of little value without an adequate supply of smaller tools to be

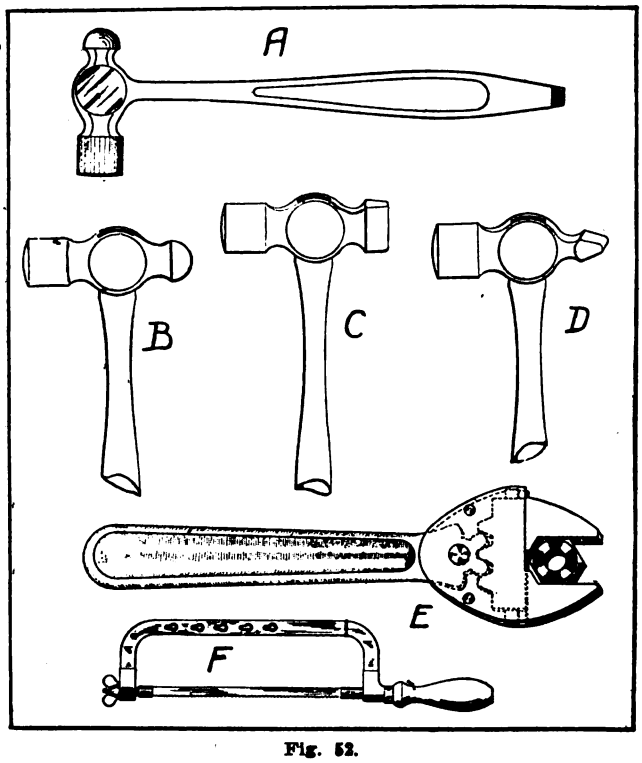


Fig. 52.

used in connection with them. For example, a lathe could not be employed to advantage without a complete set of accessories and cutting tools, while a drilling machine would be valueless if not supplied with proper chucks and drills for making the holes.

A very complete outfit of small tools, some of which are furnished as part of the tool equipment of various cars are shown in group at Fig. 51. This group includes all of the tools necessary to complete a very practical kit and it is not unusual for the floor man who is continually dismantling and erecting cars to possess even a larger assortment than indicated. The small bench vise provided is a useful auxiliary that can be clamped to the running board of the car and should have jaws at least three inches wide and capable of opening four or five inches. It

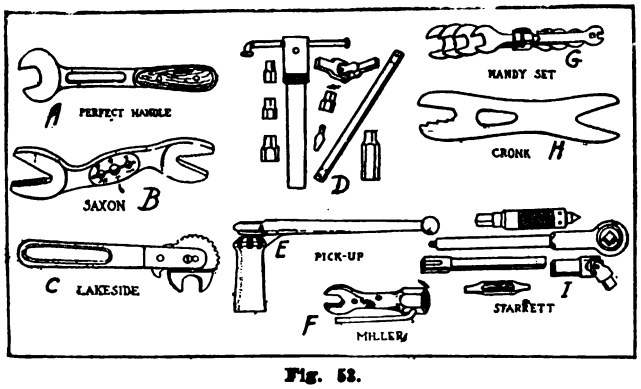


Fig. 53.

is especially useful in that it will save trips to the bench vises and can also be carried as part of the tool equipment by the motorist to advantage, as it has adequate capacity to handle practically any of the small parts that need to be worked on when making repairs. A blow torch, tinner's snips and soldering copper are very useful in sheet metal work and in making any repairs requiring the use of solder. The torch can be used in any operation requiring a source of heat. The large box wrench shown under the vise is used for removing the wheel hub cap and sometimes has one end of the proper size to fit the valve chamber cap. The piston ring removers are easily made from thin strips of sheet metal securely brazed or soldered to a light wire handle. These are used in sets of three for removing and applying piston rings in a manner to be indicated in the next chapter. The uses of the wrenches, screwdrivers, and pliers shown are known to all and the variety outlined should be sufficient for all ordinary work of restoration. The wrench equipment is very complete including a set of open end S-wrenches to fit all standard bolts, a spanner wrench, socket or box wrenches for bolts that are inaccessible with

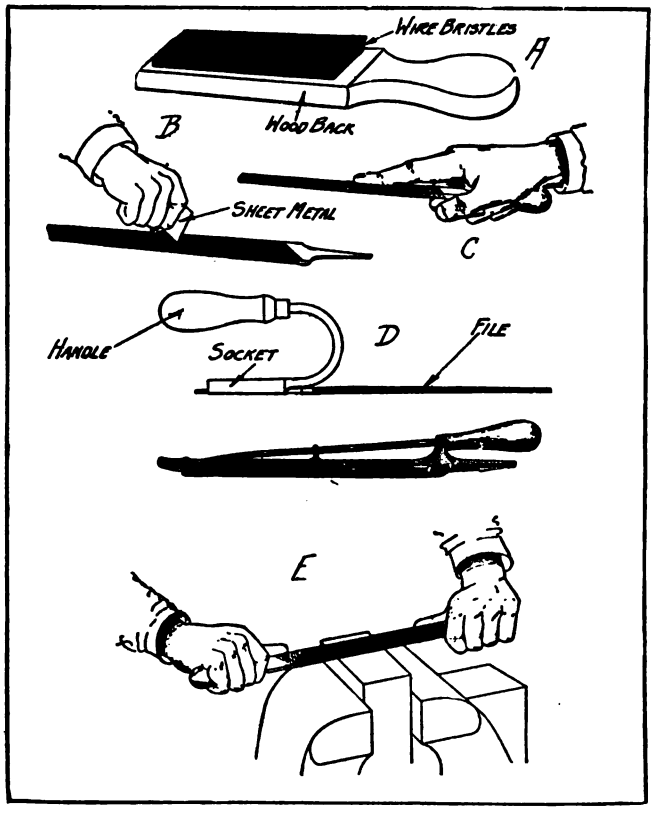


Fig. 54.

the ordinary type, adjustable end wrenches, a thin monkey wrench of medium size, a bicycle wrench for handling small nuts and bolts, a Stillson wrench for pipe and a large adjustable monkey wrench for the stubborn fastenings of large size.

The most popular form of pliers is the combination pattern shown beneath the socket wrench set. This is made of substantial drop forgings having a hinged joint that can be set so that a very wide opening at the jaws is possible. These can be used on round work and for wire cutting as well as for handling flat work.

A very complete set of files, including square, half round, mill, flat bastard, three-cornered and rat tail are also necessary. A hacksaw frame and a number of saws, some with fine teeth for tubing and others with coarser teeth for bar or solid stock will be found almost indispensable. A complete punch

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and chisel set should be provided. A number of different forms and sizes of chisels are necessary, as one type is not suitable for all classes of work. The adjustable end wrenches can be used in many places where a monkey wrench cannot be fitted and where it will be difficult to use a wrench having a fixed opening. The Stillson pipe wrench is useful in turning studs, round rods, and pipes that cannot be turned by any other means. A complete shop kit must necessarily include various sizes of Stillson and monkey wrenches as no one size can be expected to handle the wide range of work the repairman must cope with. Three sizes of each form of wrench can be used, one, a 6 inch, is as small as is needed while a 12 inch tool will handle almost any piece of pipe or nut used in a motor car. For large work a 16 inch or 18 inch Stillson will be found of value.

Two or three sizes of hammers should be provided, according to individual requirements, these being small riveting, medium and heavyweight machinist's hammers. A very practical tool of this nature for the repair shop is shown at Fig. 52, A, as it can be used as a hammer, screwdriver or tire iron.

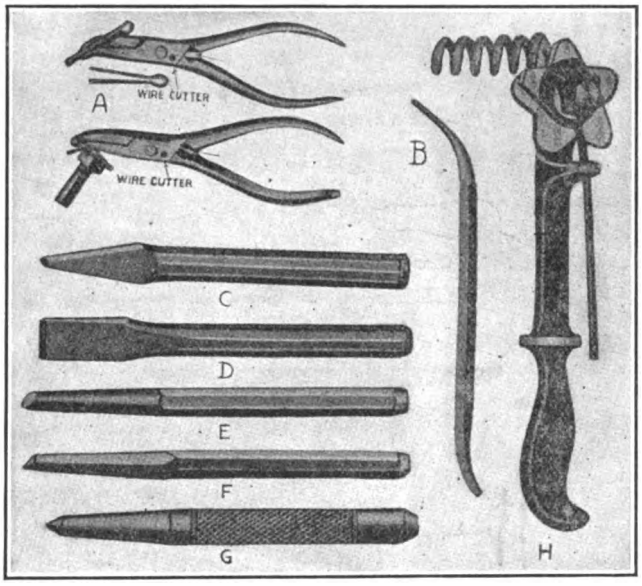


Fig. 55.

It is known as the "Spartan" hammer and is a tool steel drop forging in one piece having the working surfaces properly hardened and tempered while the metal is distributed so as to give a good balance to the head and a comfortable grip to the handle. The hammer head provides a positive and comfortable T-handle when the tool is used as a screwdriver or tire iron. Machinist's hammers are provided with three types of heads, these being of various weights. That at B, is the form most commonly used and is termed the "ball pein" on account of the shape of the portion used for riveting. The straight pein shown at C, is just the same as the cross pein shown at D, except that in the latter the straight portion is at right angles to the hammer handle, while in the former it is parallel to that member.

A self-adjusting monkey wrench which is known as the "speed nut" is shown at Fig. 52, E. The act of pulling on the handle tightens the wrench on the nut by means of a rack which is formed integral with the movable jaw and a portion of a pinion meshing with it at the end of the handle. Pulling on the handle tightens the wrench on the nut and the harder one pulls, the more securely the nut is gripped. The hacksaw frame shown at Fig. 51, is a solid type adapted only to take one length of blade. As hacksaw blades are made in varying

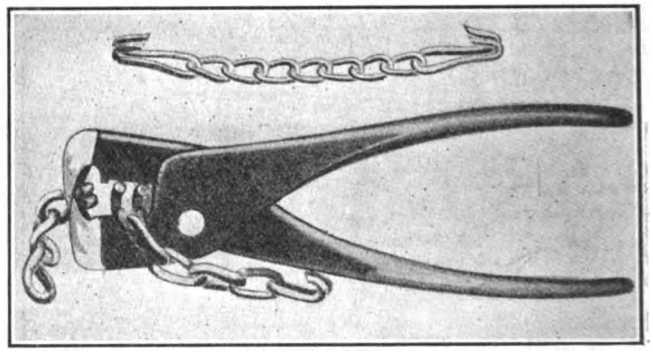


Fig. 56.

lengths it may be possible that a longer one than that frame was made for would be the only thing available. In such a case the adjustable hacksaw frame shown at Fig. 52, F, would permit of using a longer saw blade by merely extending the frame as necessary.

Wrenches have been made in infinite variety and there are a score or more patterns of different types of adjustable socket and off-set wrenches. The various wrench types that differ from the more conventional monkey wrenches or those of the Stillson pattern are shown at Fig. 53. The "perfect handle" is a drop forged open end form provided with a wooden handle similar to that used on a monkey wrench in order to provide a better grip for the hand. The "Saxon" wrench is a double alligator form, so called because the jaws are in the form of a V-groove having one size of the V plain, while the other is serrated in order to secure a tight grip on round objects.

The file brush shown at 54, A, consists of a large number of wire bristles attached to a substantial wood back having a handle of convenient form so the bristles may be drawn through the interstices between the teeth of the file to remove dirt and grease. If the teeth are filled with pieces of soft metal, such as solder or babbitt, it may be necessary to remove this accumulation with a piece of sheet metal as indicated at Fig. 54, B. The method of holding a file for working on plain surfaces when

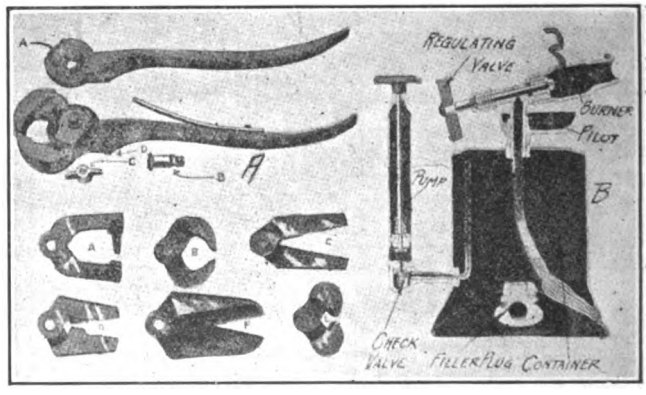


Fig. 57.

it is fitted with the regular form of wooden handle is shown at C, while two types of handles enabling the mechanic to use the flat file on plain surfaces of

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such size that the handle type indicated at C could not be used on account of interfering with the surface finished are shown at D. The method of using a file when surfaces are finished by draw filing is shown at E. This differs from the usual method of filing and is only used when surfaces are to be polished and very little metal removed.

One of the most widely used of the locking means to prevent nuts or bolts from becoming loose is the simple split pin, sometimes called a "cotter pin."

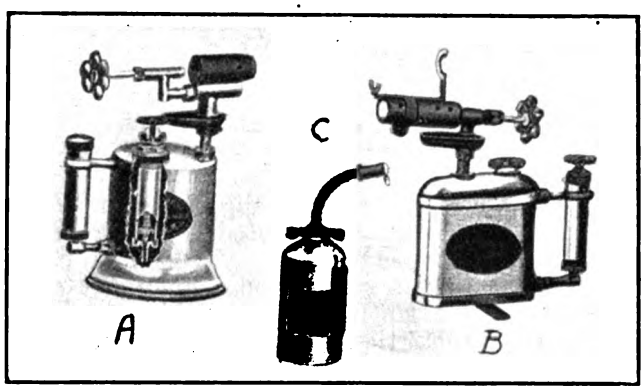


Fig. 58.

These can be handled very easily if the special pliers shown at Fig. 55, A, are used. These have a curved jaw that permits of grasping the pin firmly and to insert it in the hole ready to receive it. It is not easy to insert these split pins by other means because the ends are usually spread out and it is hard to enter the pin in the hole. With the cotter pin pliers the ends may be brought close together and as the plier jaws are small the pin may be easily pushed in place. Another use of this plier also indicated, is to bend over the ends of the split pin in order to prevent it from falling out. To remove these pins a simple curved lever, as shown at Fig. 55, B, is used.

This has one end tapering to a point and is intended to be inserted in the eye of the cotter pin, the purchase offered by the handle permitting of ready removal of the pin after the ends have been closed by the cotter pin pliers.

A complete chisel set suitable for repair shop use is also shown at Fig. 55. The type at C is known as a "cape" chisel and has a narrow cutting point and is intended to chip keyways, remove metal out of corners and for all other work where the broad cutting edge chisel shown at D cannot be used. The form with the wide cutting edge is used in chipping. cutting sheet metal, etc. At E a round nose chisel used in making oil ways is outlined, while a similar tool having a pointed cutting edge and often used for the same purpose is shown at F. The center punch depicted at G is very useful for marking parts either for identification or for drilling. In addition to the chisels shown, a number of solid punches or drifts resembling very much that shown at E, except that the point is blunt should be provided to drive out taper pins, bolts, rivets and other fastenings of this nature. These should be provided in the common sizes.

A complete set of real value would start at ⅛-inch and increase by increments of 1/32-inch up to ½-inch. A simple spring winder is shown at Fig. 55, H, this making it possible for the repairman to wind coil springs, either on the lathe or in the vise. It will handle a number of different sizes of wire and can be set to space the coils as desired.

Anti-skid chains form an important item in the equipment of the car and as they are subject to wear it is desirable to replace the worn cross chains with new ones from time to time, as some of these wear out quicker than others. A special pair of pliers having overlapping ends, as shown at Fig. 56, is intended to assist in removing and applying the cross chains.

A typical gasoline blow torch is shown in section at Fig. 57, B, in order that the internal construction may be readily understood. It consists of a main container of heavy sheet metal to which an air pump is attached at one side to act as a handle. The lower portion of this pump communicates with the interior of the tank by means of a bent pipe which deflects the air to the top of the fuel receptacle. The upper portion of the tank is supplied with a burner having a pipe leading to the bottom. A filling plug is inserted at the bottom of a conical depression which acts as a funnel when the torch is inverted for filling. The function of the air pump is to force air into the tank and displace the liquid fuel, forcing it to the burner where it is vaporized. The burner is of the Bunsen pattern and gives a blue flame. The intensity of the flame is regulated by a needle valve. In order to start the torch it is necessary to

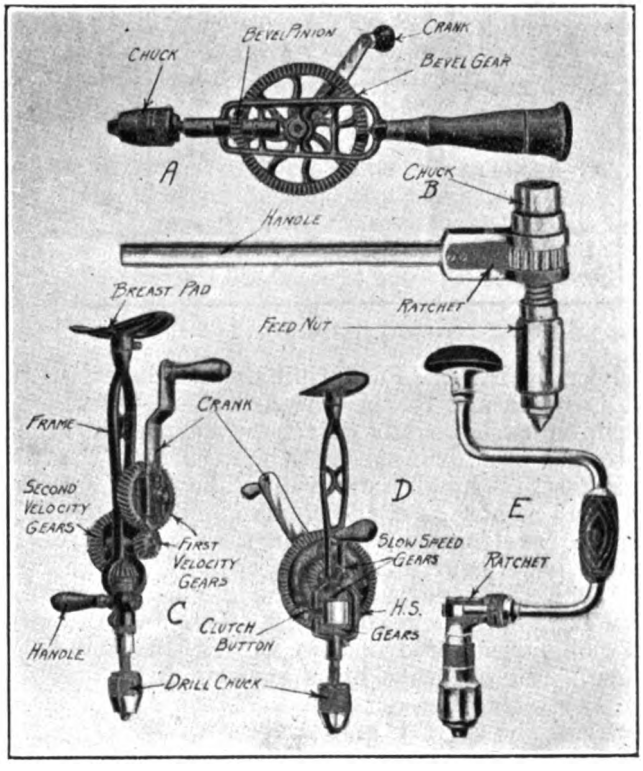


Fig. 59.

fill the pilot cup under burner with gasoline and to ignite same, leaving it burn until the torch burner body is sufficiently heated to vaporize the liquid fuel. Three forms of these blow pipes are shown at Fig. 58. That at A has a pump set into the tank and a more powerful burner that will give a very hot flame for brazing. The torch at B has a flat fuel tank instead of the usual cylindrival form and has the filler opening at the top instead of at the bottom. The flat torch is easier to carry than the round ones because it occupies less space. A very

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small torch which needs no air pressure is shown at C. Sufficient heat to vaporize the fuel and to start the torch may be obtained by holding a match at the curved portion of the burner. This form does not produce the intense heat that the torches having internal air pressure do, but the flame is of sufficient intensity to heat a soldering iron, or perform any of the work incidental to soldering.

Drilling machines may be of two kinds, hand or

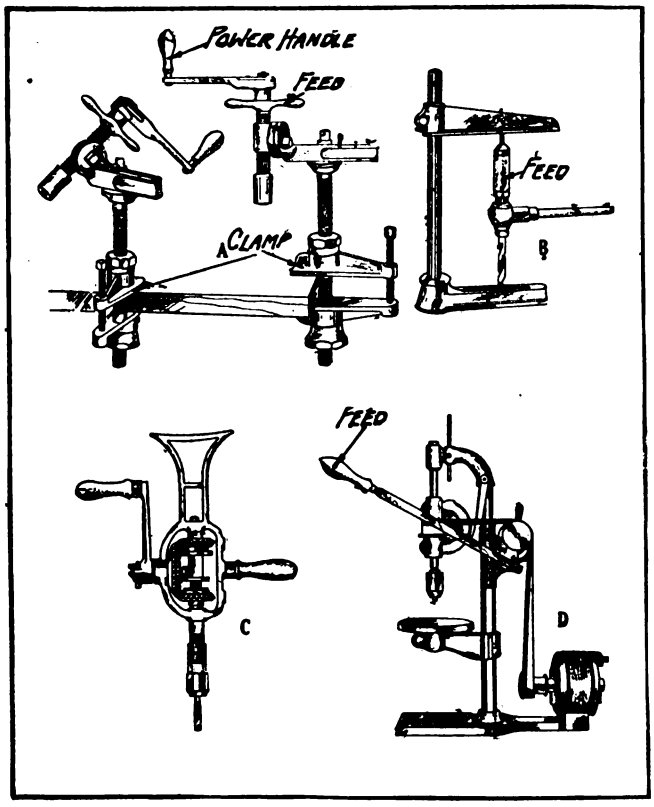


Fig. 60.

power operated. For drilling small holes in metal it is necessary to run the drill fast, therefore the drill chuck is usually driven by gearing in order to produce high drill speed without turning the handle too fast. A small hand drill is shown at Fig. 59, A. As will be observed, the chuck spindle is driven by a small bevel pinion, which in turn is operated by a large bevel gear turned by a crank. The gear ratio is such that one turn of the handle will turn the chuck five or six revolutions. A drill of this design is not suited for drills any larger than one-quarter inch. For use with drills ranging from one-eighth to three-eighths, or even half-inch the hand drill presses shown at C and D are used.

A handy tool that has many applications is shown at Fig. 60, A. This is mounted on a clamp bracket, has a screw feed, can drill holes at any angle and offers a wide range of adjustment in all directions. These are made in three sizes, one taking any drill up to 5/8 inch, a medium size that can be used up to 1 inch in diameter and a larger model that will bore holes as large as 1¼ inches in diameter. The medium size tool will be found sufficiently large to answer the requirements of any repair shop. The chucks provided will take either square shank or standard taper shank drills. It will be evident that this fitting can be easily clamped to any part of the frame and that large holes may be drilled with ease on account of the leverage provided. A somewhat similar fixture is shown at Fig. 60, B, this being in use with the ratchet drill shown at Fig. 59, D.

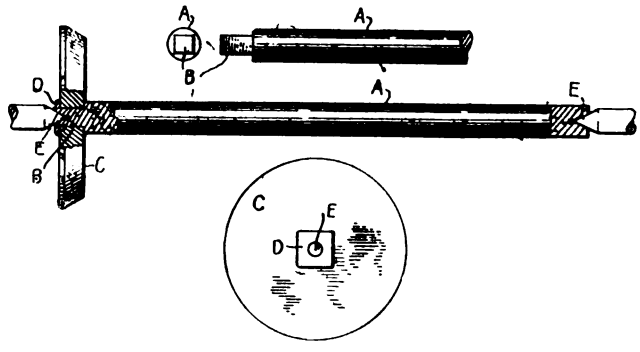
KINKS AND THINKS.

Broken Valves, Radiators, Headlights, Slipping Wheels and Loss of Power.

From N. G. Near, New York.—When a valve stem or valve disc breaks, it is not so difficult as it might seem to make a new valve that will hold its own with the other one-piece valves for a good while. Herewith I show the method that I have successfully used for making two-piece valves where the owner of the car is in a hurry and cannot or will not wait for new standard valves from the factory or storehouse.

Take a mild steel bar, A, slightly oversize, and file a square end on it as indicated at B. Be as careful as possible to make the flatted faces parallel with the axial lines of the rod. Then get a mild steel plate, C, (it can be forged out if necessary), a little thicker than the disc will be when finished, and chip off the corners of the squared piece or in other ways make it as nearly round as you can before placing in the lathe. Cut a square hole in the center of the disc to fit the squared end of the rod A. Don't spend too much time on the job though; just make it a reasonably good fit—a drive fit is preferable for obvious reasons. Then drive together and rivet the end of the rod over to hold the disc solidly in place as at D. Now center the ends carefully, counter sink, as at E, and turn down to the required dimensions. In turning the valve spindle, use a follower rest.

The valve will give excellent service, but, of course, before it gives trouble through loosening or through premature wear it is best to abandon it as soon as a standard one-piece factory made valve is procurable. Whenever I have made a repair of this sort I have always admitted that it is "not as good



When a Valve or Disc Breaks.

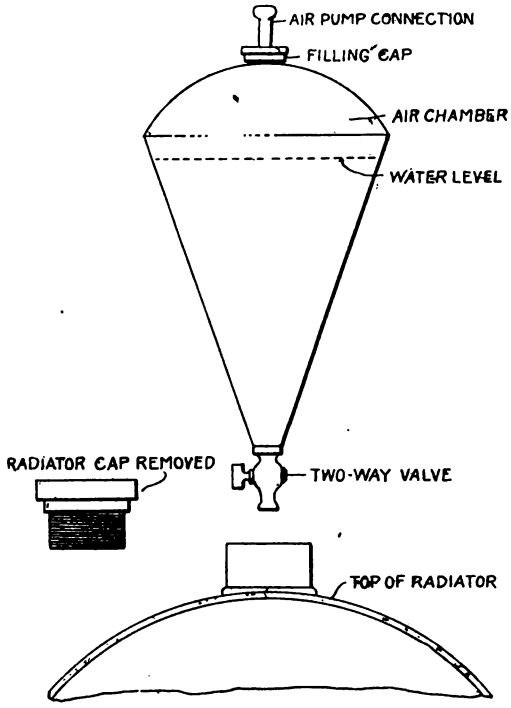
as new," and is only temporary. I believe it would be wise for more repairmen to follow such tactics for it stands to reason that a single man with a small set of tools and ordinary materials at his disposal cannot make a better valve than an entire factory which specializes in valves.

I have noticed, at automobile races, that considerable time is consumed at the pits in replenishing the radiator water supply. This is due to the fact that an ordinary funnel is used and the water is allowed to run through the funnel by natural gravity only. Now, the earth's gravity is insufficient in a case of this kind where seconds amount to thous-

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ands of dollars. I therefore suggest that an arrangement similar to my sketch herewith would save many seconds. Air could be pumped into the funnel over the water while the automobiles are racing, with an air or tire pump. Any pressure could be produced in this way and the water would spurt into the radiator in a "jiffy." Any size of funnel could be made for this usage.

I have seen about a thousand and one ways in which drivers soften the glare of brilliant headlights—paint, soap, tissue paper, talcum powder,



Filling the Radiator.

etc., but I saw the simplest of all the other night when I heard a chauffeur in New York City cursing softly among several co-chauffeurs. His side lamps refused to work and he was compelled to use the headlights which had a ferocious glare. Did he use soap, or library paste? Indeed he didn't. In his handiest pocket he had a bottle of liquid. The shape of the bottle was similar to those that usually contain whisky. He hastily smeared some of this liquid (it had the whisky odor, too) over the headlight fronts, and then, with the dust that he managed to scrape together from the street he manufactured "dark glasses." Then he drank some of the liquid. When he drove off he was singing something about the River Shannon and where it flows.

Wheel slip is bad in two ways: it wears out tires quickly and it eats up engine power. You know about the wear, but do you know how much the gasoline loss amounts to? Have you ever thought of it?

Let us suppose that you are in a mud hole; that the engine and wheels are running at normal speed —about 30 miles per hour—but you are not getting anywhere. The engine is working just as hard as though you were actually running at 30 miles per hour, and perhaps harder. You are using just as much gasoline. The gasoline is all being wasted. The slip, of course, is 100 per cent. Hence, we can make this rule—where the slip is 100 per cent., the full loss is 100 per cent.

Now let us go to a sandy road where the wheel slip is 50 per cent. That is, the wheels are running at a rate that would ordinarily drive you 30 miles per hour, but your car is moving at the rate of 15 miles per hour only. The slip, therefore, is 50 per cent. The amount of fuel used is the same as in the mud hole, but, you are getting somewhere; all of the gasoline is not being wasted. It is logical and correct, therefore, to say that 50 per cent. of the fuel is wasted where the slip is 50 per cent.

From these two examples we can then come to the conclusion that "one per cent. of the fuel is lost for each per cent. of wheel slip." This is a good rule to remember.

Similarly, each per cent. of slip in an automobile friction drive represents one per cent. of loss of power because the pressure of the wheel against the disc is always the same whether there is slip or no slip. And as long as the pressure is the same the engine is bound to do the same amount of work.

It is true that this reasoning is not "absolutely correct" because there are many different possible conditions, to take into consideration. Roughly though, and with good average accuracy, you can safely figure that "each per cent. of slip, no matter what the machine, represents one per cent. loss of power."

"THE CAR AHEAD."

The Pilot Is a Marvel of Convenience, Power and Up-to-Date Construction.

Among the cars where value is given for every dollar of price is the Pilot of Richmond, Ind. The prices are based on actual factory cost, low overhead charges and selling expenses. There is no large watered stock or bond capitalization on which large interest and dividend charges must be paid, and no large salaries. Models now on the market are the four-cylinder Pilot 40—$2,000—with either five-passenger touring or roadster body on the same chassis, the four-cylinder Pilot 50—$2,250—and six-cylinder Pilot 60—$2,500. The beautiful jewel body for either five or seven passengers will be used on the Pilot 50 and Pilot 60. The motor in itself is a marvel of simplicity, lightness, strength and power and represents the latest word in construction.

Every working part of this superior car is easy to reach and it can be handled by a woman for it is practically "fool proof." The Gray & Davis system of starting and lighting is a marvel of simplicity. There are no complicated controls—only a simple switch. The big feature is the fact that it only requires the 6 volt battery which is charged automatically by the dynamo. It starts a car under any conditions and in zero weather which is a feature to remember. It is a specially designed motor which rotates the flywheel—positive in its operation—a pressure on a pedal starts the engine. It will spin a 6 cylinder car for 1½ hours—propel it two miles. The following are the condensed specifications of this unusual car:

Axle (Front)—I-Beam, drop forging. 30 P. C. Steel.

Axle (Rear)—Full floating type, one piece pressed steel housing. Nickel steel gears and shafts.

Bearings—Annular ball bearings in front and rear axle. Special on Pilot 50 and Pilot 60. Silent type annular bearings in transmission. Nickel babbitt bearings in motor.

Body—Fore-door Roadster and Touring Car on

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Pilot 40. Five and seven passenger body on Pilot 50 and Pilot 60.

Brakes—Internal expanding of large size, both brakes acting on rear wheel drums.

Clutch—Cone, leather faced, auxiliary springs. Engagement very easy. Very efficient.

Cooling—German Silver Radiator. Mayo honeycomb type 4-in. core. Large reservoir surrounding

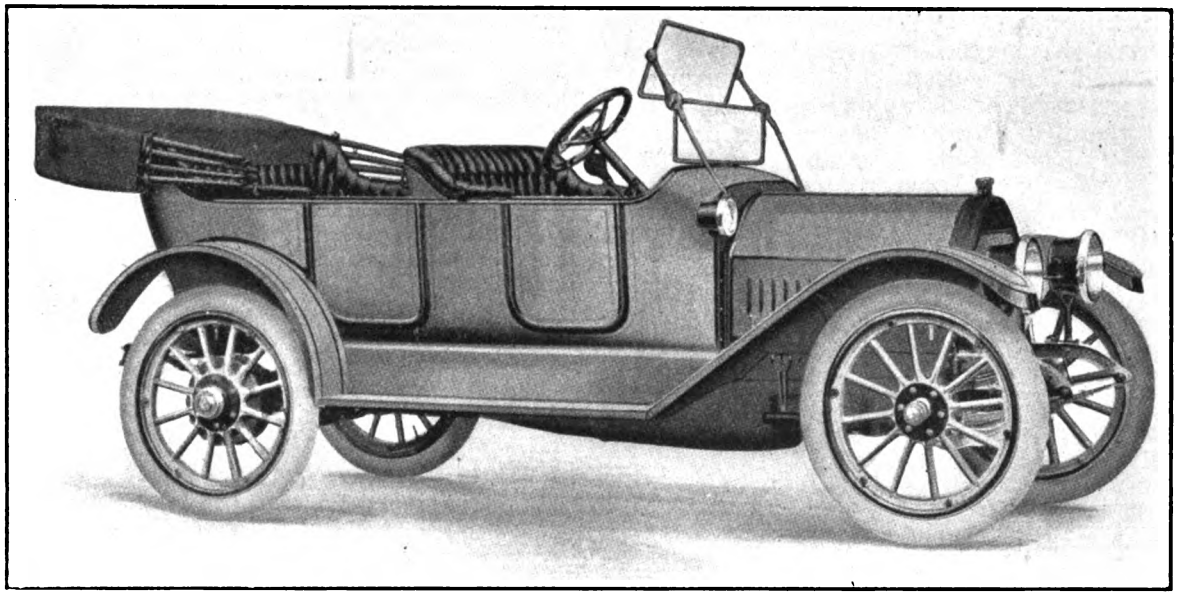
Springs—Front, semi-elliptic; rear, half-elliptic 52-in. long. Rear spring suspension insures easy riding car.

Steering Gear—Irreversible. Worm and Wedge.

Tank Capacity—20 gallons.

Tires—Pilot 40, 36x4. Pilot 50 and Pilot 60, 37x4½.

Transmission—Selective sliding gears of chrome



Pilot 40 Five-Passenger Touring Car. Price $2,000.

cylinders. Centrifugal pump, 17-in. fan on annular ball bearings.

Drive—Shaft, straight line. Double universal joints between clutch and transmission and between transmission and differential.

Ignition—Dual system. Eiseman Magneto and battery.

Lubrication—Automatic splash system.

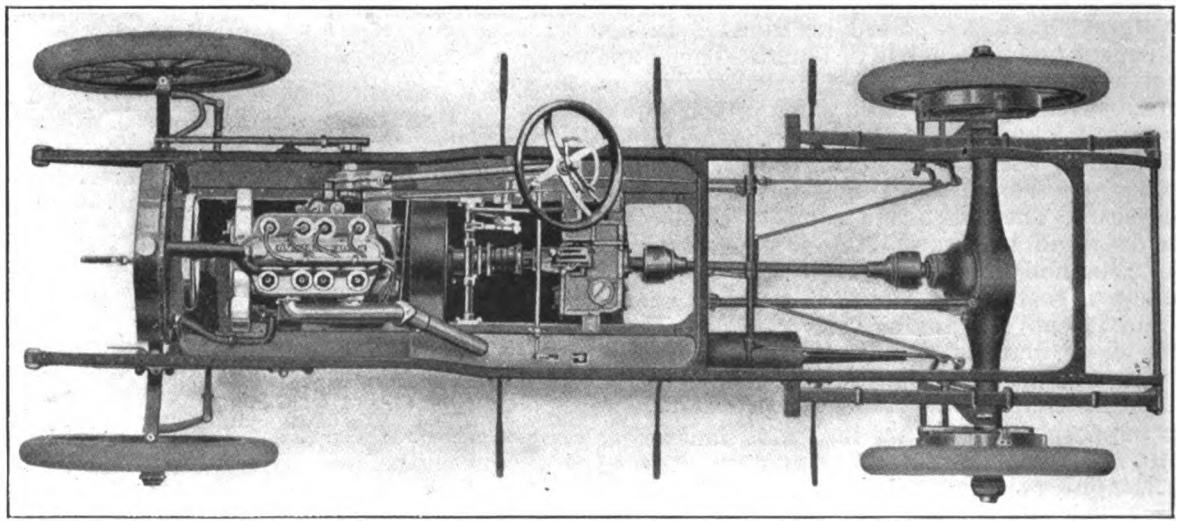
vanadium steel. Three forward speeds and reverse.

Tread—56-in. or 60-in.

Wheels—Artillery type. Twelve heavy spokes of second growth hickory Q. D. Demountable Rims.

Wheel Base—Pilot 40, 120-in., Pilot 50, 126-in., Pilot 60, 132-in.

Equipment—Standard equipment includes Gray & Davis Electric Lighting and Starting System, pure



Chassis of Pilot 40.

Motor—Cast en bloc. Pilot 40, bore 4½-in., stroke 5-in. Pilot 50, bore 4½-in. stroke 6-in. Pilot 60, bore 4-in., stroke 6-in. Pilot 40 and 50 four-cylinder; Pilot 60 six-cylinder.

Horsepower—Pilot 40, brake test 53; Pilot 50, brake test 59; Pilot 60, brake test 67.

mohair top and hood, ventilating windshield, Warner Auto Meter, (Stewart & Clark Model C-1 speedometer, clock combination optional) Stromberg Carburetor, both bulb and electric horns, tire power pump for inflating tires and connected with flywheel when in operation. Five electric lamps, tool kit, tire

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repair outfit, jack, Hind View Auto Reflector, Never-out License Brackets. Toe and robe rails on touring cars, tire irons on rear.

THE NEW HUDSON.

Final Evolution of Automobile Construction, Convenience and Lasting Quality.

Those who purchase a Hudson car do not buy an experiment. They are known and have been tested in every civilized country on the face of the globe, and in many that are far from being civilized. And it has not been found wanting in a single instance. Not a weakness or shortcoming, not a fault or criticism, has developed.

The 1916 model is a beauty, the lines being as graceful as the construction is scientific and the material of the highest quality. Meantime, the price for the 1916 new type Hudson has been reduced to $1,350, which means a drop of 23 per cent. in two years for a vastly improved car. The Hudson is probably the lightest six cylinder car on the market

quietness are of cloth composition, which has been proven to be the most satisfactory.

Water pump is of centrifugal type and of such size as to provide ample circulation of water.

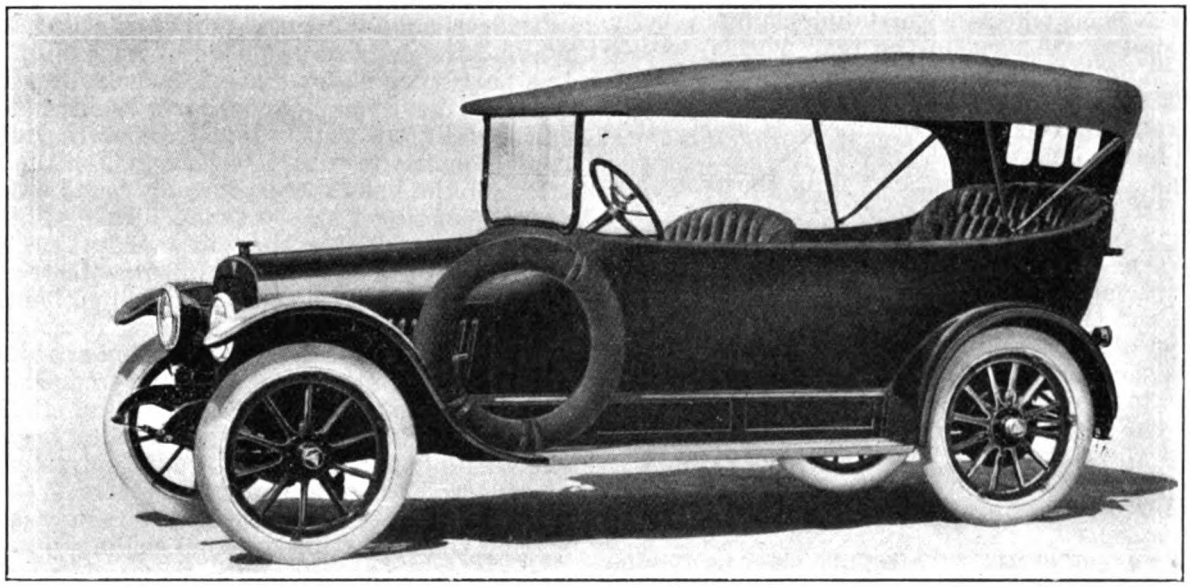
Lubrication—Motor is lubricated by constant level splash system, with reservoir beneath the crankcase.

Oil level gauge is provided on the left of the motor, this gauge indicating the amount of oil in the reservoir.

Carburetor—The motor is equipped with a carburetor of improved type, with adjustment for low speed. One adjustable control valve attached to carburetor, controls hot and cold air, and also strangler. This valve is operated by a lever on the cowl-apron within easy reach of the driver.

Ignition—New, improved, patented, quick acting system. Dual ignition, that is, one system of the magneto type for ordinary running and another, with the dry batteries, used in case of emergency.

Starting—The motor is positively self-started, thereby doing away with the necessity of the start-



to-day, this meaning less fuel consumption, less general wear, and much longer lasting tires. Here follows some of the specifications:

Wheel base, 123 inches—left side drive—right hand (center) control.

Cylinders, 3½ inch bore by 5 inch stroke. Valves are of nickel steel and interchangeable.

Pistons are of special grade gray iron, annealed, ground, and with rings in place, are lapped in their respective cylinders.

Wrist pins are of nickel-steel tubing, hardened and ground.

Connecting roads are of special steel I-beam section, heat-treated to relieve all undue strain.

Crankshaft is of an original design, forged from special steel and heat-treated.

Crankcase proper is of aluminum. The upper half of the case carries the three crankshaft bearings so that, should it be necessary, the lower half of the case can be removed without disturbing the crankcase.

The camshaft is made of special steel, hardened and ground. Cams are integral with the shaft.

Timing gears are of helical type, and to insure

ing crank. The starter is operated by pushing a small foot pedal located on the left side of the gear shaft lever in the center of the car.

Lighting—All lamps are lighted directly from the generator when the motor is running. When the motor is not running, necessary current is supplied by the storage battery. This storage battery is automatically recharged by the generator. A small lamp is located on the cowl apron, above the instruments, for the purpose of illuminating them at night. All lights are operated by switch conveniently located on the cowl apron.

Clutch—It is of an improved noiseless disc type, self-contained in an oil-tight case, which is a part of the flywheel.

Transmission is selective, three speeds forward and reverse with direct drive on third speed. Transmission is bolted to the rear of the motor, making a unit power plant.

Power is transmitted from the transmission to the rear axle through a tubular propeller shaft, and two universal joints.

The front axle is I-beam type, the axle proper being a one-piece drop forging.

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Wheel spindles are of nickel steel, heat-treated.

Pivot pins are of special steel, hardened and ground.

Positive lubrication of all bearing surfaces in the spindle head is provided by means of compression grease cups set in top of pin and in center of spindle. Leather dust washers are provided at all exposed joints.

Speedometer drive is effected by a flexible shaft from forward universal joint to indicator located in a conspicuous position.

Rear axle housing is of reinforced pressed steel which is much lighter and stronger than the ordinary combination tubing and cast housing type of axle.

The driving shafts are made of chrome nickel steel, heat-treated.

Front hubs and flanges are pressed steel securely clamped to the woodwork of wheels. Rear hubs are steel forgings.

Brakes—The foot brake is of external contracting type and the emergency brake is of the internal expanding type.

Wheels are of the artillery type. Ten spokes are used in the front wheels with 10 hub clamping bolts. Twelve spokes are used in the rear wheels, with 8 hub clamping bolts. Wheels are fitted with 34-inch by 4-inch demountable straight-side rims.

The frame is of special grade pressed steel. It is of extra heavy channel.

Springs are of semi-elliptic type in the front and three-quarter elliptic in the rear.

Steering gear is of the worm and gear construction. Worm gear and shaft are made of one piece from a special hardened steel.

Spark and throttle hand control levers are placed at the top of the steering column.

The gasoline tank is placed under the cowl with the filler in a very accessible position on the cowl-apron. The tank is tested under pressure to make sure that there is no leakage. Capacity of the tank is approximately 14 gallons.

Radiator is an improved honeycomb type, of large cooling capacity.

Trunk rack of latest type is furnished as regular equipment.

The Hudson is electrically self-cranking, and electric lighted throughout. The system is the latest and most improved in use and is especially designed for the Hudson.

The spark advance and retard is perfectly automatic and requires no attention whatever.

All lights are operated from the electric switch on the dash.

Electric starting and lighting switch is furnished with key that locks all lights in place and cuts off ignition and starting current so that lights cannot be tampered with or car started without this key.

FORD CAR USERS.

To Those Who Want Best Service and Continued Usefulness.

When the car comes in on a wet and muddy day nothing is worse for the tires than leaving the car standing on them, particularly on a stone or cement floor, for at the point of contact with the ground the tires have no chance of drying and the wet will speedily find its way through any small cuts and quickly cause havoc, a premature burst through rotted fabric being the result. Once the wheels are clear of the ground it is an easy matter to turn the wheels round to examine the tires for nails, flints, etc., that may be embedded therein without having actually punctured the tube. These should be removed and any cuts filled up with some one of the fillers used for this purpose.

Tires may, with advantage, be taken off every 2,000 miles and turned round, so that they will run in the opposite direction. This has been proved to give longer life, and, incidentally, that distance is quite far enough to run before taking them off, examining the rims for rust and dusting afresh with French chalk. They will be all the better for this attention. The jacking up of the wheels also enables one to test the bearings both easily and quickly, correcting any trouble in that direction almost at its inception. Nor is it necessary to spend a lot of money on patent jacks, some of which do not allow the wheels to turn, operating on the hub caps instead of the axles. Any carpenter or wheelwright will supply four wooden blocks about 4 inches square at the bottom, two 15 inches long and two 13 inches long for less than a half dollar.

It does not take three minutes to get all wheels up, and the car can be pulled or pushed off them in less than that number of seconds, and only having to drop about an inch no harm whatever is done. Incidentally the car is much easier to start under these conditions with top gear in, for the flywheel effect of the back wheels turning round is taken advantage of to get a good swing. This will be particularly appreciated in the winter months.

If Ford owners will experiment with the gasoline adjuster on the dashboard they will probably be surprised to find how far to the right it can be turned without adversely affecting the running of the engine after a few miles have been covered, thereby reducing the amount of gasoline issuing from the jet. If the throttle is slightly opened to correspond with the turning back of the gasoline adjuster, a very considerable saving can be effected. One must, however, put the adjustment back to the original setting when starting up from cold again, or even if a short stop is made, until thoroughly warmed up again. The farthest extent to which the screw can be turned without causing the engine to missfire through too weak a mixture will soon be found, and its position noted. There is not the slightest necessity to buy an extra air inlet for a car fitted with an adjustable jet to the carburetor.

It is almost impossible to close the gasoline tap fitted to the bottom of the Ford gasoline tank, but if a hole large enough to put one's hand through is made in the fender above the footboard on the off side of the car, the exact position being ascertained, it can then be turned off and on with ease. This is much better than relying upon the needle valve of the carburetor entirely, for it is not by any means unknown for a carburetor suddenly to commence to drip from no apparent cause while standing. If a piece of black patent leather is fitted over the hole with two small nuts and bolts, the appearance of the car is not spoiled in any way.

The Ford Company recommend owners to "go it easy," which is excellent advice from every point of view. A light car does not hold the road so well as a heavier vehicle, and must be treated with more consideration in consequence. Every Ford owner would be well advised to fit a speedometer if the car

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be not so equipped when supplied. It is almost impossible to gauge one's speed with anything like accuracy without one, and it should not be regarded as a luxury, but a necessity, and the mileage recorder provides an excellent check on the miles per gallon of gasoline run, tire mileage, and general running. The owner of a car not so fitted never gives his car credit for having done the mileage actually covered, and will then often begrudge replacements undeservedly. The Ford is such an excellent high gear car that there is a great temptation to stay "on top" too long. This puts an unnecessary strain on the car, and broken crankshafts have been traced directly to this habit. The excessive strain causes "whip" which really reaches breaking point in a shaft not built to bear such abuse.

The engine will itself give notice when it requires to be decarbonized by its rough running and proneness to knock, but this is a job which many do not carry out with sufficient thoroughness, and they do not get the full benefit in consequence. While the cylinder head is off, if the protrusion around each spark plug is carefully examined, it will be found that this is often coated with a fairly thick film of carbon, so hard that it has to be chipped off, and if pains are not taken to remove this, overheating may easily be caused. The exhaust ports, too, get covered with a flint-like deposit requiring a special tool to deal with it. A piece of metal shaped like a screwdriver bent to a considerable angle at the "business" end will get into the corners where an ordinary screwdriver or similar tool would not go. The non-removal of this causes excessive heat around the valves. If, after decarbonizing, the piston tops, valve heads and cylinder casting around the valves are polished with a piece of wire brush used for cleaning files, the formation of fresh carbon deposits will be considerably deferred. An excellent gas tight joint can be obtained by carefully rubbing both sides of the cylinder head gasket with ordinary yellow soap, taking care to tighten the 15 bolts up gradually and equally. If the car can be left over night for the joint to settle down, so much the better.

The addition of a water accelerator to the Ford circulating system has been found by many to result in better running and less waste of oil and loss of water. Less than a cupful every 200 miles will suffice to bring the water to its original level. A sluggish water circulation is far reaching in the harm it may cause, and the above offers one way out of the difficulty. If the car owner will provide himself with a few tools not included in the usual kit, it is really surprising how independent of the garages he can be for small jobs.

The range of adjustment on the coils is so narrow that it is frequently a most difficult matter to obtain regular firing for long at a time, and those who experience any trouble in this direction will be well advised if they fit a master vibrator, which has such a wide range of adjustment and equal effect for all cylinders, instead of four separate vibrators, which it is a matter of great difficulty at times to operate alike. With the separate coils, missfiring is frequently caused when the light is switched on, and the adjusting screws would have to be altered to correct this, not always successfully, and then an attempt has to be made to find the original adjustment for use in the daytime. With a master vibrator, in all probability, no different adjustment would be required, and, if so, only to a very slight extent.

When grinding in the valves, it will sometimes be found that the tappet clearance is excessive. The running of the car can be considerably improved by closer adjustment. If a piece of very thick brown paper will pass between the tappet and the valve stem easily that will give all the clearance necessary for first-class running. Valve stem adjusters can be purchased for this purpose. If upon examining a valve a ridge is noticed around the face it will result in better running if the surplus metal is removed with a valve cutter, or skimmed off in a lathe, as the passage of the gases is considerably throttled otherwise. If a light spring is dropped on to the valve stem of sufficient strength to hold the valve off its seating, the operation of grinding is considerably lightened, as the valve has not to be lifted off its seating by hand, and the oftener it is lifted during the operation the better the result will be.

It is advisable to remove the detachable plate from the bottom of the crank chamber after the first 1,000 miles running, and at less frequent intervals later, to remove the foul grease that will be found to have settled there and to change the oil. Quite a lot of metal gets rubbed off the bearings of a new engine and settles there. It cannot be too often reiterated that the first few hundred miles should be covered at a comparatively low speed in order to allow all the bearings to get well run in, and owners must resist the temptation to see what the new car will do. A little restraint at the beginning will amply repay in the long run, and the car will not develop little rattles and general looseness anything like so quickly if the pace is kept down to 20 miles an hour as a maximum at first. To run any car at the mininum of expense requires a certain amount of thought and care expended upon it, but this is amply repaid in the results obtained. All the joints and bearings of a car require more attention when it is new, but if the necessary attention is given (and it does not take long to get round) the buying of renewals will be postponed almost indefinitely.

THE EMERGENCY BRAKE.

What It Is for and How and When to Use It Properly.

F. R. Hutton in The Club Journal of Philadelphia. —The discussion of the brakes for a motor vehicle would naturally divide itself into two parts. It is plain that there must be one brake which the driver uses all of the time, and whose use becomes semi-automatic so far as his muscles are concerned, or which requires so little time to think that the brake will be applied immediately upon the necessity to use it. Such a brake to be applied in an emergency might have claim to be called an emergency brake. In the second place the brake which is to control the car in an emergency external thereto must be always in condition to use. Hence, therefore, the brake used in service should be the one to be used in an emergency. From this point of view, and regarding the emergency as something external to the car, the service brake and the emergency brake should be the same thing.

There has arisen, however, the use of the term "emergency brake" as being a brake to be used in the case of an emergency or an accident happening to the service brake. In such an emergency, used

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in this sense, there must be a brake to use when the principal or dependable brake has failed.

Those who recall the history of the early cars will remember that at first there was but one brake. This was universally applied by the foot because the hands were otherwise occupied. If one goes back far enough, the memory will unearth the foot brakes which would hold in only one direction, that is for the car going forward, while if the car started to go down hill backward the tendency was to unwrap the brake band and neutralize the pressure of the foot. Some nasty accidents resulted from this badly designed early type of brake and all modern brakes worthy of the name hold in both directions. The legislation of many states demanded the installation of two brakes, one of which to be supplementary to the foot brake already in service, and which, therefore, received the name "emergency brake," used in the second sense above referred to. It was convenient to make this second brake a hand operated device, and it received the form closely resembling the type of hand brake used on horse-drawn vehicles for many years. It was also made with a ratchet and dog detail, so that it could be used as a locking device to hold the car with the brakes set when the driver left his place and took his foot off the foot pedal. The muscles of the leg are the most powerful of the body; and a man using the extensors of the upper leg to straighten the knee can exert a pressure or produce a lift greater than he can do in any other way, and with less fatigue. For these reasons it would seem that the foot brake should be made in the design of the car to be the more effective of the two brakes so far as ability to stop the car is concerned in the presence of an emergency external thereto. The hand brake with its latch construction should only therefore be called an emergency brake because it is to be used in case of failure of the foot brake by reason of some accident thereto which may or may not be called an emergency. There used to be a general practice which still prevails in some cases to connect the hand brake with its detail of latch for locking with the mechanism which operated the clutch of the motor so that the clutch can not be put in gear with the hand operated brake locked on. This is now discontinued for the reason that it is often convenient to use the compression in the cylinders of the motor as a means of braking, and if the hand brake cannot be put on without pulling the clutch out of gear the hand brake could not be used on long grades as a supplement to the braking action of the compression. The hand brake is used by many drivers on long grades as it can be set in position and locked there. It is probable that even here, compression braking would be equally satisfactory and would save wear on the braking surfaces.

There is an opinion among certain designers that the foot brake should not be what they call "positive." This term as so used means that the operator may lock the wheels by means of his brakes so that they skid upon the ground. To prevent this they either allow the equalizing lever to be flexible enough to bend under a strong application of the brake, or they make the brake levers of small enough section to stretch, and still allow the wheels to slip. The hand brake, however, under the philosophy of design, is made "positive" so that with it the brakes may be applied with positive effect. For the reasons above indicated this philosophy is not believed to be as sound and defensible as that which makes the best brake which is to be depended upon and used in an emergency. As a matter of fact, both brakes in a well-designed car are powerful enough to exert the maximum retarding effect on a road surface upon which the tires will not slip when brakes are applied. This is an opinion held by many as a result of experience in the past on railways with the smooth tread on a smooth rail that the maximum retarding effect is produced when the wheels are just turning without slipping upon the rail. When the brake was sufficiently powerful to lock the wheels and cause them to skid on the track the train did not stop in as short a distance as when the other condition prevailed. Therefore, the brake levers are adjusted on this philosophy so that the brake cannot be put on too hard even with the maximum pressure in the train reservoir. It would seem that the same philosophy would hold always on a smooth or slippery roadway. There can be no objection to giving the driver the maximum retarding power on his foot brake so far as the designer is concerned, and then have him taught in operating not to use it all the time. A car of ineffective brake power is a menace both to those within it and to other users of streets and highways.

BATTERY HINTS.

Not New But They Must Always Be Borne in Mind.

Batteries must be carefully installed and securely fastened in position. No vibration of the cells in their containing box must be permitted, and play of the connecting straps must be prevented.

The cells must be readily accessible to facilitate the regular addition of pure distilled water and the testing of the solution.

The battery compartment must be kept well ventilated and drained and must keep out oil, water, dirt, etc. It should also be well coated, both inside and out, with acid resisting paint. A free air space must be left all round the battery.

Any spilled solution must be instantly removed by waste, wet with ammonia water, and the interior of the battery compartment kept clean and dry.

An open flame must not be brought near the battery, since a battery in use, or even when resting, gives off hydrogen, a highly explosive mixture being formed when the hydrogen is diluted with air.

Pure distilled water must be added at regular intervals and the solution maintained above the top of the plates.

Remove the plugs to add water and replace them carefully after filling, otherwise solution will be spilled when the car is in motion. Replace lost or broken plugs immediately.

Do not use tap or boiler water for refilling.

Use a clean non-metallic vessel to hold or store water.

Attend to the plugs and boxes regularly and replace broken or leaking ones.

In cold weather, add the water just before charging to prevent freezing, for water freezes at 32 degrees F., while accumulator acid does not freeze until the exceedingly low temperature of 4 degrees F. has been attained.

Density of Solution.

Ascertain the condition of the battery by testing the density of the solution.

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Use a hydrometer, hydrometer syringe, or a discharge indicator.

Test after the water added has been mixed by charging.

The density of the electrolyte in each cell should be about the same.

The values should vary from 1.22 in a fully charged cell to 1.18 in a discharged cell.

Some makers give a greater range—1.22-1.15, and in two cases 1.12. The latter figure is contrary to good practice.

The variation is to be explained by the fact that the range in density is dependent upon the amount of the acid present compared with the bulk of the plates.

Never add acid except under expert guidance.

If acid must be added and there is no time to consult an expert, make up the acid to the same density as that in the cell.

Do not add acid of 1.22 gravity to a discharged cell.

Excessive water replacement indicates a leaky cell.

Charging and Discharging.

Ascertain the correct charging current and compare this with the reading of the car ammeter when the cells are on charge.

The normal charging rate should be about one-tenth of the capacity in ampere hours (continuous discharge, not ignition rate).

A low ammeter reading generally indicates a slipping belt.

If the belt is in order, examine the brushes on the dynamo. True up, but do not displace them, for the regulation depends upon brush position.

If the cells are in order, the charge is complete when the voltmeter registers 2.5 volts per cell, or 2 volts per cell with the cells supplying current and the dynamo disconnected.

Check some time after charging, as the reading is always higher just on the completion of a charge. Say after half an hour.

If outside charging is made use of, connect the positive battery terminal to the positive charging wire.

Test polarity of the charging mains by a voltmeter or by dipping the charging wires in water with a few drops of electrolyte added. Bubbles appear at the negative.

Use carbon incandescent lamps for resistance purposes.

Avoid overcharging or too rapid a discharge.

Connect an ammeter in the circuit to avoid excessive charging current.

Never discharge below 1.8 volts per cell.

Prevention of Troubles.

Terminals and connectors must be non-corrodible.

Keep terminals coated with vaseline.

Use anti-sulphuric enamel for all connectors and cable.

Doctor a sick cell by prolonged overcharging at a reduced rate on a charging board.

Consult the makers when in trouble.

Keep the cells in regular service and as fully charged as possible.

Fully charge a battery that has to stand idle, and give it a freshening charge at least every two months, recharging fully before using.

Remove all connecting wires if the battery has to stand idle for a lengthy period.

Burns and Stains.

Keep a bottle of ammonia handy in case of an accidental splash of acid. The instant application of this liquid neutralizes the acid and prevents a hole from being burnt in cloth.

Dip the hands in water, rendered strongly alkaline with washing soda, to prevent the skin smarting.

If acid enters the eye, wash well with water, warm if possible, and then put in a few drops of olive oil. Any oil, however, is better than none, and engine oil may even be used for the purpose.

SERVICE TO THE OWNER.

From a Paper Read Before a Convention of Service Managers.

By Charles Gould, Manager of Service, Maxwell Motor Co.—This question implies the existence of a definite and fixed policy used by all companies, although such a policy, of course, does not exist. On the contrary, the meaning of the word "service" as applied to the owner is varied in its interpretation. In fact we may say that "service" means something different to every manufacturer. Furthermore, as our interpretation of it relates to one service only and as we believe the discussion of any single company's policy would beg the question, we will take the liberty of changing this query to read: "What Should Constitute Service to the Owner?"

Service to the owner should embrace the following main components

1. Parts.
2. Repairs.
3. Supervised instruction.

Besides these, co-operation between manufacturer, dealer and owner is a necessary adjunct. Each has a very distinct duty, the performance of which alone makes successful service possible; and after endeavoring to define what we mean by "parts," "repairs" and "supervised instruction," we will state what we think these duties should be and the manner of their performance.

By "parts" we mean not only the matter of purchasing new parts to replace those actually worn out and the method of replacing defective parts, but also the rules which determine whether or not a part is defective, and for such as are found to be defective, the proper passing of credit.

There should be a sufficient supply of parts so located as to be at all times conveniently obtainable by the owner. There should be a well defined meaning of the word "defective;" this definition to be the result of judgment, which, though broad and liberal-minded, will impartially consider the manufacturer as well as the owner. This determination must of necessity permit the use of common sense in the judgment of particular instances, but the number of these particular instances should be carefully recorded as such and care taken to guard against their injudicious increase. Accidents, lack of oil or grease, driving ignorance and temperamental differences between owner and dealer are some of the things which service should not be called upon to cure.

In this very connection were the question asked, "Has the manufacturer been too liberal in his interpretation of the word 'defective' as applied to his dealings with dealer and owner?" would not the implied affirmation be forthcoming? Has the time come to strictly enforce the 90-day warranty or at least to so supplement it that the limit of broad in-

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terpretation may be definitely fixed? "Free from defects in material or workmanship under normal use and service" seems to be a very definite phrase, but is the meaning of "normal" accurately understood?

When these questions have been squarely met and answered and a standard set up, the owner should unquestionably be entitled to replacement of all parts free of charge which are defective in material or workmanship, and for these reasons only and during 90 days only, or whatever the specified time may be. Making these replacements, or the passing of credit for a like amount, should be made contingent, however, upon the receipt of the defective parts, transportation charges prepaid.

By "repairs" we mean the provision of adequate facilities for the repair of parts, the making of necessary adjustments and inspection, the establishment of a definite rule in regard to the amount of free adjustment and inspection and the fixing of a scale of prices for certain classes of work.

Service to the owner should constitute these facilities and the rules governing their use. Not only should he be entitled to know beforehand the cost of work when the amount of it can be predetermined, but he should be given to understand in no indefinite terms the exact amount of free adjustment and minor repairs he can expect. To make this effective, there must be a well-equipped and a well-run shop. A careful and painstaking policy, leavened well with courtesy and a spirit of "nothing is too much trouble" should form a part of this shop's equipment.

Instruction constitutes a very important part of service to the owner. It should begin with the sale of the car in supplying him with complete information in printed form regarding not only the care and maintenance of his car, the proper method of ordering and returning parts, but also suggestions relative to all other matters which will lead to the fuller enjoyment of his car and to the keeping down of his cost of maintenance.

These instructions should be constantly called to the owner's attention by showing him, if possible, the exact rule the violation of which has made repairs necessary. At every opportunity he should be impressed with the fact that his car is a very valuable piece of machinery and that it requires a fair amount of care and attention. He should be shown that neglect is not only a poor substitute for this care, but made to see to what extent it has touched his pocketbook. So instruct him that he will share with you the knowledge that although his car will perform wonderful feats, it is not equipped with a brain, and by these instructions convince him that an ounce of prevention is worth more than a pound of cure.

It should be the duty of the dealer constantly to maintain a complete supply of parts. He should be guided absolutely by the company's policy in making adjustments and replacements and he should not only pass to the owner the same amount of credit which he receives from the company, but go even further in his interpretation of the meaning of the word "defective" and be more liberal in his allowance of free adjustment and minor repairs.

It should also be the dealer's duty to maintain a proper repair shop. He should make it his particular duty to insist upon a systematic inspection of the owner's car and it should be his earnest endeavor to instruct the owner in the proper manner of adjustments and minor repairs. While the latter may tend to curtail somewhat the volume of his repair business, it will be more than made up to him in increased sales and he will be rewarded also by a constantly growing number of satisfied customers. To properly enforce the policy laid down by the manufacturer, particularly where it is his clear duty to refuse free material or labor, he should keep a separate record of every car and the amount of service performed on it.

The manufacturer's duty should consist in establishing the rules governing service to the owner. It should also be his duty to see that these rules are rigidly enforced. He should conduct a systematic inspection of the dealer's stock of parts, his shop practice, accounting methods and the charges made for repair work. He should instruct the dealer in the method of best keeping such records, the inspection of which will reveal to him exactly the amount and kind of service the dealer is giving, and when this inspection finds the necessity of a change, the manufacturer should insist upon its adoption.

Before passing credit to the dealer, he should insist upon the receipt of the owner's name and address, and when such credit is passed to the dealer, the owner should at once be notified. Pride alone should teach the manufacturer the necessity of jealously guarding the method of his dealers in handling his product.

He should also do his part in keeping dealer and owner thoroughly posted at all times in regard to the results of his experience, and in order that this experience may consist of more than the information gathered by his representatives in the field, he should maintain a well-equipped service experimental laboratory for the purpose of adding to the general sum of mechanical knowledge, with particular reference to adjustments and repairs. The benefits of such work should be passed along by him to both owner or dealer. Any suggestions received from the owner or dealer should have his immediate attention, whatever their value. Full credit for such as may lead to an improvement, and the reason for the impracticability of the rest, should be courteously given.

The manufacturer should constitute himself the umpire of all disputes between owner and dealer and his decision should be absolutely final, and, although the owner should be made to feel confident that he will be accorded at all times just and fair treatment, he should be held strictly to account for any attempt at sharp practice. The policy of standing back of one's representatives will work out as successfully in the giving of service as elsewhere.

It would be the owner's duty to assist in every way towards properly and efficiently carrying out the service policies as outlined by the manufacturer. He should furnish all information necessary to the proper filling of orders and the issuing of credits. At the very outset he should be made to understand that it is not the dealer's nor the manufacturer's duty to write him for information which should have been part of his original order. He should not be coaxed too often to use the same kind of business methods when ordering or returning parts as are necessary in probably all of his business dealings. As the matter of service concerns him chiefly, he should be more than willing to co-operate, not only by calling the manufacturer's attention to shortcomings on its own or the dealer's part, but he should be ever willing and ready to make helpful

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suggestions to the manufacturer and dealer, which in the final analysis will redound to his own benefit.

Finally, a service to the owner which is actually furnished by the dealer, under a systematic and well-defined policy laid down and supervised by the manufacturer, not only can be made the means of an enormous financial saving to all concerned, but also will create a well-founded feeling of satisfaction which the combined co-operation of dealer, manufacturer and owner will do much to foster.

CORD TIRES.

Their Construction and Some of the Advantages Claimed for Them.

At the Indiana section of the S. A. E., J. H. Wagenhorst of the Goodrich Tire Company, read a paper on cord tires in which he said:

Fabric Tire Construction.

In fabric tire construction the cloth or fabric is cut of a certain length and width to thoroughly envelop the core or form upon which the tire is built. One ply after another is laid until there are a sufficient number of plies in the carcass to give it the necessary strength and shape. Certain variations in length of circumference at the tread as well as at the bead are bound to prevail due to the shape of the tire. These variations in length are to a large extent, but not wholly, equalized during the building up process. The inequalities are, therefore, bound to cause disturbing forces in the tire, of which a more detailed account will follow. It is true that at certain parts of a fabric tire some material may be in tension while other parts are in compression, due to the inequalities spoken of. This tends to develop certain forces and heat while the tire is in motion.

Heat in Tires.

The general supposition is that heat in tires is due to road contact and skidding. To some extent this is true, but the percentage of heat from this source as compared to the real cause is small. As a matter of fact a very large percentage of heat comes from the inside or carcass of the tire. There are found to be variations in tension in each ply and between adjacent plies. The various plies not acting uniformly, the deflection due to contact with the road when a tire is in use, causes what is known as internal friction, which is practically the direct cause for the heat developed. The tire in use is constantly changing its shape or form at places of contact with the road, which requires a certain amount of energy; the greater the change in shape, the more energy is required and consequently the more heat developed.

Stone Bruises.

Whenever the order of curvature of the inner plies is changed from convex to concave under inflation, due to a severe blow, the inner plies are apt to break. In combination with the series of fabric cloth layers in the carcass will be found a certain amount of rubber by which these plies are stuck to each other, the power of adhesion being in a large measure in proportion to the quality of rubber used. The structure of a fabric tire is such that the warp and woof have no chance for elongation when severe blows are delivered. The result is that the inner plies cannot convey the shock over any great distance. In other words it is concentrated at or over the surface of an area about equal to the size of the object struck, the result being that the material is overworked and consequently breaks. How many know, however, that this has happened? No one removes a tire after a particularly hard impact, providing the inflation holds up and the tire has no apparent cut. The tire may not show the least sign of injury, yet on the inside will be found a broken strand in one, two or three plies. The tire has sufficient remaining strength to hold up for some time, during which wearing of the material of the remaining strands in all plies is going on until finally the casing gives way with no indication of defective fabric. When blow-outs occur on the tread, the cause has invariably been some severe blow by impact with a stone, block of wood, iron or any hard substance.

The Effect of Stone Bruises.

The body of a fabric tire is more rigid than that of a cord tire and consequently it will not bend through as large an angle without breaking. Impact tests have been made on fabric tires as well as on the cord tire to determine their relative strength. A pile driver was erected with a hammer of a certain weight, having at its bottom a projecting point about 2 inches long and 1 inch in diameter. It was found by dropping the hammer on a fabric tire and on a cord tire of the same size, that the cord tire would stand about double the blow before being injured.

If you should pull on a single cord in a cord tire, you would notice a slight movement along the entire strand from pin to pin. By releasing the pull quickly, the cord can be seen jumping back to its original position, showing that every portion of the cord does a certain amount of work when called upon. This action distributes the blow of stone bruises or shocks over a large area. The distance from pin to pin varies from 15 to 20 inches. To illustrate more clearly the effect of this length in distributing a shock, suppose an inch of this cord were subjected to a blow equivalent to 100 pounds. The cord being thoroughly anchored would have to resist all this in one inch. If the cord were 20 inches long, the shock would be distributed over 20 inches, each inch taking up a certain amount of the strain. The fact that the cords have freedom of motion and are embedded in rubber and also have a chance to elongate, makes them act as a dissipator of heavy blows.

Strength.

We have made numerous tests of cord tires and fabric tires, as to their comparative sternght, and find that the cord tires are considerably stronger. This is due to the fact that every cord is working more as a unit. We have frequently subjected 4-inch cord tires to 800 pounds hydraulic pressure without failure. These tests were made on tires that had already given 6,000 miles service.

Heat.

Cord tires running under the same conditions as fabric tires show a considerably lower temperature. This means a saving of horsepower by the use of the cord tire. The cord tire being more flexible offers less resistance to action and does not develop heat. In cord tire construction, with both plies laid under equal tension, there are no inequalities in tension and no excess work to be done in overcoming internal friction. It is claimed that the saving

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in horsepower is easily 15 per cent., and the fact that cord tires do not heat up proves that the saving is directly in the tire.

To test the comparative load-carrying properties of fabric and cord tires, a hill was selected on which the grades were measured and it was found that with equal size tires a car carried 800 pounds more load at a higher rate of speed with cord tires than could be carried by the same car with fabric tires. In these tests the throttle of the car was fixed and not disturbed during the time the test was going on.

Repairs.

Cord tires can be repaired so well that the repaired portion is fully as strong as any other part of the tire. To prove this, suppose a tire has been cut or injured so that it is necessary to remove the cut or broken cords in order to make the repairs. The cords are taken out by stripping off enough of the tread to expose the cord between the two pins where the cord is looped. The bead covers are removed and the beads forced away from the tire far enough to allow the pins to clear, after which the broken cords are slipped off the pins. A repair may cover a space of several inches and include both plies if the injury is great enough to cut through both. Owing to the fact that the cord tires do not stretch, we keep what are known as cord sections. These sections are taken directly from tires made for such repair work. The cord section is fitted directly in the space whence the broken cords have been removed, fitting perfectly over the pins, as well as conforming to the original shape and size of the tire. The repaired section of the tire is then vulcanized.

In conclusion, I would say that cord tires have these advantages over other types: Greater engine efficiency; gasoline saving, which guarantees greater mileage; additional speed; quick starting; easier guiding, thus reducing the work of steering; greater coasting ability; greater strength; practical immunity from stone bruises; greater riding comfort and safety. All these advantages are due to two things. First, the equality of tension in all members of the cord tires, and secondly, the use of only two plies in absolute unison, which means that there is no work to be overcome due to inequality of tension in the tire. The only way that a tire of this kind can be made is by the use of a specially prepared cord. It is the nearest approach to the ideal construction, which as has been stated, should be a one-ply tire, as it has but two plies, and gives a tire of greater strength.

THE AUTOMOBILE ROUND TABLE.

Care for the Car Finish and Tires—Prompt Service and Touring.

From G. D. Crain, Jr., Kentucky.—The owner of a new car, especially if it is one that has just left the factory, should be particularly careful about allowing mud to get on the finish for a few days after he puts it into service. There is always a possibility that the varnish may be a little green, and in that event the mud is likely to leave a spot that will be very hard to eradicate, and will spoil an otherwise beautiful appearance.

A friend of the writer recently had an experience that illustrates this very well. He purchased an automobile and decided to drive it home from the factory. He had been very urgent about delivery at a certain date—the beginning of his vacation—and possibly matters were rushed some in order to get the car ready to run by the time specified.

The auto looked good, ran well and everything seemed to be fine, so that the motorist started on his 500-mile trip without misgivings. And, as a matter of fact, none were needed as far as the mechanical features of the car were concerned, for he made the trip easily; but oh, that finish! Where mud had splashed up on the fenders and hood, the best efforts of the garage people were unavailing; they got the mud off, but each spot was marked by a stain.

The owner tried all sorts of methods to remove the spots, but inasmuch as they were due to a finish that had not hardened perfectly, there was nothing to do but wait for them to wear off. By the time the first gloss of the finish had disappeared, the spots had become about the color of the remainder; but that took some time.

If there is any suspicion that the finish is not altogether dry, a wash in extremely cold water will go a long way toward hardening it. Some motorists recommend greasing the car all over, stating that mud and other foreign matter wash off easily with the grease, leaving the finish smooth and clean.

"Selling" the Dealer a Car.

"When I take a car in trade," said a veteran automobile dealer, one of the few really successful members of the trade in his town, "I am buying something—not the man who gets the new car. In other words, the automobile owner who comes to me wanting a trade is in the position of the seller; not of a buyer. He has something to dispose of—his old car. The dealer is buying something which is, comparatively speaking, poor merchandise, and which he must sell again in order to get his money out of it. It is dangerous business.

"Our experience has been such that this season we have practically eliminated out-and-out trade-ins. About the only way we handle second-hand cars is to put them on our floor and agree to sell them for the owner. We do the best we can with the car, and submit all propositions for his approval. This relieves us of all risk, and at the same time shows the owner what the dealer is up against when he attempts to rehandle a used car and make money on the transaction.

"Occasionally we have calls for used cars at just about the time we are dickering with a chap who has something that is in demand. We arrange for the delivery of the used car before we make the sale of the new one, and in that event turn the old machine over to the new owner immediately. But, in any case, we take pains to see that we are not going to be caught with a lot of second-hand stuff which must be sold again before we get our profits back.

"There is where most of the people who have started in the business and failed have lost their money."

Tires Still Give Trouble.

The person reading the announcements of the car builders, and noting the claims made for easy-riding qualities, secured by the use of cantilever springs, thick upholstery, oversize tires, etc., and who then turns to the ads of the shock-absorber manufacturers to see how they assist in making "all roads boulevards," may get the idea that one can drive as fast

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as the engine will turn over, no matter what sort of going it may be.

But this is far from the case, and aside from the fact that some discomfort is experienced in even the best of cars in riding at high speed over bad roads, the fact that such going is extremely hard on tires ought to give the motorist pause. The springs and the upholstery and the shock-absorbers help to save the passengers, and good springs likewise are beneficial from the standpoint of the motor; but the tires get just as much shock and pounding as ever, and bad roads will soon show in ruined tires, if the latter are not considered in getting over the highway.

Good sense, as well as easy riding, suggests that even though rough roads may be negotiated at high speed with a minimum of discomfort, it is far better to take them at a moderate pace and save the tires.

Prompt Service Counts.

An automobile tire dealer who has the biggest end of the business in his town on tires and vulcanizing carries a considerable stock of sundries, but in spite of his popularity and pre-eminence on tires, he has never been able to do much with the merchandise end of the business. The explanation, which apparently has not been grasped by the dealer, is simply that it takes too long to get waited on in this department.

If a motorist wants a tire change ten miles from the store, he can phone in and have a man on the job in less than half an hour. If a car drives up in front of the store for gas or oil, the supplies are forthcoming immediately. The dealer has organized his business with prompt service along those lines in view. On the other hand, if an automobile owner is interested in a new specialty, and comes in to inquire about it, it takes so long for someone to disentangle himself from the other business of the concern that the interest of the prospective purchaser has cooled off considerably.

Having a stock of the right goods is only the first step in the direction of selling them; even following this up with good advertising and display work will not be sufficient; but the sales effort inside the store must be right, and that means that the customer must be waited on promptly by a salesman who is able to concentrate on that particular thing for the time being.

The possibilities of the sundries business are much greater than many dealers believe. As it is the customer usually comes in and sells to himself, without much help from the dealer or his sales force.

Touring De Luxe.

By "touring de luxe" reference is not made to any special style or luxury of the automobile itself, but to the convenience which is afforded by the great service organization which the industry has built up.

A few years ago the automobilist who started on a long tour felt as though he were taking things into his own hands. He was prepared to handle most any job that might develop in connection with his machine. He expected to have indifferent roads to tour over, inadequate information as to the best and shortest routes, and more or less difficulty in locating garages and getting gasoline and oil. It was considered a rather hardy autoist who was willing to set out on any extensive trip.

Contrast this with all of the facilities which are afforded at present. Not only is the motor car itself so thoroughly standardized that engine troubles are few and far between, but road information is practically complete, as is garage service. An automobilist with little or no mechanical knowledge can tour just as confidently as an old hand, and outside of knowing how to change a tire—which with demountable rims is not much of a job—about all that he need be able to do is to drive the car.

If some of the automobilists who toured ten years ago could go over the same ground now, with present advantages of car, roads and service facilities, they would certainly say, "Oh, what a difference just a few years make!"

Out of Gasoline.

From the Ohio Motorist.—Under the spreading chestnut tree a stubborn auto stands, and Smith, an angry man is he, with trouble on his hands. He cusses softly to himself and crawls beneath the car, and wonders why it didn't bust before he got so far. The carburetor seems to be the cause of all his woe; he tightens half a dozen bolts but still it doesn't go. And then he tries the steering gears and finds no trouble there, till wet with perspiration, he quits in sheer despair. He squats beside the road to give his brain a chance to cool, and ponders on his training in the correspondence school, and then he starts the job once more, until by chance it's seen the cause of all the trouble is he's out of gaosline.

Fire Precautions.

"One often hears the argument that heat causes expansion of the air in a tire sufficient to produce a blow-out," says P. W. Litchfield, Factory Manager, The Goodyear Tire & Rubber Co. "Many motorists thus excuse their habit of running tires under-inflated. Even experienced garage men advise that tires be run at fifteen to twenty pounds lower pressure in hot weather. We have to admit, of course, that heat does expand air and raises the pressure in a tire, but in its practical effect the rise in temperature is insufficient to cause even the slightest danger.

"To satisfy ourselves on this point we recently made an unusually severe test, using a runabout equipped with 33x4 tires. We selected a day, which according to the local records was the hottest June day ever recorded. The tires were pumped up to eighty pounds with the car standing in the cool of the garage. It was driven intermittently for about an hour, and when not running was allowed to stand in the sun. Then it was taken for a spin at forty miles an hour over brick and tarred wood-block pavements. On measuring the pressure we found it had increased just four pounds.

"As far as the welfare of the tire is concerned a difference of four pounds is really no difference at all. Tires are now built with such a high factor of safety that an increase in pressure of many times four pounds would not cause a blowout unless already ruined by overloading and under-inflation. We have often inflated up to three hundred pounds without any damage to the tire.

"The most serious variation in tire pressure is caused by leakage. Rubber is to a small degree porous and will allow air under pressure to leak through it. A certain amount of leakage through both tube and valve is normal and to be expected. Your pressure may maintain itself for a considerable time, but it is never safe to count on it. You cannot put it too strong that under-inflation, not over-inflation, is the condition to guard against."

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NEW AND INTERESTING THINGS IN MOTORDOM

Radico for Leaking Radiators.

This is a new compound which has recently been put on the market by the Radico Manufacturing Co., Box 887, Springfield, Mass. The illustrations will

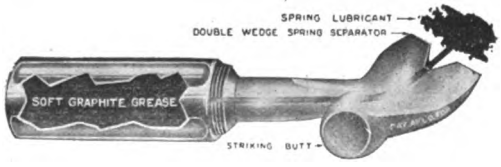


give the reader an excellent idea of the appearance of a can of Radico and also show what the manufacturers call their "Silent Salesman Display Box," which is for the counter or show case of the supply dealer. It is claimed that with Radico anyone may make a metallic repair absolutely sure and permanent in 15 minutes. The Compound contains no acids or other injurious minerals which would eventually corrode the metal and cause other leaks. Motorists who have had trouble with leaky radiators, will appreciate this compound and it will undoubtedly have a large sale.



The Tomahawk Spring Lubricator.

The Tomahawk Spring Lubricator is an effectively simple tool for spring lubrication. Soft graphite grease, injected between the leaves of the springs



is the best known lubricant and will double the comfort and easy riding of your car, even if it is equipped with the best make shock absorbers. It eliminates the squeak, adds to their flexibility and allows free movement of the springs to absorb the shocks. Each application is good for 1,000 miles. It is very simple to operate and made of the finest drop forged steel hardened and nickel plated. Graphite grease greatly exceeds oil, as a spring lubricant which is too thin in body and will creep out and be absorbed by the dust and dirt that accumulates around the springs. It is easily washed out and evaporates. The price of the tool is 75 cents and is manufactured by the Charles W. Manzel Co., 307 Beard Avenue, Buffalo, N. Y.

Edison Day Prize Contest.

In conjunction with the celebration of Edison Day, October 21 this year, the thirty-sixth anniversary of the invention of the electric incandescent lamp by Thomas A. Edison, a nation-wide prize contest for boys and girls has been inaugurated by the Edison Lamp Works of the General Electric Company. Thirty-three grand prizes and 2,000 smaller prizes amounting to $2,500 are offered, and the conditions are such that either boys or girls may compete with equal chances. The contest will be carried on in co-operation with lighting companies and dealers all over the United States. The contest opens 12:01 a. m., Tuesday, Sept. 21, and closes 12:00 midnight, Thursday, Oct. 21, 1915.

The first prize for boys is a $275 Indian big twin motorcycle and for girls is a $200 new type Edison diamond disk phonograph with $75 cash for records; the second prize for boys is an $80 Evinrudo detachable rowboat or canoe motor, and for girls is an $80 order on any jeweler for a choice of jewelry; the third prize for boys is a $47 Old Town "Octa" 17-ft. canoe, and for girls is a $47 Parisian ivory toilet set; and so on down through a long list of jewlery, musical instruments, cameras, sporting goods, etc., for the thirty-three prizes. Each of the 2,000 boy or girl contestants that stand next highest will receive an Eveready fountain pen flashlight. Each prize is not awarded to one boy and one girl contestant, but the first prize to one boy or one girl, and so on. The boy or girl winner also has the privilege in each case of accepting the cash equivalent instead of the prize.

The conditions of the contest provide that each entrant must be under 18 years of age, and live in or near a city or town having electric light, in which a distribution of the cards for crediting Edison Mazda lamp sales can be made. The contestant has to secure from the local lighting company or agent for Edison Mazda lamps an official contestant card and the number of printed order cards desired, on which the contestant's full name and address should be signed in the space provided. Next the cards have to be distributed by the contestants during the time authorized to users of electric light in homes, stores, factories, etc., who can be induced to replace old style carbon incandescent lamps with modern Edison Mazda lamps, or who contemplate purchasing a new supply of lamps. The purchaser fills in his order for Edison Mazda lamps on the card, which can be returned to the local lighting company or Edison agent by the contestant, or mailed in or delivered personally by the purchaser during the stipulated period, from Sept. 21 to Oct. 21, 1915. Sales to individuals or firms holding contracts for Mazda lamps will not count, nor will free renewals.

The points of the contest are counted by watts, the current consumption of each new lamp being given in watts on the sticker. An order for one 10-watt lamp would credit the contestant with 1x10=10 points; four 25-watt lamps would make 4x25=100 points; three 40-watt lamps, 3x40=120 points; five 60-watt lamps, 5x60=300 points, and so on, the total number of points on the contestant's orders constituting his or her score.

After the contest is closed, Oct. 21, the lighting companies and Edison agents will total and turn in all the cards to the Edison Lamp Works of the General Electric Company, where they will be sorted and counted. The contestant, boy or girl, whose name appears on order cards totaling the highest number of watts, or points, in lamps sold will receive the first prize; the next highest, the second prize, and so on through the list. In case of a tie by two or more contestants, each one will receive the prize. This rule applies to all prizes except in the case of flashlights. The prizes will be distributed by the Edison Lamp Works of the General Electric Company just as soon as the cards are counted and the winners determined. Scores will be counted only on a basis of retail sales of Edison Mazda lamps through regular appointed agencies. Standard package quantities will, however, count in such sales. No prize will be awarded to any employe of the General Electric Company, of any lamp or of any lighting company.

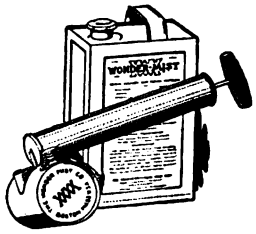
Change in Name.

The corporate name of the O'Neil Tire & Protector Company of Akron, Ohio, has been changed to the O'Neil Tire & Rubber Company, and all in the trade who are dealing with this concern should bear this fact in mind.

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Wonder-Mist.

The Wonder-Mist Company of Boston, Mass., after a great deal of experimental work, both in the laboratory and in practical use, introduced Wonder-Mist to the motor trade some two years ago. Wonder-Mist is entirely free from acid, grit



or any other injurious substance, is non-inflammable, non-combustible and non-poisonous, and is sold, under a money-back guarantee. It contains no gum or wax to necessitate a backbreaking amount of rubbing or to fill the corners with an unsightly deposit, but is applied with a sprayer which distributes a fine mist evenly over the surface to be cleansed and is consequently easy and economical to use. A slight polishing with a piece of cheese cloth then cleanses the surface and restores the brilliancy of the finish.

Besides it cleans and polishes furniture, woodwork, ornamental bronze, iron, floors, marble, dark leather and linoleum and is fast becoming a household as well as an automobile necessity.

Pedal Lock for Ford Cars.

This lock affords the owner of a Ford car absolute protection against theft, as it locks the clutch pedal in neutral, so that the motor may be started but the car cannot be operated. This lock can be put on the car by anyone in two minutes and it becomes a part of the car. There are no holes to drill. The lock fits in place of the lower left hand bolt in the base of the steering column. In some of the larger cities we hear reports of ten Fords stolen in one day, and when these cars are recovered, which is seldom, they are always damaged more or less. Many use a lock on the coil, but this does not positively lock the car, as with one end of a wire attached to the magneto terminal on the front of the dash, and the other attached to the base



A Reliable Lock.

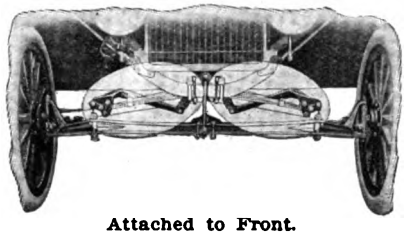
of the vibrator on the coil, the car may be operated, but with the lock there is no possible way for a thief to run away with the car. This device sells for only $1.50, and all inquiries and orders should be addressed to the Commercial Manufacturing Co., Commercial Building, Cleveland, Ohio.

Speedometer Parts for the Trade.

A large line of speedometer parts including swivel joints, flexible shafts and fibre gears for every speedometer on the market is manufactured by the Ogden Manufacturing Co. of Columbus, Ind. Their product is of superior quality and their prices are low. Proprietors of repair shops, dealers and jobbers should write for quotations and all such correspondence will have prompt attention.

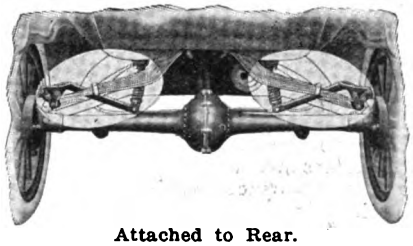
Easy Riding for Ford Cars.

Flexlevers are as their name indicates, a system of flexible levers which makes the Ford car ride like a high priced car. They prevent practically all vibration and overcome the disagreeable rebound, saving that lame back and making long



Attached to Front.

tours a pleasure rather than a hardship. They do not let jolts get into the car; they are absorbed immediately, thereby saving an immense strain on the mechanism of the car, reducing tire expense, thus saving their cost many times over in the wear and tear of the car. They work equally well at all speeds, and are essential on all kinds of roads. They do not allow any side sway of the body, or affect the steering of the car in any particular. They require no special machin-

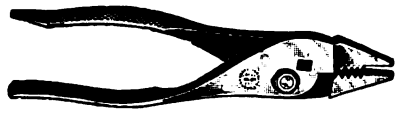


Attached to Rear.

ing to attach, and the complete set of four can be attached in thirty minutes without the removal of wheels or jacking up of the car. There are no wearing parts to get out of order, no caps to lose or rattle, no lubrication is necessary, and when attached properly will last the life of the car. Sold subject to thirty days' trial and if not found strictly as represented and perfectly satisfactory, money will be refunded. They are made by L. P. Halloday Co., Streator, Ill., as are also the tire holders for Ford cars, illustrated herewith.

"Red Devil" Automobilist's Plier.

A handy vest pocket automobilist's combination slip joint plier with a Prest-O-Lite tank opener in the jaw is gotten out by Smith & Hemenway Co., Inc., 179 Chambers Street, New York City, manufacturers of "Red Devil" tools. It is a nickel plated drop forged steel tool and is only 5 inches in length, vest pocket size. The handles are milled and shaped to assure a firm grip. It is accompanied by a two years' signed and sealed bond, guaranteeing two years' satisfaction to the user, or a new tool is replaced free of charge. It comes in a leatherette case. The reason that the price is kept within practical limits is made possible by enormous output. It has proven beyond experiment that it is a highly practical tool for gripping bolts, nuts, pipes,



Vest Pocket Pliers.

screws, wires, etc. The specially designed thin nose permits use in close places, where an ordinary pair of pliers is too clumsy. In spite of these features, it retails for only 60 cents, and is said to be well worth the investment.

The Stewart Handy Worker.

This is a remarkable combination tool which is described by the manufacturers as a complete repair outfit in itself. This tool combines in one the following appliances, a strong practical anvil; a powerful vise, up to 4½ inches; width of jaw 4 inches; a sure-grip steel pipe vise, up to 1½ inch pipe, a Corundum grinding wheel 5x1 in.; a drill press with two drills; a metal cutting wedge and driving mechanism of three speeds. This mechanism operates a grinding wheel, a small circular saw, buffing wheel and many other similar tools. The entire outfit sells complete for only $12.50 and it is particularly adapted for use in small repair shops or public and private garages. Send your orders or write for full particulars direct to the manufacturers, The Chicago Flexible Shaft Co., 586 North La Salle St., Chicago, Ill.

A Convenient Oil Tank.

Of interest to the motorist who wants to know where his next gasoline is coming from is the new Q. D. (quick delivery) Gasoline Tank body for Ford cars made by the Ohio Welding and Manufacturing Company, of Cincinnati. Oil companies whose service is A. No. 1 must provide a method of transportation of gasoline and oil quickly to the garage



A Convenient Oil Tank.

or owner that requires a supply in an emergency. This outfit fills the bill. The 100 gallon tank with extra cans of lubricating oil when required makes just the right load for Ford cars. Tank complete can be attached the first time in an hour or two, and after that it requires not more than five minutes to attach or detach. This means that car can be used for a double purpose.

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Firestone Annual Convention.

Thursday evening, September 30th, saw the close of the Annual Sales Convention of the Firestone Tire and Rubber Company at Akron, Ohio. For three days Branch Managers and Salesmen from every branch in its world-wide organization attended the various activities scheduled for the annual event. Every State in the Union and six foreign countries were represented. Five hundred men constituted the total attendance.

In this intimate study of business conditions in general and the tire business in particular these men gained a large amount of invaluable information. This information will in turn be given by each salesman to the customers in his territory. Thus through the days of intensive study and generous exchange of ideas the tire user is the ultimate gainer. It all results in better service for mortorists everywhere. Furthermore, it means a more up-to-date and better informed organization.

The men in attendance saw at the home plant in Akron, five large additions under construction—additions that will provide over seven acres of additional floor space and which will allow an increase in the output of Firestone pneumatic tires, from 7,500 to 12,000 per day.

The social side of this convention was not neglected. Dinners and outings at the Lakes around Akron, theater parties and banquets at local hotels featured the entire week. Conviviality and good fellowship were dominant during the entire progress of the convention. Company officials unanimously agreed that in point of attendance, interest aroused and results accomplished it was the biggest and most successful convention ever held by the Firestone Company.

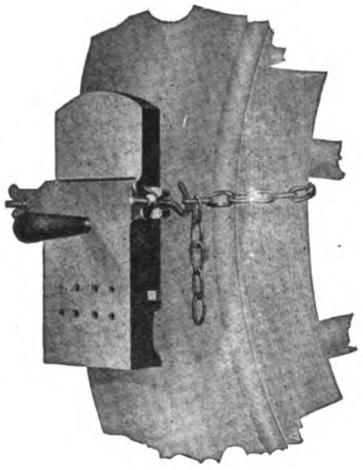
Live Specialties for Car Owners and Garages.

The National Motor Supply Company, 5602 Euclid Ave., Cleveland, manufactures a line of specialties for motorists which should interest every one of our readers. They have recently brought out



National Air Jack.

the National Air Jack, illustrated herewith. This jack utilizes the tremendous power which can be exerted by the use of air. To use the jack, just put it under your car, attach a hand or power pump to the end of the hose, and up goes the heaviest car and stays up until the air is released. The jack cannot slip, as it has a safety automatic locking device which holds the car indefinitely for winter storage or for a short time. The jack cannot sink into the ground on account of its large base, and it has many advantages which the manufacturers would like to demonstrate. To introduce this jack, they are offering to put it out on ten days' free trial and if not as represented they will absolutely refund the cost of the jack. This device



Wizard Automatic Steam Vulcanizer.

is very compact, being only 11 inches high when closed, and the price by parcel post is only $6.00, prepaid. No doubt many of our readers will accept the generous offer made by the manufacturers of this jack. The same company manufactures the Wizard Automatic Steam Vulcanizer for car owners, also illustrated herewith. This vulcanizer is curved to fit both tubes and casings of any size. The fuel used is gasoline and it burns with a blue flame, without any smoke. This vulcanizer is especially useful for roadside repairs, and it will soon pay for itself by saving your ruined casings and by filling the cuts with new rubber, making the shoes last twice as long. This article will also be sent on ten days' free trial, on receipt of the price, which is only $3.50, prepaid. The National Motor Supply Co. is anxious to trace the inquiries obtained from this publication and readers are therefore urged to use the coupons attached to their advertisement in this issue of our magazine.

An Attractive Engine Offer.

Many garages and repair shops throughout the country are putting in gasoline or kerosene engines for power and all who are interested in prime movers of the smaller sizes, will also be interested in the latest engine offer which has been made by Ed. H. Witte, of the Witte Engine Works, 2499 Oakland Avenue, Kansas City, Mo. Mr. Witte offers to put out his engines on sixty days' free trial to prove their big value. Every Witte engine is backed up with a five year guaranty, which certainly means something, as Mr. Witte has been manufacturing gasoline engines for twenty-eight years. His line for the automobile trade includes gasoline, gas, kerosene, and distillate engines, from 2 H.P. up to 22 H.P., and the scale of prices is remarkably low, running from $34.95 for a little 2 H.P. engine up to $359.80 for a powerful 22 H.P. engine. Readers are urged to write direct to Mr. Witte at the address mentioned above for his free book, and also for full particulars on the new liberal offer referred to in this article.

Creditors Buy McIntyre Assets.

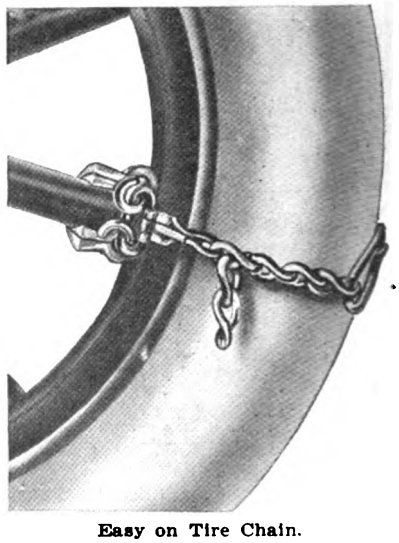
The creditors of the W. H. McIntyre Co., which made the McIntyre car and Imp cyclecar in Auburn, Ind., and went into bankruptcy some time ago, have bought the propertv for $50,500. A new company has been organized under the name of the DeKalb Mfg. Co.

Less Horse Cruelty.

Humane societies of Illinois are in danger of going out of business because of lack of complaints. With the rapid reduction in the number of horses and the institution of motor cars complaints of ill treatment of these horses, which in the past furnished the bulk of the business for the humane agents, the occupation of the latter is nearly gone. Very few horses are now used for transportation purposes. The great majority are on farms where they receive the best of care.

Improved Easyon Tire Chains.

The Leather Tire Goods Company of Niagara Falls, N. Y., announces that they are now making deliveries of their 1916 Easyon Chains which have been improved in several respects. The new chains have a metal fastener for attaching to the spokes which is absolutely unbreakable and is covered with leather so that it cannot injure the paint. The cross chain where it comes in contact with the middle of the tire is smoothly rounded so that it cannot injure the rubber and the chain portion being made entirely of welded links is unbreakable under any condition. Most automobile owners carry chains with them only in order that they may be sure they will not get stuck on the road. Easyon Chains are especially valuable for such persons for they can be applied in a moment even when stuck in the mud or snow and will give excellent traction on any sort of road surfaces. They also have the advantage of being more durable than ordinary chains and it costs



Easy on Tire Chain.

less and is much easier to renew the cross members. Easyon Chains are packed a set of 8 in a bag, 4 for each rear wheel. They are made in two sizes, small size, which fits tires up to 4 in. cost $3.20 per set; large size, which fits tires from 4 to 5½ in. inclusive, sells at $4 per set. The chains will be delivered parcel post at these prices to any part of the country.

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Don't Break Your Back

crawling under your car in the dirt and mud to jack it up, bruising your knuckles and wiping the grease off springs with your shoulders.

LIFT YOUR CAR WITH AIR

by using a **National Air Jack.** Just slip it under your car, attach a hand or power pump to the end of the hose, and Up Goes The Heaviest Car, and stays up until air is released. It can't slip as it has a safety automatic locking device which holds the car indefinitely for winter storage or for a short time.



A NATIONAL AIR JACK

is as far ahead of the ordinary jack as the gasoline car is of the old steam one, and will

DO THE JOB WITH EASE

as the **National Air Jack** will not sink in the ground on account of its large base. See that your agent gives you one with your new car.

TEN DAYS' FREE TRIAL

and if not as represented we will refund your money. Weighs only seven pounds, four inches in diameter, eleven inches high when closed, with six inch lift.

PRICE BY PARCEL POST, $6.00 PREPAID.

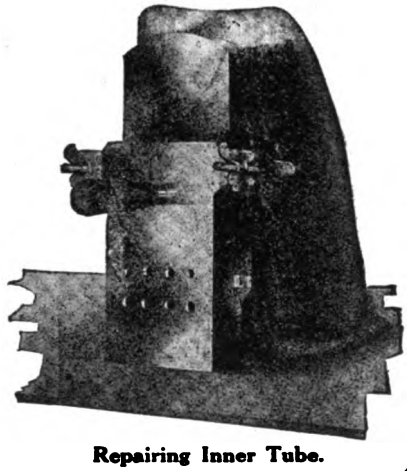
WIZARD AUTOMATIC STEAM VULCANIZER



Repairing Casing.

for car owners, curved to fit both tubes and casings of any size, uses gasoline and burns with a blue flame without smoke. Can be used on the road.

You can pay for it in a short time by saving your ruined casings, by filling the cuts with new rubber, making them last twice as long, saving the cost of new ones.



Repairing Inner Tube.

TEN DAYS' FREE TRIAL.

We will ship you this vulcanizer by mail prepaid. Try it for ten days and if you are not satisfied return it, and we will refund your money.

ONLY $3.50 BY MAIL, PREPAID. Use the Coupon To-DAY.

MANUFACTURED BY

THE NATIONAL MOTOR SUPPLY COMPANY

Main Office and Factory:
5602 Euclid Ave., CLEVELAND, OHIO

Branch Office:
2204 Michigan Ave., CHICAGO, ILL.

TEAR OFF AND MAIL TO-DAY.

Enclosed find Money Order for $3.50. Send me by mail prepaid a Wizard Steam Vulcanizer.

Name.....

Address.....

City..... State.....

TEAR OFF AND MAIL TO-DAY.

Please send me one National Air Jack on trial.

Name.....

Address.....

City..... State.....

Enclosed find $6.00.

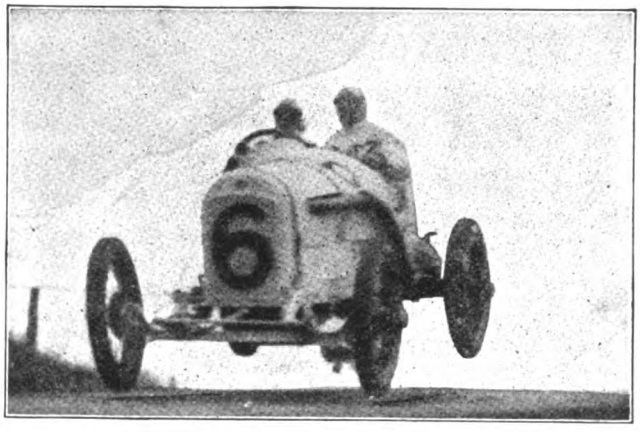
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One Million for a Patent.

A million dollars for basic patents of the Dixie Magneto was paid recently by the Splitdorf Electrical Company of Newark, N. J., to the Sumter Electrical Company of Sumter, S. C., which controlled them through the invention of their president, Charles T. Mason. Rarely has such an immense sum of money figured in the transfer of patents, but the Splitdorf Electrical Co., now establishing a world-wide reputation as the largest manufacturer of electrical units, considers itself fortunate in the acquisition of the valuable rights to the Dixie features, which are playing such an important part in the world's ignition field. The Splitdorf Electrical Company is building as high as fifteen hundred Dixie Magnetos daily—single cylinder, two cylinder, fours, sixes, eights and twelves to meet the tremendous demand. It is the utter simplicity of Dixie Magneto construction combined with its extreme effectiveness that has brought the Dixie so quickly into the limelight as 20th Century Ignition.

Car With Four Wheels Off Ground.

Here is a picture of an incident in the recent Elgin Race. Traveling at such terrific speed that merely going over the brow of a little hill will hurtle the whole car into the air is test enough of the strength and resiliency of rubber tires When the machine hits the ground again, it bounces down with all of its 2,500 pounds at the rate of about 95 miles an hour. Both Anderson and Cooper used, with the utmost satisfaction, the Silvertown



All in the Air.

Cable constructed tire, made by the B. F. Goodrich Company, Akron, Ohio, under the Silvertown Patent. Cooper won the first day with Anderson second, while on the following day the order was just reversed.

The Silvertown Tire has won every important race this year and it is used by the drivers not only on account of its great speed and resiliency, but also because it is safe.

Salaam Cigarettes With Initials.

Many fastidious smokers like to have their initials or monogram engraved on their cigarettes, as it gives the little individual touch that makes you stand apart from the rest. The Salaam Cigarettes are made of the finest Egyptian tobacco, delightfully delicate, with splendid aroma appreciated by all connoisseurs of true Egyptian cigarettes. The manufacturers of these cigarettes are ready, at a nominal price, to send you a supply with cork, plain, silver or gold tips with your initials in block, script, or Old English type neatly engraved on each cigarette. These cigarettes will be sent parcel post prepaid at $2 per hundred including the initials, to any address in the United States. Send your orders and inquiries to T. Chalkiadi & Co., Inc., 503 A, Fifth Ave., New York City.

A Campaign to Consumers.

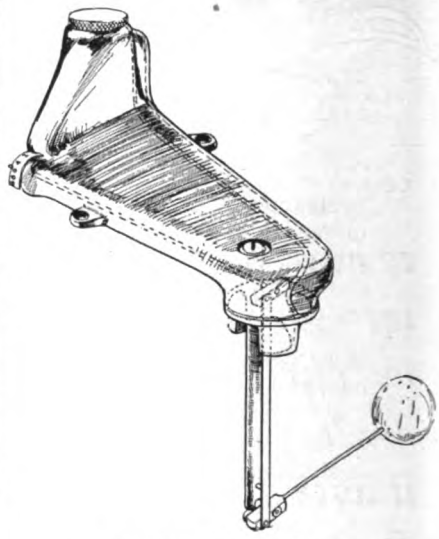
The Warner Auto Top Company, 1646 Central Avenue, Cincinnati, Ohio, which is an old and reliable concern, will hereafter market their product on an entirely new plan. They have been manufacturers of automobile accessories for a number of years, but heretofore they have always sold their goods to distributors, who in turn sold them to the consumer under their own private brand or trade mark. Realizing that by this method, they have been merely making goods for someone else to build up a reputation on, they discontinued all their contracts with these distributors September 1st, and they have now launched a campaign direct to consumers with the intention of establishing Warner Auto Upholstery as a standard article on the market. They will sell their covers direct to the trade under their own name, as manufacturers. By thus eliminating one large profit which formerly accrued to the distributor, they are able to place these goods on the market at a lower cost to the consumer and a larger actual percentage of profit to the dealer than heretofore. This is something which ought to vitally interest all readers, whether they are individual car owners, or dealers. An interesting catalogue will be sent to any subscriber who will take the trouble to write for it.

Repair Parts for Ford Cars at Cut Prices.

Many dealers and repairmen will be interested in the line of repair parts for Ford cars which are offered at cut prices by the Grossman Auto Parts Company of White Plains, New York. They are sending out a price list which they would be glad to mail to any of our readers who will take the trouble to ask for it. Their line includes differential ring gears, differential pinion gears, front radius rods, rear axle shafts, driving shafts, plain piston rings, triple piston rings, front springs, rear springs, connecting rods, and a large list of other parts at surprisingly low prices.

The Apex Fillometer.

We illustrate a new device called the Apex Fillometer. This is a gasoline tank filler and gauge combined which fastens permanently in place under the cushion, and the gasoline tank can be



Gasoline Tank Filler.

filled without the driver and passenger getting up from their seats. The meter is easily read from the driver's seat and anyone can install the Fillometer in two minutes with a screwdriver. The price of the complete outfit is $4.50 and it is manufactured by the Apex Electric Mfg. Co., 1410 West 59th St., Chicago, Ill.

New Gemco Specialties.

To supply a popular demand the Gemco Manufacturing Co., of Milwaukee, Wis., have decided to add to their line of individual bumpers for the Dodge, Maxwell, Buick, Studebaker, Packard and Reo cars, and also a new specially designed bumper for the 1916 Cadillacs. These bumpers are of "Gemco" standard construction, modified to exactly fit the individual cars for which they are designed, and we understand that all of these bumpers are now ready for deliveries. The 1916 catalog of the Gemco Mfg. Co. will be ready for distribution November 1st, and will show a number of new accessories. Any of our readers who may be interested to receive this catalog may do so by notifying the company.

The Mandel Limosette.

This is a flush, snug fitting top, made of wood, metal and glass for the Ford roadster and touring car. It is equipped with an automatic rain vision windshield, electric dome and handsome cowl dash. It has full length doors which operate with one handle, and the generous overhang in front accentuates the length of the Ford. These tops which are luxurious in appearance are built exclusively for the 1913, 1914, and 1915 Model Ford cars. They can be attached in less than an hour, and they add only about 40 lbs. to the weight of the roadster and 75 lbs. to the touring car. All inquiries and orders should be addressed direct to the manufacturers, the Mandel Limousine Company, 1453-1455 Congress Street, Chicago, Ill.

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Keep Your Car Like New with JOHNSON'S PREPARED WAX

"I'm ashamed to be seen getting into such a shabby car. Why don't you polish it with Johnson's Prepared Wax? We've used it on the floors and furniture for years."

It forms a thin, protecting film over the varnish adding years to its life—it covers up mars and scratches—prevents checking, and imparts a perfectly hard, dry, glass-like polish which

Will Not Gather Dust

Johnson's Prepared Wax polishes and finishes in one operation. It is in paste form—clean and easy to use and economical. It is conveniently put up—always ready for use—no tools or brushes required—all you need is a cheese cloth rag.

"Sheds Water Like a Duck's Back"

The heaviest rain will not dim the mirror-like polish that Johnson's Prepared Wax gives your car. Use it also on your wind shield for clear vision and on the leather upholstery—it livens it up and acts as a preservative.

Makes a Wash Last Four Weeks

Johnson's Prepared Wax is a boon to the man who takes care of his own car. The tiresome task of washing is reduced to the minimum. One user writes us, "It makes a wash last four weeks instead of one." An occasional application will keep your car like new, increase its market value, and give you the prestige that follows the appearance of prosperity and class.

Send 60c for 1 pint by Parcel Post prepaid—enough for a season's use—or mail coupon for a trial can—sufficient for one polish on a large car.

S. C. JOHNSON & SON
RACINE, WIS.



S. C. JOHNSON & SON, Racine, Wis. AD10
I enclose 10c for a can of Johnson's Prepared Wax—sufficient for one polish on a large car.

Name .....
Address .....
City and State .....
My Accessory Dealer Is .....

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A Welding Outfit for Only $42.

Every up-to-date automobile repair shop ought to have an oxy-acetylene welding outfit, and those who have not already installed an equipment of this character, will certainly be interested in the Waterhouse Complete Welding Outfit which is offered for only $42. This outfit is so small and compact that it occupies very little space in the shop yet it is guaranteed to be absolutely efficient and reliable. Readers who are interested should write for prices and full particulars to the Waterhouse Welding Company, 16 Pelham Street, Boston, Mass.

For Brakes and Clutches.

The efficiency obtained from brakes and clutches depends largely upon the proper countersinking of the rivets retaining the friction material. Ordinary tools are not satisfactory as ragged and uneven holes are likely to result. Stevens & Co., New York City, has perfected a set of countersinks for this work that is not only inexpensive but cut a clean and accurate hole. The set consists of three sizes, 9/16, ½ and 13/32-inch, these being used with Nos. 7 to 11 inclusive flat head rivets as well as with rivets with countersunk heads. As the shank of the tools is 5/16-inch in diameter they can be used in a drill press or hand drill. The set retails for $1 but single sizes are marketed. Stevens & Co. is also manufacturing six different assortments of brass and iron wood screws, brass and iron machine screws with nuts, bolts and copper rivets and burrs. These are marketed singly or come packed in a strong cardboard box. The sizes are particularly adapted to motor car repair work.

Now Made in America.

Among the many pre-conceived notions which have been dispelled as a result of the European war, not the least well grounded was the belief that it was impossible for American shops and American workmen to produce anti-friction bearings equal in quality, precision and uniformity to the imported bearings. It has been said that American mechanics were not temperamentally adapted to the quantity production of high-precision bearing parts over long periods. However, necessity has ever been the mother of invention—and the shutting-off of the supply of imported bearings created a situation in American industries which demanded relief. And American mechanical genius has proved equal to the emergency. The preliminary stages in manufacture having long been passed, enlargement of productive facilities consisted simply in the getting together of the men and machinery and materials necessary for operation on a larger scale. This extension has been in progress for several months and will continue so long as the demand for "Norma" Bearings promises to exceed the supply. The Norma Company now has a most efficient, completely equipped and up-to-date ball-bearing factory, turning out thousands of bearings daily in every way equal to the high-precision imported "Norma" Bearings which introduced a new standard in America. And this factory is being steadily enlarged and increased in capacity, to keep pace with the growing demand for speed bearings of the "Norma" standard.

Automobile Trouble Charts.

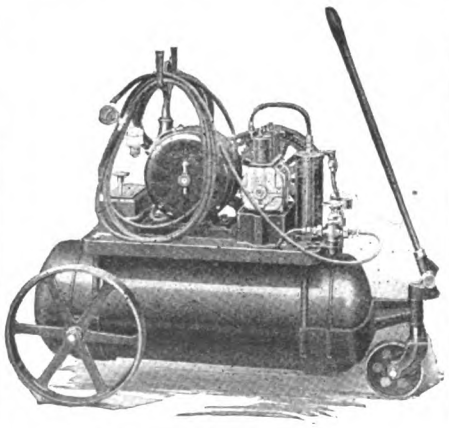
These charts are the most compact self-educators ever published and are sold at such low prices that they are within reach of all. They are practical, timely and authoritative as all have been prepared by a recognized authority on automobiles with an experience dating to the inception of the industry in this country, including practical shop work as well as design and construction. These charts are invaluable to all who motor. They make ideal wall charts for schools, clubs, garages and repair shops. These charts cover engine, ignition, carburetor and lubrication troubles, and car owners can procure any particular subject they wish by sending to the publishers The Norman W. Henley Publishing Co., 132 Nassau Street, New York, and enclosing 25 cents, or any five will be sent on receipt of $1.

Audel's Automobile Guide.

This is a standard work of reference for automobile owners, operators and repairmen. It contains a large number of questions and answers and illustrations in regard to the parts, operation, care, management, road driving, carburetors, wiring, ignition, motor troubles, lubrication, tires, etc., in fact everything connected with the mechanism of an automobile. The book contains a section on self-starters and lighting systems. The price is $1.50 postpaid, in leather binding, pocket size, and the publishers are anxious to send a copy for free examination to any one who doubts the usefulness or value of this book. Free examination of the book may be obtained by using the coupon which is attached to an advertisement appearing in this issue of the Automobile Dealer and Repairer.

Kellogg Garage Pumps.

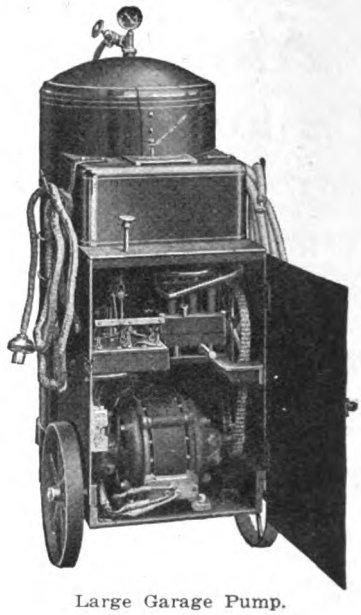
The Kellogg Manufacturing Co. of Rochester, N. Y., have just issued a new folder illustrating and describing their line of Electric Motor Driven Garage Pumps. The models vary from a small stationary plant with a two-cylinder pump for the private garage to a large portable plant consisting of a 1 H.P. electric motor, driving their latest model 6-cylinder pump mounted in a portable



Kellogg Portable Pump.

unit with a large air storage tank, which holds sufficient air to take care of the requirements of a large garage for half a day without replenishing.

The Kellogg Manufacturing Co. lay particular emphasis on the fact that these outfits are inexpensive to operate, as well as upon the fact that the various sizes and models enable a man to select a type exactly suited to his requirements. When "free air" is such an incentive for a driver to stop at the garage where this service is extended to him, no garage man can afford to be without a power driven garage compressor. Improvements for 1916 consist of genuine babbitt bearings throughout, an oil reservoir which insures sufficient lubrication at all times, and other general refinements. Automatic electric control is a part of the equipment furnished with the larger outfits. List prices range from $70 to $240.



Large Garage Pump.

Radi-Um-Tine.

This is the name of an automobile body polish which has been brought out by the Fordham Chemical Company, 1021 East 178th Street, New York City. This polish is good not only for automobiles, but for all kinds of furniture, pianos, etc. It is also good for leather as it cleanses, softens and adds freshness to the finish, and by its use, the original texture is preserved. The same manufacturers also make a cleaning preparation called "Beats-All" which is a guaranteed tar and stain remover and is absolutely non-injurious to the enamel, paint or varnish of your car. Readers who are interested should write for prices and particulars direct to the manufacturers.

Has No Legal Authority.

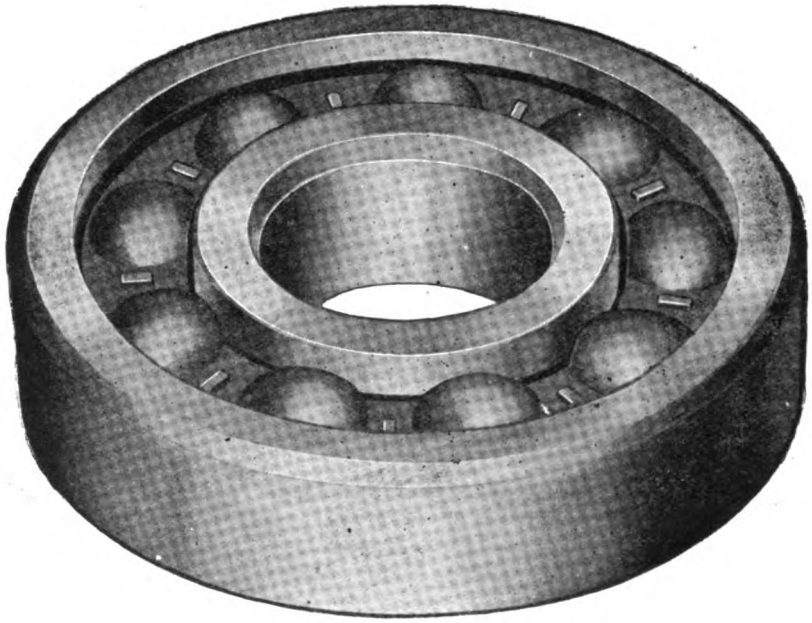
We have received a letter from the Motor Specialties Company of Waltham, Mass., in which they state that a party named L. W. Sumner has lately been calling on the trade in connection with Excel Jacks and Bemus Timers in Kansas City, St. Louis and other Western cities. The Motor Specialties Company wants it distinctly understood that Mr. Sumner is not legally representing them and he has no authority to sell or solicit the specialties referred to nor to transact any business for the Motor Specialties Company or in their name. Any orders taken by Mr. Sumner will not be recognized by the Motor Specialties Co.

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NEW DEPARTURE BALL BEARINGS
American Made for American Trade

THE CHOICE OF AMERICAN MANUFACTURERS who have investigated its merits ▬ ▬ ▬

One says ▬ "The use of these bearings for carrying both radial and thrust loads of the worm gear is largely responsible for the high percentage of power delivered at the road wheel contact." The use of New Departures promotes long life in whatever mechanism they are used. ▬ ▬ ▬ ▬



Send for Catalogue

THE NEW DEPARTURE MANUFACTURING COMPANY

Distributors in Trade Centers Throughout the United States

BRISTOL, CONNECTICUT, U. S. A.
Conrad Patent Licensee

Sole British Agents: Brown Brothers, Ltd., London and Manchester

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Western Branch: 1016-17 Ford Bldg., Detroit, Michigan

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Don't Pay Good Money for a Private Brand!

Buy the Same Upholstery Covers from the Manufacturer and Save one big Profit

MR. DEALER, think of the best Auto Upholstery Covers of which you have any knowledge. No matter what *name* these goods may bear or what trade-mark they may be sold under, the chances are that they are *made* by Warner. For twenty-two years we were manufacturers of Buggy Accessories. For the past eight years we have been large manufacturers of Auto Accessories and have made fully 95% of all Auto Upholstery Covers shipped out of Cincinnati. The output of our factory has been marketed by exclusive distributors who sold the goods under their private brands.

This was unfair to the dealers who had to pay two profits instead of one in order to secure our product with its many features of exclusive superiority. It was unfair to the consumers who were forced to pay exorbitant prices. It was unfair to the distributors because they were building their reputation on a line of goods over which they had no permanent control. It was unfair to ourselves because it limited our business expansion to the selling capacity of the favored distributors.

So we have refused to renew these exclusive distributors' contracts and have deliberately cut out the private brand business altogether. Hereafter we sell Warner Covers under their proper name and trade-mark.

WARNER AUTO UPHOLSTERY COVERS

FIT LIKE A GLOVE

DUST-PROOF WEAR-PROOF

Our retail list is only a trifle more than half as high as the retail lists of exclusive distributors who have been selling our goods under their own private brands. Our discounts to jobbers and retailers are fair and reasonable;—they allow for a good margin of profit and a quick turnover. Our goods will be maintained at the same high standard of quality, style, material, workmanship and fit that has built the reputation of distributors who have been selling our goods as their own product. Our stock will be kept up to date and ample for all demands. We will make rush deliveries the same day orders are received.

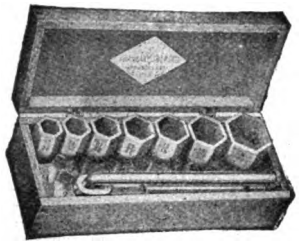
Here, Mr. Dealer, is your opportunity to cut out the tax that the favored distributor demands for the privilege of using his trade-mark on our goods. We do not ask you to load your shelves with a big stock of Warner Covers. But you owe it to yourself to write at once for our catalog, price-lists, trade discounts and samples of the various grades of materials of which our covers are made. Get our dealer helps and put yourself in position to command the cream of the upholstery cover business of your community by offering the best values at the lowest prices.

We have patterns for about all the leading American cars.

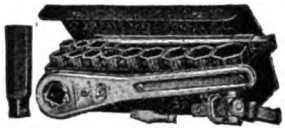
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No. 6 A $2.20



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No. 10 $8.00



No. 14 $12.00
The "Complet-est" Set



Pliers that are absolutely guaranteed.

Ask for Wrench Book No. 181B



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Mossberg Auto Wrenches
8 in., 9 in., and 11 in. long



Thin model small adjusting wrenches

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For 18 years Mossberg Co. has faithfully tried to manufacture the most desired wrenches and tools in the best possible grade of material and labor and yet sell them

At Lowest Prices Consistent with an

Absolute Guarantee

Judge for yourself if we have not succeeded in considerable degree.

Just write us your wrench troubles. We will be mighty glad to help you all we can.

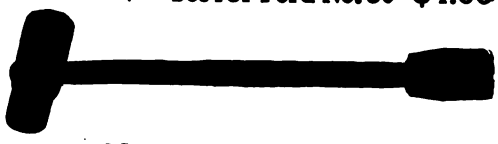
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Set for Ford No. 17 $2.00



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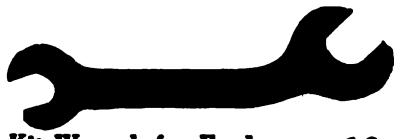
No. 630 for Fords 26c



Hub Cap Wrench for Ford, 10c



Ratchet Transmission Wrench for Fords, 50c

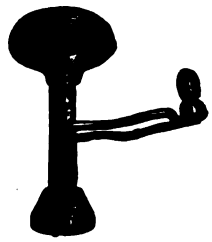


Kit Wrench for Ford 16c



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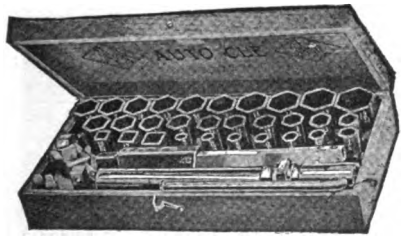


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The Reliable Auto Cle, $10





Thin model open end Engineers' Wrenches at really reasonable prices.



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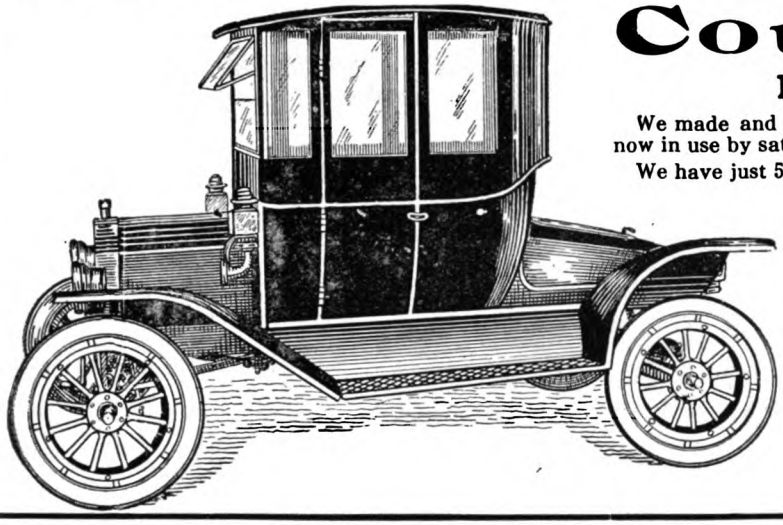
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CLOSING OUT OUR 1913 MODEL

Coupe Tops

For FORD CARS



We made and sold over 400 of these tops last season and they are now in use by satisfied customers.

We have just 50 left in stock which must be sold now.

We cannot keep them over and want to turn them into cash.

If you have a 1913 car, and want comfort in its use, mail us your order at once. We will fill all orders for these tops, while they last, for $25.00 f.o.b. Springfield.

These tops are made of hardwood frame, metal covered, glass windows, full length doors, and nicely trimmed inside. Sold last season for $100.00.

THE AUTO METAL CO.

531 Worthington St. SPRINGFIELD, MASS.

Eliminate Wear and Repair

— By Using —

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE



Metal that rubs upon metal must be kept constantly separated, else friction results. Friction robs your car of free motion, wastes energy developed by your engine and destroys vital parts. Only **perfect lubrication** can overcome these troubles. Only **perfect lubrication** stops frictional wear on gears and bearing. Only **perfect lubrication** can obviate costly repair bills.

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Get a Can Today and Prove It

Reduced Prices. Ask your dealer. The original NON-FLUID OIL is identified by orange-colored cans bearing the above sprocket-wheel trade mark. Avoid substitutes.

New York & New Jersey Lubricant Co., 165 Broadway, New York
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Differential Improvement.

The M. & S. Differential is a new construction which prevents the spinning of a drive wheel in soft places. Under such circumstances, a locking of the differential takes place practically automatically, without the need of separate action on the part of the driver. It naturally follows that, as this action is automatic, it is instantaneous and comes into play the moment the disturbing road conditions present themselves, so that a car does not "dig itself in" and find itself in difficulties from this cause, but is able to make the best of the drier road surface under the other wheel. When road resistance is sufficient to give adhesion to each driving wheel, both wheels are equally driven, the crown wheels to which they are attached being carried bodily round by the worms in which they are in engagement, just as, with an ordinary differential, they are carried round by the pinions. But when road resistance upon one wheel is reduced to a point at which it loses adhesion, and would, with the ordinary differential start spinning, nothing of this kind happens, because the angle of the worms is such that, whilst the crown wheels can drive the worms, the worms cannot drive the crown wheels, and, as a consequence, the differential is locked so far as any movement of the wheel in relation to the differential is concerned. The axle becomes for all practical purposes a solid one, and all the drive is taken up by the wheel which is for the moment supported on firm ground and can take advantage of its grip. It is claimed that this new device not only meets the wheel-spinning difficulty entirely, but at the same time prevents skidding, or sideslip on greasy roads. It is made by the M. & S. Gear Company, Detroit, Mich.

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Classified Advertisements

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Auto Accessories

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Desirous of cleaning up a few job lots we have on hand, therefore will offer them at specially reduced prices.

Call and look over our stock. We have the most complete "Automobile Plant" for retail business in the world. Everything from a cotter pin to a complete car.

A few of our specials are: One-man tops (all years), $25; windshield, $8; self-starter, $6.50; shock absorbers, $3.85 (set); tool boxes, 75 cents and up; speedometers (Stewart), $6.45; sloping hoods, $6; lamp sets, $4.25 up; demountable rim sets (painted or natural wood), $12.50; new runabout bodies, $35; carburetors, $5 up; Remy complete dual system magnetos, $25; Splitdorf, $17.25; bearings, $1 up (bring in old one and we will dublicate at a great saving); electro horns, $1.60. Rims, all kinds and sizes at a big reduction. Electric lamps, $5.50 pair; windshields, $9; spark plug pumps, $3.75; Prestolite tanks, $7; Pyrene fire extinguishers, $5.50; lap robes, $1.85; gloves, $1; spark plugs, 15 cents; wrenches, 8 cents up; clocks, 90 cents; mirrors, 60 cents; storage batteries, $7; fur coats, $15; tops, $15; sweaters, $2; trunks, $5; dashboards, $1; runabout or racing seats, $8.40-$16; wheels, $1; bodies, $35; transmission, $20-$45; axles, $10.

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World's Largest Dealers
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WILL (not) LAST FOREVER

but come mighty near it and don't cost much more than any other good tube. Write us for full particulars.
IT WILL PAY YOU WELL.

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New Catalog and Lists ready Now.

Send for copy. Wholesale only.

Special prices on Piston Rings, Brake Lining, Grease Cups, etc. Send us your list of wants for special quotations.

WESTCHESTER ACCESSORIES COMPANY
1777 Broadway, New York City

Auto Accessories

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We forced them to reduce their prices, but our prices still beat theirs

SPECIAL THIS MONTH

STEWART $7.50
$25.00 Models Complete

Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

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Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
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Odometers reset to zero, 25c.

All workmanship and material absolutely guaranteed.

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A. H. KASNER

Formerly 20 years on Chambers St., N. Y., now located at
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Tires and Supplies, inside prices.
Our only store. Low Expenses, Low Prices.
Mr. Manufacturer, anything you have, let me know.
SPOT CASH PAID.

Fore Doors for Open Front Cars

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Auto Accessories

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Stromberg carburetors G 1¼" double jet	11.00
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Schebler Model L 1¼" carburetors	8.00
Marvel, Holley or Kingston carburetors 1½"	3.00
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Same with clock and electric light comb. list $85.00	20.50
Magnetos Bosch 6-cylinder DU 6 H.T.	50.00
Eisemann H.T. 6-cylinder E.M.I.R. 6	42.50
K.W. High Tension 6-cylinder	20.00
Comb. Tool Box & Running Board 60"	2.50
Rambler Motor 4-cylinder, all models	135.00

Other parts and accessories at equally low figures.

AUTOMOBILE APPLIANCE CO.
1436-38 Michigan Avenue
CHICAGO - ILLINOIS

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Your present car just because some part is defective or worn. Replace that part and use your car another season.

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Keeton transmission, four speed, center control with levers	75.00
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Hess full floating rear axle (complete)	100.00
Weston Mott front axle, 30 inch centers (complete)	14.00
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Keeton 7-passenger body, 38½x102 inches, unupholstered	25.00
Henderson 5-passenger, 33x92 inches, unupholstered	15.00
Write for prices upholstered and painted.	
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This is only a small list of our large and complete stock of parts. If you need any parts, send us your specifications and we will help you make a selection.

Send for our Catalog and Forging Sheet

DEPT. D
AUTO PARTS COMPANY
737-39 W. Jackson Blvd. CHICAGO, ILL.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Auto Accessories

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AT LOW PRICES

ALL GOODS GUARANTEED

Demountable Wood Wheels, - - $14.50
With One Spare Rim

SEAT COVERS Absolutely Waterproof — **Runabout, - - $3.20**
Touring, - - - $1.80

Many other prices like these.

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WRITE FOR IT.

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Established 1904

ONE MAN TOPS—$20, $25
Fit Fords and others. Top enveloped, $1.
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MIRACLE TIRE REPAIR SHOP
Workmanship Guaranteed.
310 West 47th Street
Near Eighth Avenue New York

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1717-1719 Broadway Established 1905 **New York**

ALL TYPES OF BEARINGS
The New Departure Service Station
THE GWILLIAM COMPANY
ENGINEERS
Specialists in Bearings
NEW YORK, 253 West 58th Street, (at Broadway)
PHILADELPHIA, 1314 Arch Street.

NEW 4-CYL. SPLITDORF MAGNETO and coil, $25; Brown-Lipe 35 h.p. transmission side levers, $50; racing seats, 16 inches wide, 21 inches high, pair, $18; Spache DeLuxe 9-13 h.p. 2-cyl. motor, Atwater-Kent and Schebler carburetor, $63; new W. M. Co. 4:1 ratio axle, tubular front, 30x3 wire wheels, 48 inch tread, $45; Carter 1-inch carburetors, special, $4.50; new 4-cyl. 4x5 motor, cone clutch, starting crank, water pump, fan, equipped for Westinghouse self-starter, $140; one ¾ inch model L Schebler carburetor, $12.50. We sell everything for the automobile. K. C. Auto Parts Co., 1827 McGee St., Kansas City, Mo.

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Double Tread Tires
AT 75% SAVING
GUARANTEED 3500 MILES

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.00	$8.75
30x3	$5.00	$5.25	36x4	8.00	9.00
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
32x4	7.00	8.00	36x4½	9.00	10.00
33x4	7.50	8.25	37x4½	9.00	10.00
34x4	7.50	8.25	37x5	10.00	11.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
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SAVE YOUR OLD TIRES
AND HAVE THEM
Reclaimed for $2.50 to $4.00
ACCORDING TO SIZE.

SQUARE DEAL TIRE EXCHANGE
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Write for catalogue on Double Tread Tires.

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SAVE 75%
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TIRE BILLS
BY USING OUR
DOUBLE TREAD TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

For retreading your old tires we charge you 40% off above prices.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

TIRES
BUY THE BEST
Double Tread Tires
IN THE MARKET

— PRICE LIST —

30x3	$4.50	34x4½	$9.00
30x3½	5.50	35x4½	9.50
32x3½	6.50	36x4½	9.50
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36x4	9.00	37x5	11.00

One dollar extra for non-skids.

A deposit of 10% is required on all C. O. D. orders. You can save C. O. D. charge by sending a money order. Please specify in order whether Q.D., Clincher or Straight Side desired.

R. K. TIRE CO.
1401 RIDGE AVE., PHILADELPHIA, PA.

TIRES TIRES TIRES
Automobile Dealers Take Notice.
We now offer for sale our Henschel Special tires in a sizes and types. **Write for our special dealers' proposition**
HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

DOUBLE TREAD YOUR OWN TIRES. You can do it yourself with the Ruff Wire Outfit. Make two old tires into one and get this additional service at a cost of less than 50 cents per tire. Dealers, Repair and Garagemen, make money Double Treading Tires for your customers. Complete outfit and stock, enough for 4 large tires, $2.50. Address, Tire Trading Co., 50 William St., Newark, N. J.

Tires

TIRES TIRES
NEW TIRES GUARANTEED 3500 MILES
40% off Standard list price

We also carry a large stock of
Double Tread Tires
GUARANTEED 3500 Miles
AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
NEW YORK CITY
The Home of Double-Tread Tires

GERMANIA RUBBER WORKS
AUTO-TIRE REPAIRING
Tube Vulcanizing, 15c.
Use Roll-in-White, it Preserves your Tires, 25c. per pint.
1092 Bedford Avenue BROOKLYN, N. Y.

REDUCE
YOUR TIRE BILLS
By Having Your
OLD TIRES RECLAIMED
We Are the Originators

Why not get 2,000 additional miles out of your old casings, in place of throwing them away? Others are doing it. Why not you? Reclaiming prices sent on request.

COWANS BROTHERS
150 West 55th St. New York
Branch: 815 North Broad St., Philadelphia

TIRES Send for list of factory blemished standard makes.
Agents Wanted
STAR RUBBER CO., 1781 Broadway, New York, N. Y.

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Standard or Oversize.
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PISTON PINS
Carbonized Ground, Standard or Oversize.
For any make motor. We make them by 1000 with automatic machines, therefore the price. Large stock always on hand.
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CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

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Best quality piston and rings fitted, any make and size. $3.00 and up.
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NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
Prompt and reasonable.
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The only product of its kind. Removes dullness, stains and tar from cars and renews surfaces. The great demand brings overwhelming sales. Write for samples.
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Established firm with New York office and large selling facilities, will contract to handle specialty manufactured line as an exclusive sales representative for New York and the East. We can finance our own outstanding charge accounts, carry stock and pay cash for shipments made. If you have an article of merit and require capital to manufacture we are in a position to co-operate. Address C. S., care Motor Vehicle Pub. Co., 73 Murray St., New York.

$15 FORD CYLINDERS REBORED, $15, and fitted with new pistons, rings, bushings and wrist pins. Liberal discount to garages. Astoria Auto & Machinery Co., Astoria, Ill.

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Piston Pins
"Manufacturers for the Trade"
SERVICE GEAR & MACHINE CO.
READING, PENNA.

WE CARRY IN STOCK
STODDARD-DAYTON PARTS
DAYTON AUTO REPAIR COMPANY
353 West 52nd St., New York City

Gears and Repair Parts
At Discount For
PACKARD, REGAL AND CHALMERS "30" and "36"
Carried in Stock
Auto Parts & Accessories Co.
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Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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FOR SALE—Six rims for clincher tires, which are interchangeable with and fit the same wheel as 36 by 4½ inch Fisk bolted on type demountable rims. Adress for further particulars, Paine, Loon Lake, N. Y.

FOR SALE—Up-to-date garage equipment; good reasons for selling. Write for particulars. Click Bros., Cardington, Ohio.

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FOR SALE—Gentlemen's Fur-Lined Overcoats, manufacturers' samples. Black broadcloth outside, lined throughout with mink dyed marmot, a beautiful fur, like mink, large handsome Persian lamb collar, all sizes, price $29.50, would retail for $60. Sent for examination, you take no risk, examine before paying. Write to-day, stating size, and enclose 50 cents for express charges only and coat will be sent at once. E. Hart, Department D, 518 W. 134th St., New York.

FORD DETACHABLE RIMS (5)—Oiled or painted wood wheels, per set, $13; 30x3½ front wheels, $4. B. J. Potter, Okemos, Mich.

Detroit Batteries.

The Detroit Battery Company of Detroit, Mich., have made a successful move in their campaign to bring the merits of Detroit Batteries home to automobile owners by making a 50 per cent. reduction in their list prices. Detroit Batteries are the result of over 35 years of experience in battery building. The men in the organization were associated with the inventor and producer of the first successful commercial storage battery. Detroit Battery Cells are tested with 30,000 volts. The grids in these batteries are cast in the plant owned by the manufacturers. The oxides are blended as only life long experience can blend. Every carboy of acid is thoroughly tested. Every gallon of water used is distilled by the manufacturers. The battery boxes used are of the finest woods. These batteries are made for every type of car and they are also the standard equipment on many kinds of American made cars. The Detroit Battery Company have a special dealers' proposition which they wish to submit to any of our readers who may be interested. Write for full particulars to the Detroit Battery Co., Detroit, Mich.

Now the Light Eight.

The Lightweight eight cylinder car, successor to the light six, has made its appearance in the Apperson Light Eight. There have been small eights which are necessarily light but none which is analogous as a whole to the forty and fifty horsepower six. The Apperson Light Eight tips the beam at less than 3,100 pounds, fully equipped, with gasoline and oil, ready for the road, and its specifications show it to be in the luxury class as far as size is concerned. One hundred and twenty-eight inches is the span from front to rear wheel. The greatest saving in weight is found in the motor and according to Apperson officials its lightness is due to simplicity and costly materials.

Double-Focus Headlight.

A new type of headlight in which the dimming problem is solved by means of a double-focus reflector and two lamps, both of which are in focus, is now on the market. The larger of the two lamps is intended for use only in country driving. The light from this lamp is directed horizontally and gives effective illumination of the road for a distance of three hundred feet or more, according to the candle-power of the lamp used. The smaller lamp gives a light of somewhat less strength that is directed downward at such an angle that the road is well illuminated immediately in front of the car for a distance of from 75 to 100 feet. As no light whatever is projected above the level of the lamp itself, all glare is eliminated. The larger lamps need never be turned on in the city, as the smaller ones give ample light for all conditions, except for fast driving on country roads. It is said that the greatest advantage of this new type of headlight is, that in passing another vehicle while driving in the country at night, one can "dim" his lights to the extent of positively eliminating all glare from his headlights, and yet keep the road in front of his car brilliantly lighted for a sufficient distance for safe and comfortable driving. This headlight is being placed on the market by W. M. S. Miller, 3508 Cedar Street, Milwaukee, Wis.

A Good Solder.

Hess & Son, Philadelphia, Pa., make a large line of soldering devices and products. Those who have this work to do may be sure that this firm will supply them with anything they need. They make Tinol, which is a non-corrosive solder, and has the advantage of not requiring anything else whatever to make a complete job of mending. It is clean and the joint does not have to be prepared as with ordinary solder. It should be in every automobile shop and the Tinol automobile soldering outfits are simple and of low cost. This outfit is unusually good for soldering wire cables and for locking nuts and screws by solder.

New Storage Battery Plant for Prest-O-Lite.

The Prest-O-Lite Co., of Indianapolis, have in process of erection a large addition to their present plant, this new portion to be devoted to the manufacture of storage batteries. The building will give the Prest-O-Lite people an additional floor space of 45,000 square feet, and represents an addition of one-third their present floor space. Work is being pushed vigorously on the new storage battery plant, and it is expected it will be ready for operation by December 1, 1915, with a capacity of 400 batteries per day.

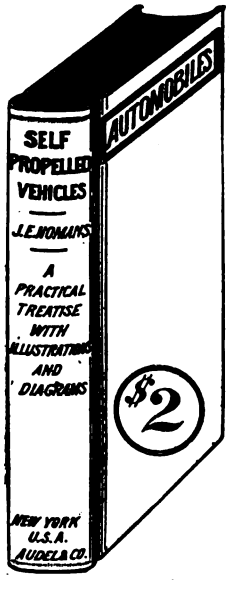
Harvey Boltless Auto Springs.

The Harvey Spring Company, 849 17th Street, Racine, Wis., in order to overcome the variations always found in hand-made auto springs, have invented and patented an automatic machine for forming and tempering spring leaves. This machine does the work so accurately and uniformly that they are able to guarantee Harvey Auto Springs against all defects. These springs are made without a hole at the center, a small depression or bead prevents the plates from shifting and all the strength is preserved at the center. There are no weak spots. These springs are strong, durable and easy-riding, and the manufacturers state that they mean freedom from spring repairs, and are a source of constant satisfaction to users. Dealers, jobbers and garage men will find the Harvey Spring Book very valuable in ordering replacements. It contains a complete list of springs for standard cars, gives sizes, weights, measurements and other valuable information that has never been published before, and is of great assistance in ordering. A copy will be mailed absolutely free, if you will take the trouble to ask for it.

It Cost $1,400 to Hurry This Contractor.

What is believed to be a record for a rapid and thorough building construction has just been made in this city at the plant of The Hydraulic Pressed Steel Company. When, on June 28th, the contract was let for the erection of a building 360x80 feet to be made of steel, concrete and glass and to be finished in eight weeks, it seemed like an impossible undertaking. The contractor naturally objected to the penalty of $100 per day for each additional day required. The contract was closed on that basis however, with the usual clause of $100 per day bonus for each day less than the required time. Nobody supposed it would be possible to erect the building in less than fifty-six days, and therefore, little thought was given to the bonus part of the contract.

The contractor, however, broke all records, and succeeded in completing the work in forty-two days, thereby earning a bonus of $1,400. Every modern factory convenience is to be found in this building, from the electric cranes overhead to the pipe tunnels underground. When the heavy hydraulic machinery is installed this building will be the largest and most complete in the world, devoted exclusively to the manufacture of pressed steel automobile frames.



Auto. Educator.

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This book was written to meet the need for a simple but comprehensive treatise of motor car construction and care—a book that is not only a necessity to the motor car owner, but also useful to the skilled engineer and mechanic.

Being clear and concise in its treatment of the subject, and is comprehensible to the most inexperienced man. At the same time it is so thorough and detailed that the expert will learn much from its pages.

The treatise on gasoline cannot fail to prove valuable to anyone interested in explosive motors, which are daily coming to the front as the readiest and most convenient source of power. ¶The price of this popular edition is $2.00, and as an insurance against accidents, caused by ignorance of the principles of operation—of which there are a lamentable number recorded every day—no one interested in the subject can afford to do without a copy of this timely volume.

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The Hert Mfg. Company of Indianapolis, Ind., make what they call "Purair" pumps for Ford cars, which take the terror out of tire troubles and fill a long felt need. They are simple and pay for themselves in a short time in the saving they effect on tires alone. The pumps are equipped with an automatic relief valve which is set for the proper pressure and which sounds a warning signal when the tires reach this pressure. In fact when they are pumped to that point, no more air can enter the tire. These pumps are low in cost, are guaranteed to last and the purchase money will be refunded without quibble if they do not give satisfaction.

An Engine Trouble Detector.

The Lazarus Manufacturing Company, 744 Euclid Ave., Cleveland, O., has brought out an engine trouble detector which is extremely convenient. With it you can locate and determine engine troubles by the dash without raising the hood. It is especially reliable in case of faulty ignition, loose connections and lack of compression. The device is not complicated and can be easily installed. This is one of the very best of the "Lazco" products, which include vulcanizers, lubricators, fire extinguishers and vacuum cleaners.

Marvel-Mist.

The Marvel-Mist Manufacturing Co., of 48 Greenpoint Avenue, Brooklyn, N. Y., have sent out a corps of salesmen who are cleaning up the Western territory with their polish, and a little later the result will be seen in the cleaning up of automobiles used there. This polish has now become thoroughly established as something of superior character, and it is extremely easily applied.

The Nifty Chain Tool.

Will A. Sapp, Elgin, Neb., is manufacturing several devices useful to the automobile owner and repairman and among them is a tool for putting on mud chains. It does this rather untidy job quickly and without soiling the hands. The cost is trifling. Car owners will find it convenient to have one. This firm also makes a foot accelerator for Ford cars, which is simple and efficient. For further particulars address as above.

Edison and the Electric Incandescent Lamp.

Edison Day, October 21, commemorated the thirty-sixth anniversary of the invention of the electric incandescent lamp and honors its master inventor, Thomas A. Edison. Mr. Edison has emphasized the value of continuous research work and given us a vision of the future in the science and art of electric lighting. "No invention is perfect," he says, "and the incandescent lamp is not an exception. Light without heat is the ideal, and that is still far off. The electric incandescent lamp of to-day is the cheapest form of filament that has ever been produced, but some day it will be cheaper and colder than it is. There is a good deal of truth in the saying that the firefly is the ideal. It is, so far as coldness goes. But its color is against it. You couldn't use a thousand candle firefly to match colors, and you wouldn't want the insect to light up a street, because his light would be a hideous greenish yellow. But some day we will get reasonably

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Spit Fire
Plugs
ARE THE BEST
A.R.MOSLER & CO.
P.O.BOX "M"
MT.VERNON. N.Y.

near the firefly for efficiency without copying his disagreeable color. The task needs much investigation, much research of the kind we did in 1879. The research that we began then is still going on, and it always will go on. Somehow, each new discovery opens up the way to another."

Franklin Prosperity.

Wages of about 1,200 employes of the H. H. Franklin Mfg. Co., Syracuse, N. Y., have been increased by two cents per hour. This means an addition of $57,000 to the yearly payroll, and was made voluntarily. The company states that the installation of an efficiency system has increased the profits of the enterprise and that it was thought just that the men should share in the increase.

Dayton Radiator Fix.

This is a new radiator cement which is manufactured by the Wearwell Rubber Company, 1033 West Third Street, Dayton, Ohio. The manufacturers guarantee that this cement will stop a radiator leak in three minutes or money back. Nine automobiles out of ten, it is said, have trouble with leaking radiators and if yours has not leaked yet, it may before long. A package of Dayton Radiator Fix may be a very handy thing for you to carry in your kit. It sells for only 50 cents per package and there is enough radiator cement in one package to mend all the leaks you are likely to have for a long time to come. Readers who are interested are urged to send their orders direct to the manufacturers or else write for testimonials and full particulars. If you will send 50 cents to-day for a package of this cement and it is not found entirely satisfactory, the Wearwell Rubber Company is willing to refund your money at any time. This is a good dealers proposition and agents are wanted for it all over the country.

New Factory for Hyatt.

The increased business of the Hyatt Roller Bearing Co. has made it necessary to greatly enlarge their plant at Detroit. The factories are located at Detroit, but an immense warehouse and a large office building are in course of erection at Cass Avenue and West Grand Boulevard, Detroit. The company has a frontage of 225 feet on the Michigan Central Railroad, and the new warehouse will be of modern construction, two stories high and having 20,000 square feet of floor space. The business of this company in bearings for automobiles has grown to such an extent that a car load of bearings is delivered daily in Detroit, and this rate of shipment will be maintained throughout the year, the new warehouse being the base of distribution. and there will be facilities for keeping on hand at all times a supply of all the popular sizes of Hyatt Bearings which can be delivered immediately to the large automobile factories in Detroit. H. R. White who has been connected with the automobile division of the Hyatt Company for some time has been named Traffic Manager, and will have charge of the extensive shipping arrangements.

MR. DEALER:

Here are two of the biggest Money Makers of the year. Our dealers are "Cleaning Up" on the 1916 **MECCA 30** *at $695, and the* **NEW TWOMBLY** *at $195.*

These cars are easily worth twice what we are selling them for and the public is quick in recognizing this. Both the **MECCA** *and the* **TWOMBLY** *sell on sight.*

We have some open territory in which thousands of these cars can be sold. Apply at once for details of our excellent dealer proposition.

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UTILITY VARNISH RENOVATOR is a money maker for you, and keeps your customers happy. Keeps the varnish on the Auto looking new, is non-acid, non-alkali; saves time, labor and varnish. Ask your jobber or send direct for trial size.
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Know Your Auto
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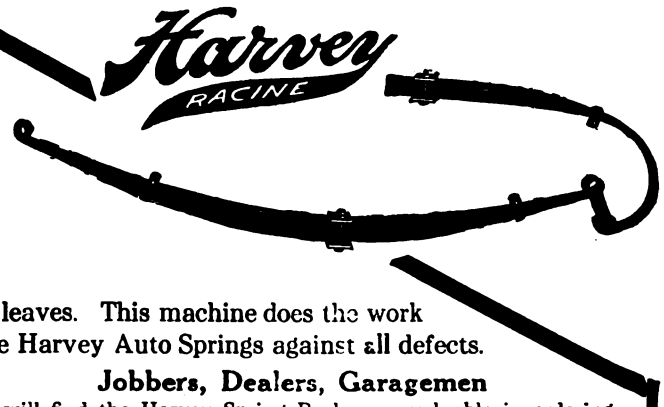
Audel's Automobile Guide with questions, answers and illustrations, relates to the parts, operation, care, management, road driving, carburetors, wiring, ignition, motor troubles, lubrication, tires, etc., including information on the storage battery, electric vehicles, motor cycles, overhauling the car, and full section on self starters and lighting systems. Price $1.50 postpaid—leather binding—to go in your pocket—order now—no money until you see your book.
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In order to overcome the variations always found in Hand-Made Auto Springs we invented and patented an Automatic Machine for forming and tempering spring leaves. This machine does the work so accurately and uniformly that we are able to guarantee Harvey Auto Springs against all defects.

Harvey Springs are made without a hole at the center and a small depression or bead prevents the plates from shifting and all the strength is preserved at the center. There are no weak spots.

Harvey Springs are Strong, Durable and Easy-riding. They mean freedom from Spring repairs and are a source of constant satisfaction to users.

Jobbers, Dealers, Garagemen

will find the Harvey Spring Book very valuable in ordering replacements. It contains a complete list of springs for standard cars, gives sizes, weights, measurements and other valuable information that has never been published before and is of great assistance in ordering. Copy mailed free. **Write for yours today.**

The Harvey Spring Company, 849 17th Street, Racine, Wis.

Keep Your Car Bright

Every motorist should take pride in the appearance of his car. The car should not only be washed thoroughly whenever necessary, but care should be taken to preserve the luster of the varnish. For this purpose, experienced drivers highly recommend Johnson's Prepared Wax, which may be used to advantage on bodies, hoods and fenders. It will preserve the varnish and protect it from the weather as this wax sheds water and does not gather dust. There are thousands of delighted users of this preparation all over the country, and it is prepared by S. C. Johnson & Son, of Racine, Wis. To introduce it among our readers, the manufacturers offer to send a generous sample, enough for polishing a large car, on receipt of ten cents in stamps and the coupon which is attached to their advertisement in this magazine. We feel sure that a large number of our readers will want to take advantage of this generous offer.

Coupe Tops for Ford Cars.

Many of our readers are owners of the 1913 Model Ford cars, and as the winter season is now coming on, a great number of these owners are likely to be interested in special Coupe tops. The Auto Metal Company, 531 Worthington Street, Springfield, Mass., have on hand about 50 Coupe tops for 1913 Model Ford cars, which sold last season for $100 each, and they offer to close these tops out while they last, for only $25.00 each, F.O.B. Springfield. Over 400 of these tops were sold last season at the full price of $100, and they are now in use by satisfied customers all over the country. These tops are made of hard-wood frame, metal covered, with glass windows, full length doors, and nicely trimmed inside. For only $25.00, one of these tops will enable you to change your summer car into a closed winter vehicle, and we predict that the Auto Metal Company will sell out the small stock of these tops which they have on hand in a very short time.

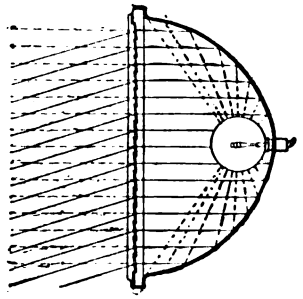
Kills the Glare, Not the Light.

A very large number of automobile accidents have been caused by glaring headlights, and as a consequence many cities through the country are passing ordinances against the use of these glaring lights. The Opalite Deflector, a new invention, absolutely kills the glare of the headlight, but it does not kill the light. It merely turns dazzling, dangerous light into soft, luminous beams, and



Opalite Deflector.

it is claimed that the penetrating power of the light is just as strong but without the objectionable glare. The Opalite Deflector fits the rim of the lamp the same as glasses fit the human eye, and the device is made to fit all makes and sizes of automobile lamps. Thousands



How the Light is Deflected.

of drivers who are using this invention say it exactly meets the requirements, and many of our readers will doubtless be glad to investigate. The illustrations give a good idea of the appearance of the Deflector as applied to the lamp, and also show how the rays of light are deflected. The Opalite Deflectors only cost $2 per pair, making them easily within the reach of any car owner. All orders and inquiries should be addressed to the M. & K. Auto Sundries Co., 1777 Broadway, New York City.

Pistons for Ford Cars.

Pistons of good quality made of soft grey iron and accurately machined are manufactured by Depuy Bros., Canterbury, N. H. These pistons are exactly of the correct weight—3 lb. and 9 oz.—and they are shipped complete with rings, pin and bushings. A complete assortment of sizes is kept on hand for immediate shipment including standard size, or .005 in., .015 in. or .030 in. oversize. By a regrettable error in our September issue, we referred to Depuy Bros. as manufacturers of piston rings, which was absolutely incorrect. This firm is ready to supply our readers with pistons, and the price for each piston, cash with order, is only $1. This ought to be interesting to a great many Ford repairmen, and all orders will be filled with the utmost promptness.

A Two-Step Extension Pedal.

This is a novel device which has been recently put on the market by the Van Derbeck-Sayers-Murdock Co, of 1834 Broadway, New York City. Cars are frequently driven by people of varying heights and what is convenient for one driver in the way of pedal position may be too high or low for another driver. With this device there are two heights of pedal available at the same time and all the time, and for family use this is an improvement which will be greatly appreciated. The adjustment of the extension or upper pedal is provided for in two clutch joints, by which the amount of the lift above the main pedal and the degree of tilt of the extension pedal may be regulated to suit each driver. The pedal is attached by means of a screw clamp, it does not deface the main pedal and there is plenty of room between the two pedals for the lower pedal to be used by longer-legged persons. The extension pedal is priced at $5 per pair and it is neatly made of steel, nickel plated.

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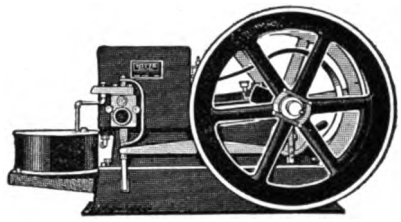
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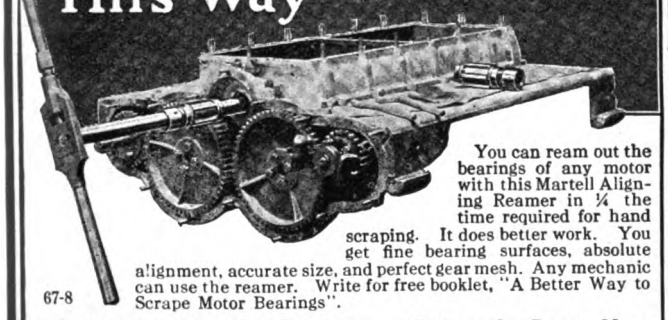
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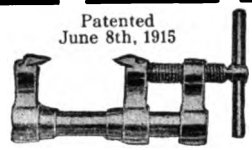
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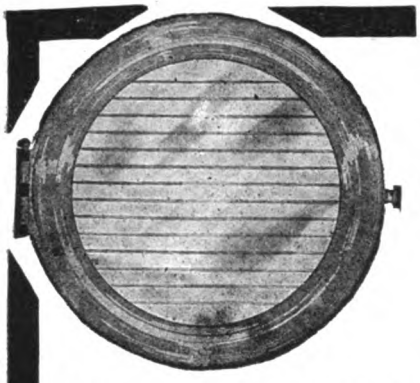
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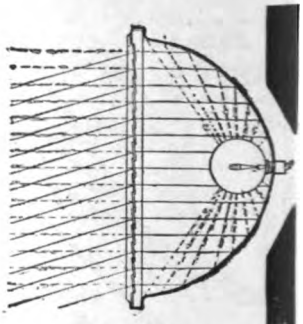
giving a soft beam to your headlights, **eliminating** the dangerous, **blinding dazzle** without reducing the **penetrating** power of your headlights.

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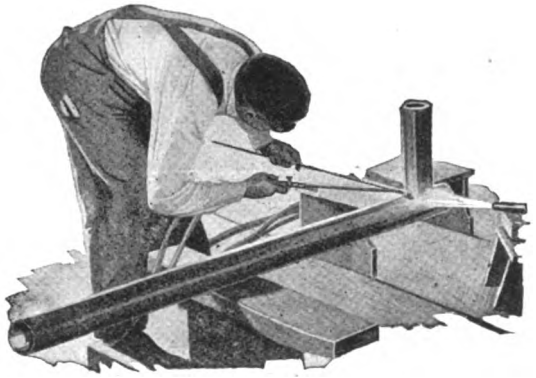
One railroad shop saved $5,000.00 in a single month on repair work alone.

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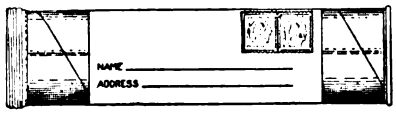
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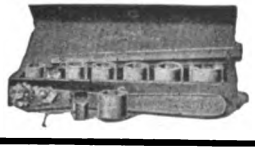


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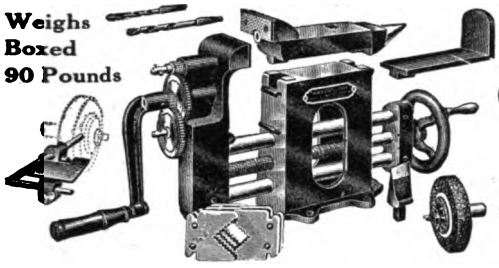
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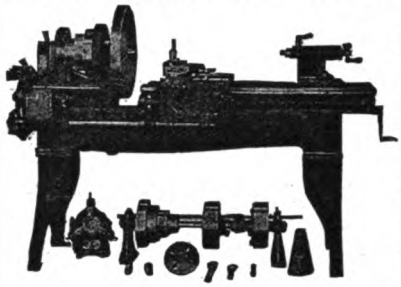
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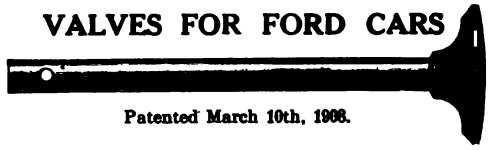
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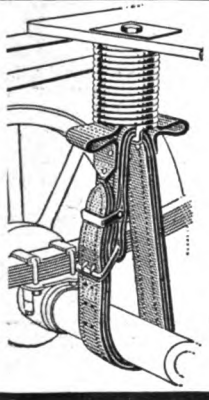


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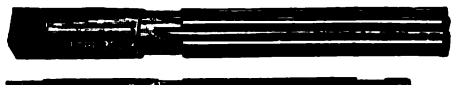
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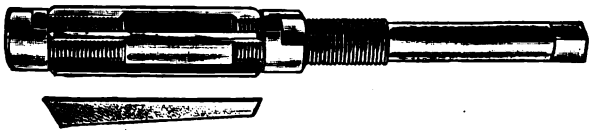
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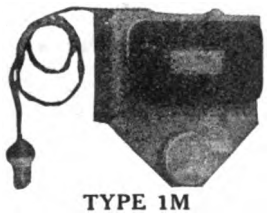
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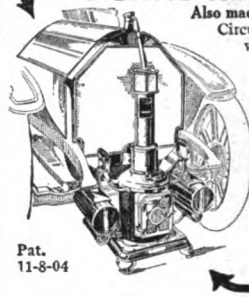
V-TYPE RADIATORS
And STREAMLINE HOODS
For FORD CARS
Livingston Radiator & Mfg. Co.
303 W. 75th Street New York City

The Perfect Pump With Perfect Attachments
"Guaranteed Not to Spray Oil with the Air"
KELLOGG Tire Pump
Model 101 with complete attachments - - - $15.00
Dodge, Chevrolet, Maxwell, $10.00
Special Ford Outfit - - $9.50
Stock carried by leading distributors and dealers everywhere.
KELLOGG MFG. CO., 2610 Circle St., Rochester, N.Y.

CHICAGO TIRE GOODS CO.
Manufacturers of high grade tire accessories.
Specialists in Tire Covers, Reliners, Inner and Outer Shoes, Raw Stocks and Cementless Patches.
Write for Description and Prices.
1216 Webster Ave., CHICAGO, ILL.

TEMCO SHOCK ABSORBERS
MASTER VIBRATORS FOR FORDS
PORTABLE ELECTRIC DRILLS
Write for Prices and Particulars
THE TEMCO ELECTRIC MOTOR CO.
2117 Sugar St., LEIPSIC, OHIO

PREPARE FOR FROST
The Neverout
Radiator and Garage Heater
DIRECT HEATING SYSTEM
BURNS KEROSENE
Also made for gas and electricity.
Circulates a current of warm water in water circulating system of motor.
Solves the cold garage problem. Keeps the auto warm in the coldest weather and makes the garage comfortable.
Write for descriptive literature, addressing Dept R.



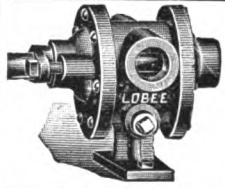
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ROSE MFG. CO.
910 Arch Street
Phila., U. S. A.



KEEP YOUR CAR UP TO DATE
WITH SLIKUP SPECIALTIES
Slikup Cream Polish contains no acids, non-inflammable. Slikup Body Polish restores brilliancy.
Slikup Hand Cleaner cannot injure the skin. Slikup Auto Soap, no alkalies or acids.
Dealers, the Slikup Salesman will make money for you.
Write today for information.
N. B. ARNOLD
1 Sigourney St., Brooklyn, N. Y.

HERZ PLUG
The famous "Bougie Mercedes" Spark Plug of Europe
ADOPTED BY U. S. ARMY and NAVY
WHY?
Unbreakable Double Stone—4 sparking points. Platinum-alloy electrode—self-cleaning. Guaranteed a year—usually outlasts the motor. Write for our special proposition to dealers. HERZ & CO. 245 W. 55th St., New York



For good circulation on Automobile or Motor Boat, use a
Lobee Pump
LOBEE PUMP & MACHINERY CO.
1790 Niagara Street, Buffalo, N. Y.

Republic Quality Tires
FOR QUALITY PEOPLE
The Republic Rubber Co.
YOUNGSTOWN, OHIO.



CELLO DASH LIGHT
Will run 25 hours on one dry cell. Neat in design, and serviceable. Sent prepaid on receipt of price, $1.50
A. S. CAMPBELL CO.,
280 Commercial St.,
Boston, Mass.

The Kennedy Auto Storage Cover
Made of heavy imported Paper, properly reinforced to prevent tearing and to add to its durability; is the best and cheapest protection for stored cars that can be secured. Made in standard sizes to fit any car.
The Kennedy Car Liner & Bag Co.
Shelbyville, Ind.

GASOLINE COUPON BOOKS
AUTO SUPPLIES COUPON BOOKS
INEXPENSIVE. F. O. B. DESTINATION. SAMPLES FREE.
WE HAVE SOLD MILLIONS OF OUR COUPON BOOKS!
J. P. FORBES, FORBES BLDG., COSHOCTON, O.

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Miller's No. 14 Three Cavity Sectional

(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

With Gasoline Burner Outfit, extra - $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.



MILLER'S REPAIR MATERIALS

Common Tread Stock, per lb	$0 40
Standard Tread Stock, per lb	.55
High Grade Tread Stock, per lb	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried....Net,	1.10
*Miller's Three in One Repair Stock	.80

* This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

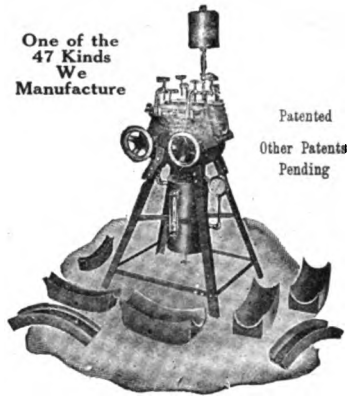
The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture

Patented

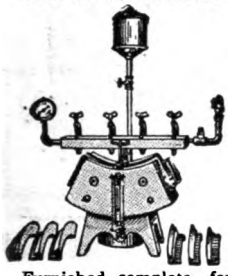
Other Patents Pending



That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Molds..... $42.00

MILLER'S SECTIONAL VULCANIZER
With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $41.50

Miller's High Pressure Air Pump

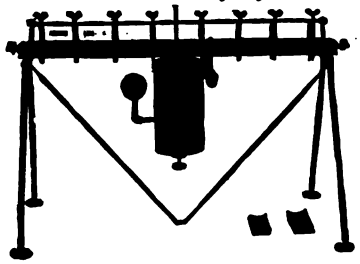
is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to 300 lbs. pressure. Write for details.

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.

Miller's Inner Tube Vulcanizers

Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

Miller's Rubber Instruction Book.

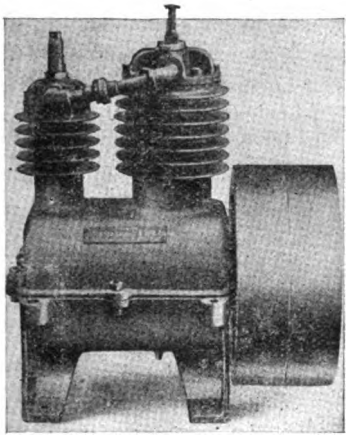
Price Prepaid, $1.00 Net

Write for our 52 Page *catalog which lists Vulcanizers of* All Sizes *and* Styles, *and Equipment for Tire Shops. Write for prices on* Miller's Heavy Wrapped and "Cog" Tread Tires *and* Heavy Red Tubes. *Address Dept. D.*

CHAS. E. MILLER

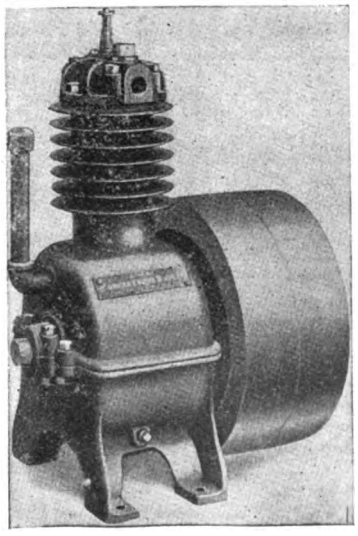
Anderson Rubber Works

ANDERSON, IND., U. S. A.



MANLEY COMPRESSORS DELIVER THE GOODS

Save 50 per cent of your electric power on your compressor by using a Manley Type C Compound Compressor. Needs only 50 per cent as much power to compress the same quantity of air. Effecting a big reduction on the wear and tear on the bearings and parts, resulting in a much longer life, which means less repairs and replacements.



If you prefer a single stage compressor, you will be impressed with the sturdy construction of our Type D Compressor, which is designed to meet the demand for a thoroughly reliable long wearing compressor **with adjustable bearings throughout** which will stand up to its work without trouble.

These facts account for the universal satisfaction they are giving wherever installed. Nine sizes to choose from.

Write at once for catalog and prices.

THE UNITED ENGINE & MFG. CO.

HANOVER, PENNA, U. S. A.

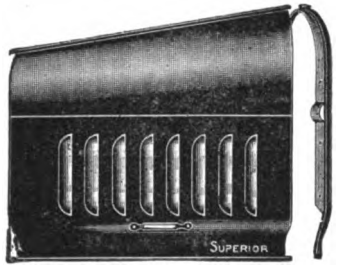
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"SUPERIOR" STREAMLINE HOODS FOR FORDS

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are merely painted and chip off easily. Buy the Smooth Long-Line Hoods.

BUILT OF HEAVY STEEL—TO LAST. IMMEDIATE DELIVERY.



Patented

NEW SURE-FIT HOOD
Complete, $8.00
Model "A" Fits 1912-13-14 Fords
Model "B" Fits All 1915 Fords

NEW WINNERS!!

Crown Fenders, Cowl Shields, Demountable Natural Wood Wheels, Lamps, All Types, Tool Boxes, 1915 Convertible Lamp Brackets.

GET THE NEW PRICES!

Send for Latest Illustrated Sheet.

"SUPERIOR" V-Type Honey-Comb Radiators For Ford Cars.

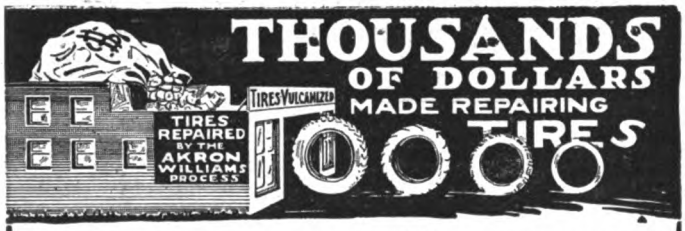
The New Constructed Vertical Water Flow Core.



Brass, $34.70 New Proposition. Get Our Credit Allowance On Old Radiators.

German Silver, $38.00 Write Today. All Types of Radiators Built and Repaired.

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.



Tire Repairing by the Akron-Williams process opens the way to prosperity and success and big money making on small investments.

The business is growing faster than men can be found to take care of it. There's a man needed in almost every town. The better repair shops everywhere use the

Akron-Williams Tire Repair Outfit

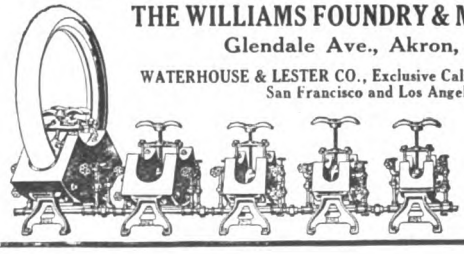
Endorsed by 30 Leading Tire Manufacturers

These men are making from $1,500 to $3,000 a year clear profit. You can do it too—with an Akron-Williams outfit.

The A-W Repair Outfit is used and endorsed by 30 leading Tire Manufacturers. So you take no chance in equipping with Akron-Williams. We'll help you to learn the business. Write for our catalog No. 121 and learn the great money-making possibilities of Tire Repairing and how little money you need to start.

THE WILLIAMS FOUNDRY & MACHINE CO.
Glendale Ave., Akron, Ohio

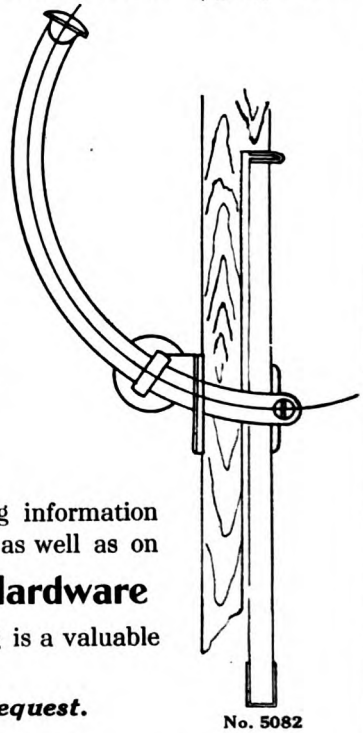
WATERHOUSE & LESTER CO., Exclusive California Distributors
San Francisco and Los Angeles



THIS illustration shows one of many patterns of fixtures for swinging forward, at any desired angle, sash of

Cabriolet, Limousine *and* **Winter Tops**

Front Windows.



To anyone seeking information on sets of this kind as well as on

Automobile Hardware

our 144 page catalog is a valuable book.

Mailed on request.

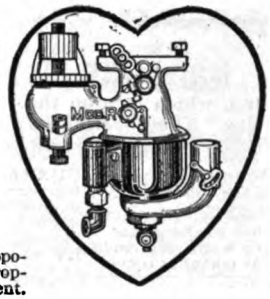
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SCHEBLER CARBURETORS

equipped the Stutz Car winner of second place in the

VANDERBILT AND GRAND PRIX RACES



This was the first American car to finish in both races and was of course

SCHEBLER EQUIPPED

Why not have a SCHEBLER yourself?

Ask us about our remarkable exchange proposition on new Model "R." Get our special proposition and particulars for Ford car equipment.

JAMES C. NICHOLS, Inc., Direct Factory Distributor

1673 BROADWAY Tel., Circle 1626 NEW YORK CITY

ROME RADIATORS

offer the utmost in

QUALITY EFFICIENCY

DURABILITY VALUE

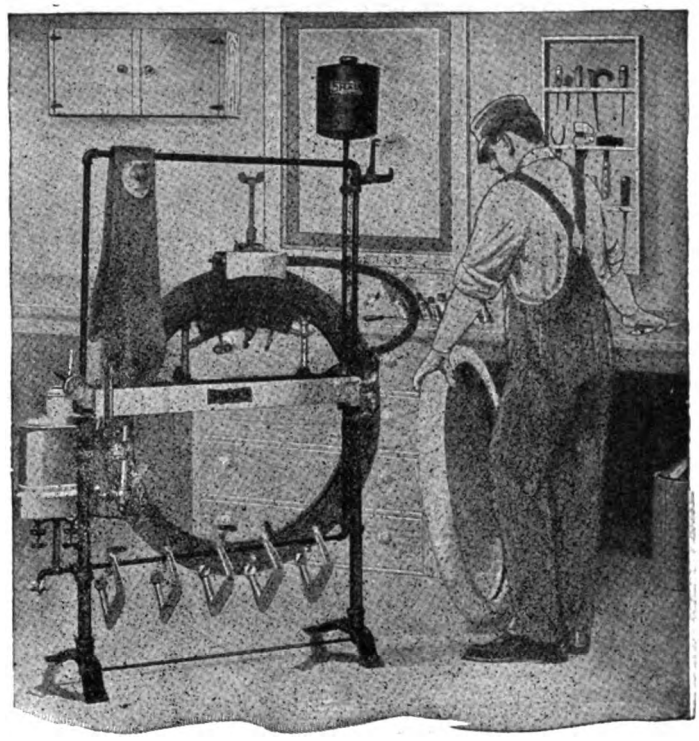
We Repair and Replace all Makes of Radiators

Large stock of radiators on hand for immediate shipment.

ROME-TURNEY RADIATOR CO.

WHITESBORO STREET

ROME, NEW YORK



Make Money Like This Man

He is a garage man and is repairing tires for his storage customers. These cars need to have the tires vulcanized very often and he makes more money from this source than he does from the storage bill or sale of supplies. You can do the very same thing with a

SHALER Vulcanizing Plant

The auto owner, when he comes to you for supplies, gasoline, oil, etc., and knows that you can repair his tires, will gladly give you the job. Give your customers this complete service they like and be ready to repair their tires.

You can easily add $20 to $30 more to your daily revenue without adding to your pay roll.

Anybody who can clean or adjust a car can operate a Shaler, because of the simplicity of Automatic Heat Control and

The Shaler Wrapped Tread Method

The Shaler System has been used successfully by tire makers for many years.

Automatic Temperature Control

This is an exclusive feature that keeps the temperature of vulcanizer exactly at the right point from morning till night without any watching or regulating.

New Complete Catalog Free

Write us today for full particulars about the money-making possibilities with Shaler Vulcanizing Plant—the low price and liberal discount. We will also send you our new catalog of the complete line of Shaler Vulcanizers—and our book for dealers, "Common Sense About Tire Repairs."

C. A. Shaler Co., 809 Fourth Street, Waupun, Wis.

The largest Manufacturers of Vulcanizers in the World

Canadian Distributors—John Millen & Son, Limited, Toronto, Winnipeg, Montreal, Vancouver.

"There's a mighty big difference in lubricators!"



Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.

Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.



BRAENDER

Tires and Tubes

Are Famous For Their QUALITY

We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2.60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

Braender Rubber & Tire Co.

Factory: Rutherford, N. J.

NEW YORK, 250 West 54th Street

Agents in principal cities

Established Agents Solicited.

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Steer Warms

Keep Your Hands Warm While Driving

Drive in comfort. Steer Warms consist of two neat leather covered grips, one for each hand, which lace on the steering wheel at any place convenient for driving. They operate on the same principle as an electric heating pad. They are simple, efficient, and cost little to maintain.

Make Driving Safer—Steer Warms keep your fingers limber so you can grip the wheel tight, making driving safe on slippery streets.

Also Preserve the Health—When you keep your hands warm, you keep your body warm and you do not catch cold. Steer Warms make for comfort and health.

Easy to Install—Steer Warms are easy to attach. They can be put on in ten minutes. No bolts and screws, or holes to bore. Lace on, wire up, that's all.

GUARANTEE—Steer warms are guaranteed for five years against burn out. They are guaranteed to do all we claim or money refunded. If your dealer hasn't them we will send direct. (When ordering state make of car and voltage of battery. If Ford car, whether 1914 or 1915 model.)

PRICE

For FORD CARS $5.00 In Canada $7.25
For Other Makes 7.50 " " $11.00

—DEALERS—

These self-selling accessories are in big demand. They are being advertised extensively and they appeal to the popular imagination.

You Make a Good Profit

Because of the demand for Steer Warms and Ieco Manifold Plugs, the ease with which they are sold, and the fact that you do not have to carry a large stock, makes them profitable items for you to handle. ***Write for full information to-day.***

PARTIAL LIST OF DISTRIBUTORS

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K. C. Auto Supply Co.....Kansas City, Mo.
Electric Appliance Co.....Chicago, Ill.
Gibson Co.....Indianapolis, Ind.
Motor Car Equipment Co.....55 Warren St., N. Y. City
Malton Specialty Co.....755 Boylston St., Boston, Mass.

Additional Distributors' Names will appear in future ads.

INTERSTATE ELECTRIC CO.
845 Perdido St., New Orleans, La.

Ieco Electric Manifold Plug

STARTS CAR QUICK IN ZERO WEATHER

This wonderful plug puts a hot vaporized mixture into the cylinders causing the engine to start at once. It will start the engine on the first or second turn anywhere. When self-starter is used it saves the battery. The plug is inexpensive to maintain, easy to install, simple and compact, and guaranteed against burn out within two years. If not as claimed money refunded. At all dealers. (When ordering, specify voltage of battery—Ford cars require six dry cells.)

PRICE $5.00 In Canada $7.25

Saves 25% Gasoline!

When used as an auxiliary air plug, the engine uses more air and less gasoline. Saves 25% on gasoline bills. Plug will pay for itself in three months.



HASSLER

$15 FOR A SET OF FOUR

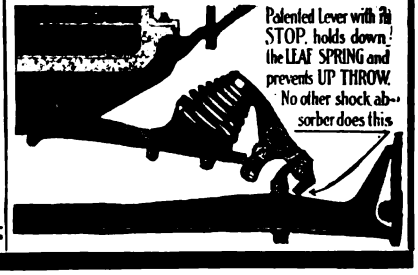
PRESTIGE

Means More Sales

DEALERS that are selling Hassler Shock Absorbers for Ford cars, are selling a shock absorber plus the prestige that 3 years of successful use on 50,000 Fords gives it, plus the rigid guarantee of a pioneer concern that depends upon **one** product for its success. These dealers are "cashing in," in a big way. The Standard of Perfection that the name Hassler stands for, makes selling easy. You can sell the Hassler.

Write for our selling plan. We want to send you a trial set. Not sold through jobbers. We protect you.

Robert H. Hassler,
Incorporated
Indianapolis, - Indiana



INLAND

1 PIECE PISTON RING



A perfect one-piece Piston Ring

that has all the virtues of eccentric, concentric and more-than-one-piece construction; and none of their disadvantages.

A continuous ring cut spirally for half its circumference; heat-treated so that the free ends hug tightly together; the result is an absolutely *gas-tight* ring that uncoils in expanding, insuring uniform pressure and perfect contact with the cylinder walls.

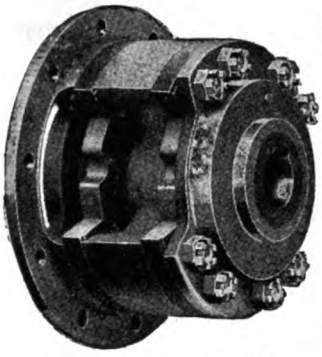
The strongest gas-tight ring on the market, because of its simple one-piece construction, and, for the same reason, it costs less to buy, and less to install, for it is easier to put on and will not break in handling. Made of close grain cast iron.

Absolutely guaranteed; money refunded on any ring that fails to give perfect satisfaction after 90 days' trial.

Full description in free booklet.
Dealers and jobbers should write for interesting prices.

INLAND MACHINE WORKS, 802 Mound St., ST. LOUIS, MO., U. S. A.

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The Bailey Gearless Differential

Thousands of Sales This Fall to Cold-Weather Drivers

Thousands of Ford owners will buy the Bailey Gearless Differential this Fall in preparation for the slippery, sleety, icy streets and roads of Winter.

For the Gearless Differential, absolutely reducing skidding and sidesway to the minimum, is the best safety-insurance the Ford owner can have.

The positive drive to both rear wheels gives all the advantages of a solid axle in straightway driving. And in ruts or mud, sand or snow, power is delivered only to the wheel having traction. Bailey-equipped cars have made some wonderful pulling records on bad roads.

Now is the Time for Dealers—Money-Back, No-risk Proposition

Write today for particulars of our sales plan. It involves no risk on your part, and it gives you the closest co-operation you have ever had on an accessory.

Hundreds of dealers are making good profits out of it now.

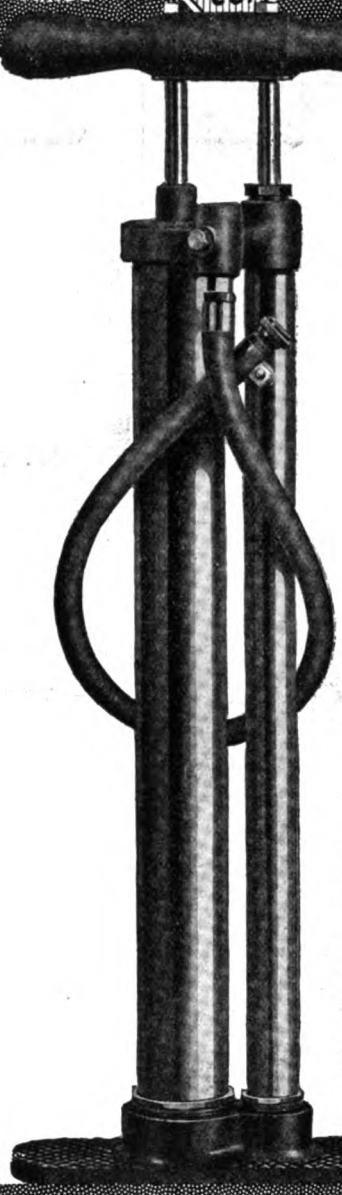
GEARLESS DIFFERENTIAL CO.

866 Woodward Avenue DETROIT, MICHIGAN

Jobbers Carrying Stock:

Chanslor & Lyon Co., San Francisco, Cal., and Branches
Auto Equipment Co., Denver, Colo., and Branches
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Hippee Motor Supply Co., Des Moines, Iowa
Tri-City Electric Co., Davenport, Iowa
Tisch Auto Supply Co., Grand Rapids, Mich.
W. S. Nott Co., Minneapolis, Minn.
Kansas City Automobile Supply Co., Kansas City, Mo.
Motor & Machinists Supply Co., Kansas City, Mo.
N. J. Engineering & Supply Co., Passaic, N. J.
Rogers & Rogers, Buffalo, N. Y.
Syracuse Auto Supply Co., Syracuse, N. Y.
Toledo Rubber Co., Toledo, Ohio
M. & M. Supply Company, Cleveland, Ohio
Fen Far Company, Cleveland, Ohio
Pennsylvania Rubber & Supply Co., Cleveland, Ohio
Motor Tire & Supply Co., Cleveland, Ohio, and Branches
Specialties for Ford Cars Co., Philadelphia, Pa.
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L. & L. Motor Supply Co., Sioux Falls, S. D.
Chemi Co., Richmond, Va., and Branches
Ferris-Dunlap Auto Supply Co., Dallas, Texas
Tri-State Motor Company, El Paso, Texas
Julius Andrae & Son Co., Milwaukee, Wisconsin
Omaha Rubber Co., Omaha, Nebr.
Paxton & Gallagher, Omaha, Nebr.
U. S. Automobile Supply Co., Omaha, Nebr.
Apco Specialty Co., Kansas City and Denver, Colo.
Capital Electric Co., Salt Lake City, and Branches
James S. Remick Co., Sacramento, Cal.
Spokane Cycle & Auto Supply Co., Spokane, Wash.
Kilmer & Sons Co., Spokane, Wash.
Ballou & Wright, Portland, Ore., and Seattle, Wash.
H. F. Brownell Co., Sioux Falls, S. D.
Henderson Garage Co., Shreveport, La.
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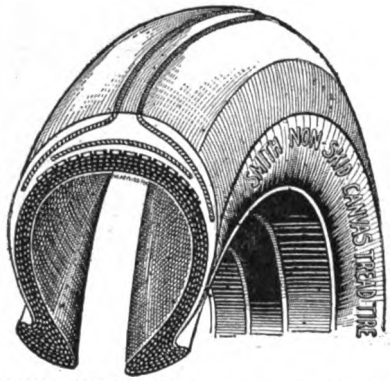
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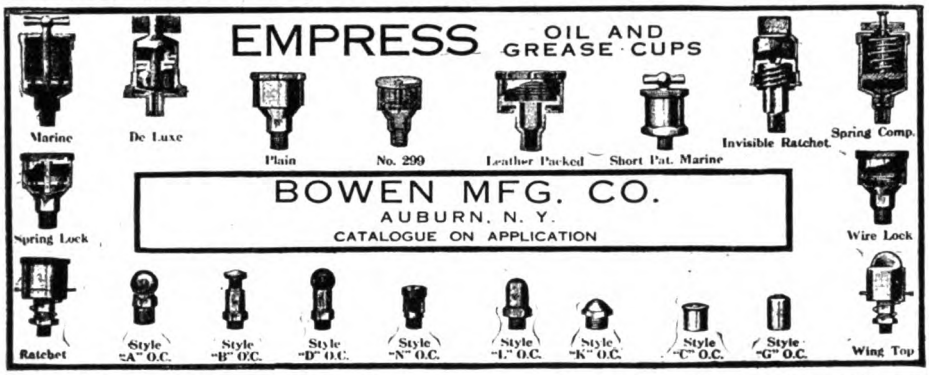
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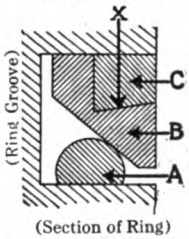
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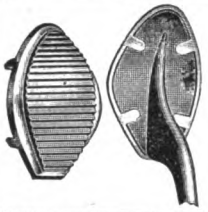
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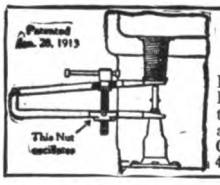
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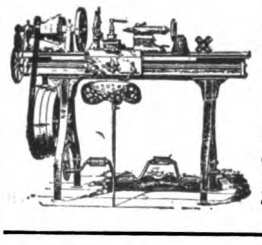
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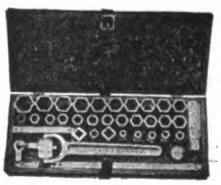


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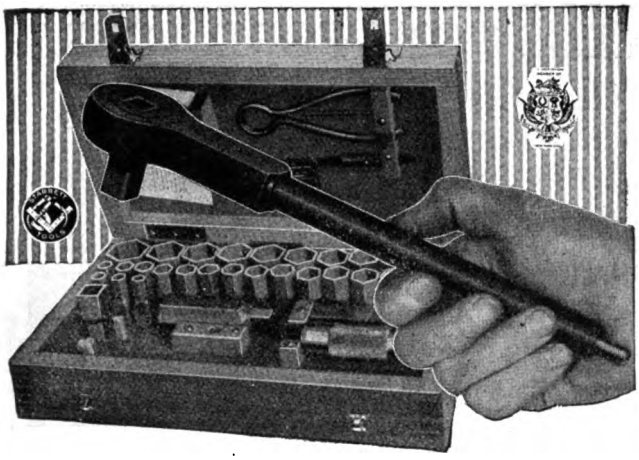
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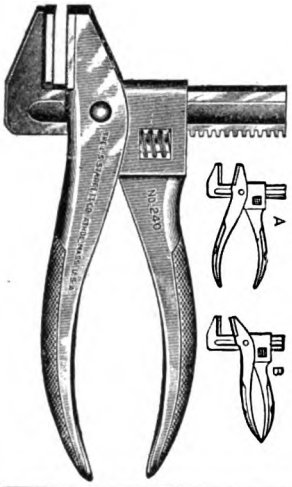
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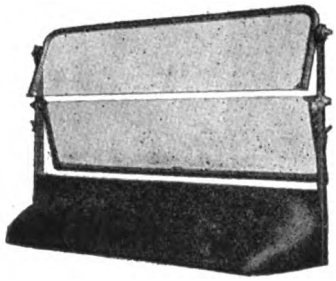
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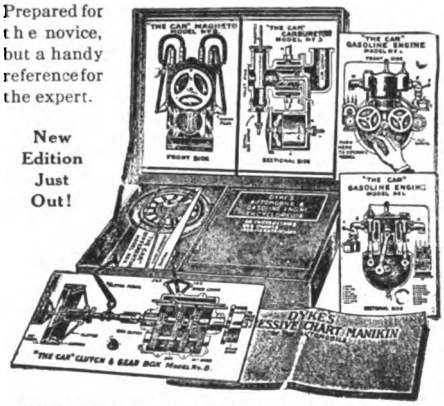
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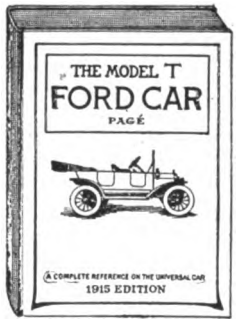
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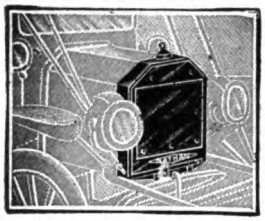


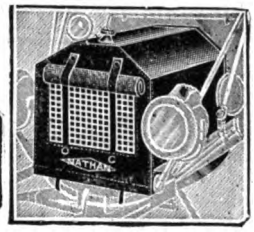
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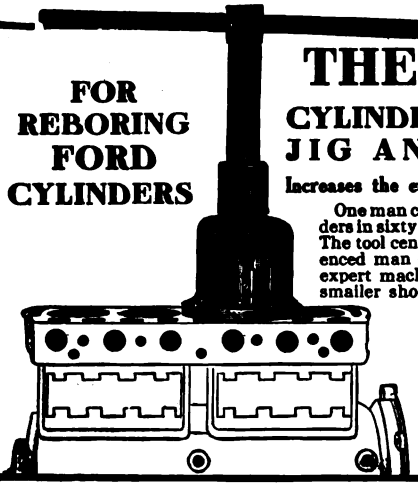
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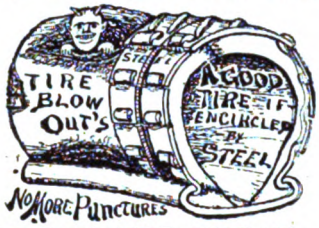
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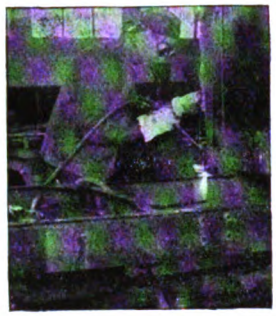
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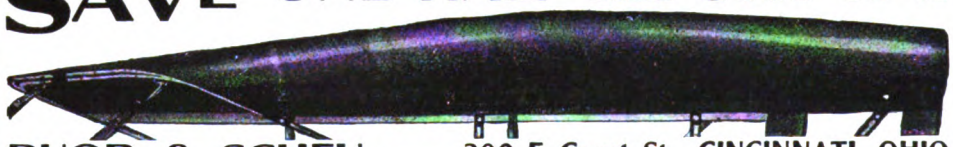


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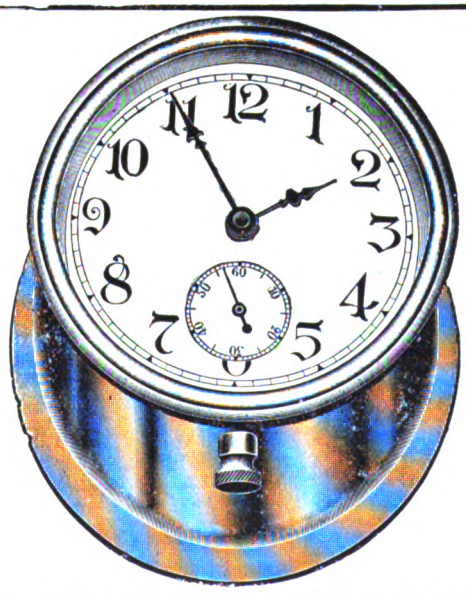
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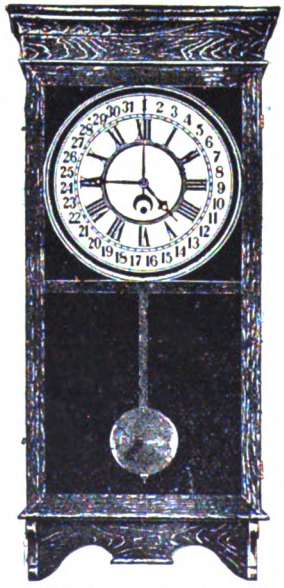


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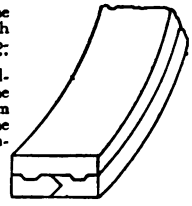
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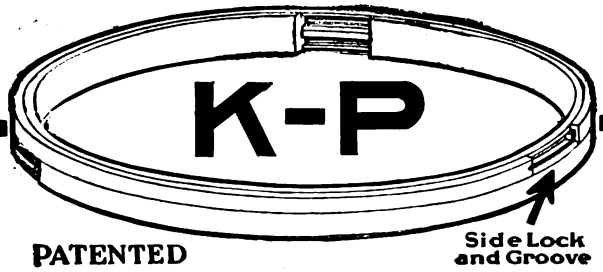


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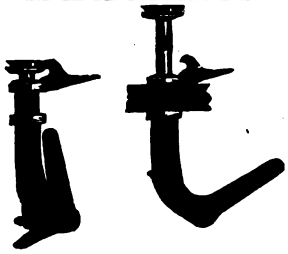
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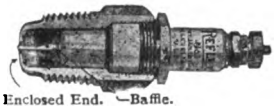
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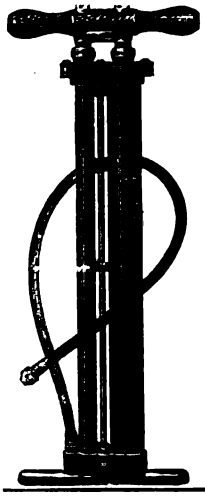
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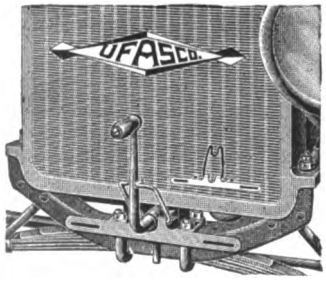
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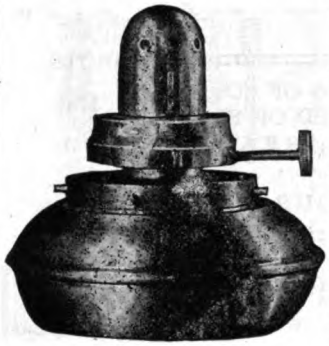
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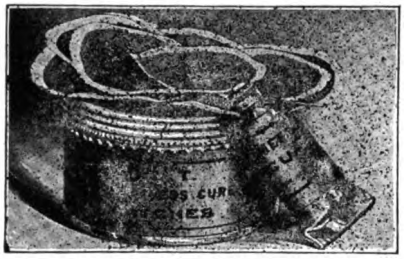
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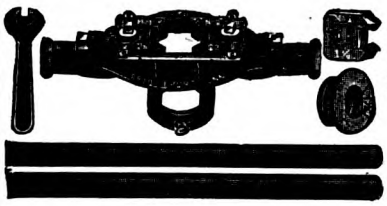
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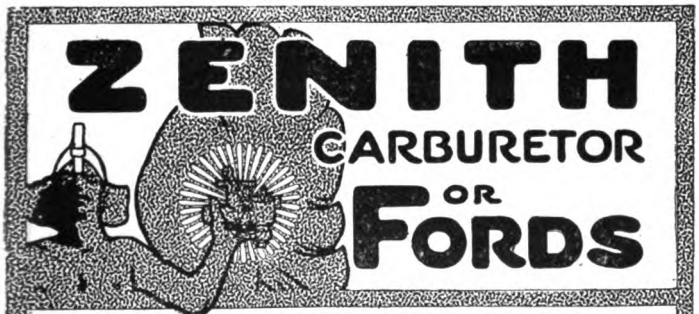


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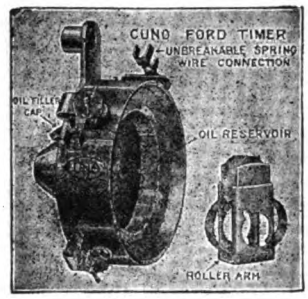
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Give to your Ford the same flexibility, power and economy that this carburetor has given to the world's best cars. That unpleasant jerky engine-pull when changing from low to high or when throttled down is entirely eliminated. Insures easy starting and wonderful economy.

Literature mailed free on request.

Trial Offer
If after 30 days' trial the Zenith Ford Carburetor is not well worth the price return it at our expense and get your money back.

MOTOR PARTS COMPANY, Sole Distributors, 822 N. Broad St., Philadelphia



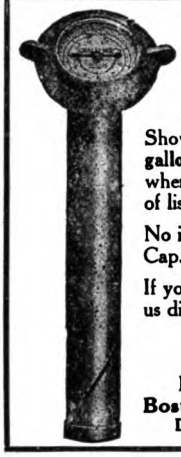
MISSING in your
FORD
will be STOPPED
by a
Cuno Timer

PRICE $1.50

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

Attractive Jobbers' and Dealers' Proposition.

CUNO ENGINEERING CORPORATION, 80 So. Vine Avenue, MERIDEN, CONN.



The "CHALLENGE"
A PERFECT Combination Gasoline Gage and Filler Cap
***For* FORD CARS**

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

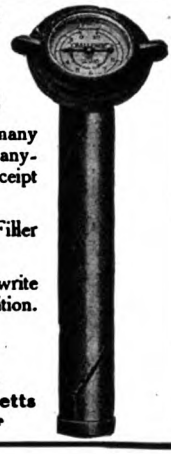
Dealers

If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

Be sure the gage you sell is a Challenge.

Quality Counts

BOSTON AUTO GAGE CO.
Boston Massachusetts
DETROIT OFFICE 1231 Woodward Avenue



TOWNSEND GREASE GUN





A Good gun should be
Quickly, easily and completely filled.
Quickly, easily and completely emptied.
—A pound a minute.
Not a speck should get on your hands.
The Townsend is such a gun—**the only one.**

S. P. TOWNSEND & CO.,
15 Central Avenue, ORANGE, N. J.

Sell Your Trade
TUTHILL TITANIC SPRINGS
NO CENTER BOLT
Guaranteed Against Center Breakage
Also Furnished with Dann Insert
WRITE TODAY for "Best Sellers"
Tuthill Spring Company
758 Polk Street Chicago, U. S. A.

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THE OLD RELIABLE
POLSON'S PATCHES
WON'T PINCH!

"POLSON ON THE PATCH IS A PLEDGE OF SAFETY AND SECURITY"

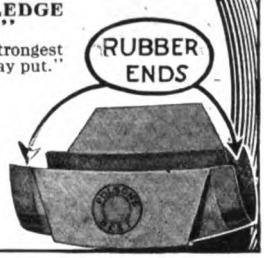
Polson's Blow-out Patches are the strongest patches made. They fit perfectly and "stay put." The rubber ends prevent pinching.

Cost no more than others.

Demand Polson's Reliners, Polson's Blow-out Patches, Polson's Tire Boots, and Polson's Tube Patches.

Write us if your dealer can't supply you. *Catalogue sent free.*

POLSON RUBBER CO., Manufacturers
329 Southwest Boulevard, Kansas City, U. S. A.



!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS, SMOOTH FORGED OR FINISHED COMPLETE, READY TO ASSEMBLE : : : : :
SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY
(PLANT AT CUDAHY) MILWAUKEE, WIS.

Self-Lubricating Oil-Grooved
PISTON PACKING RINGS

Fill the Bill



Solve the Problem

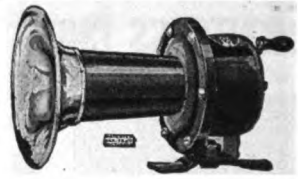
Patent Pending

What a wheel is to an automobile, the Oil-Grooved Packing Ring is to the cylinder—let it be gas, gasoline, steam or air.

AGENTS WANTED

Rittenhouse Fleury Company, Sole Manufacturers
304 N. Holliday Street, Baltimore, Md.

$4 **SEISS** Model A



$4 **SEISS** Model A

DOUBLE ACTING MECHANICAL HORN

A powerful, Commanding Warning Signal—the surprise in Mechanical Horns. Operated by touch of hand—turning either right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

At your dealer's or direct from factory—with 10 year guarantee, only $4.00. *Write to-day for printed matter.*

The Seiss Mfg. Co., 443 Dorr St., Toledo, O.

MARVELOUS REMARKABLE
Four to one in our favor



The Jensen Lever Pump inflates four tires with less effort than a compound hand pump inflates one tire, It is absolutely the easiest working pump on the market regardless of price. Send for one. Only about half the price of other lever pumps.

We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

Dealers, write for proposition.

W. H. HOWELL CO., - - Geneva, Illinois

Sears-Cross Spedindicator
STANDARD FORD 1915 EQUIPMENT
"Absolutely Accurate"
Special for Ford Cars

Mounted flush in a bracket on the cowl. A remarkable opportunity for dealers. Write or telegraph for details,

Sears-Cross Company
Bush Terminal Brooklyn, New York



SMOOTH-ON
IRON CEMENTS
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - **$1.00**

SMOOTH-ON MFG. CO.,
Jersey City, N. J.

CHICAGO, 221 N. Jefferson St. SAN FRANCISCO, 36 Sacramento St.

The Most POWERFUL and RELIABLE STARTER is
The Compressed Air Rotary

Thurber Starter



AND TIRE INFLATOR
Air Pumps and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 R P M under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc. Hundreds in use. **PRICES: Model M, Large Cars, $85.00—Model J, Medium Cars, $70.00—Model F, for Fords, $65.00.** F. O. B. Cars Our Works, Detroit,

NORTHERN ENGINEERING WORKS
12 CHENE STREET - - DETROIT, MICH.

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Perfect Valves—Always

Here is the tool you need to keep valves in perfect order. Regrinds and reseats in one-quarter the time needed by hand—and is 100% accurate. The

Fosnacht Valve Reseater

is simple in operation—no expert is required. No oil—no emery—no dirt—no tearing down of motor. Pays its cost in a week. Brings its owner repair work his competitor is now getting. Look into this matter *now*.

Our free book shows how the Fosnacht Valve Reseater will quickly bring you greater profits. Write for it today—while you think of it. Address

H. C. Paro

Suite 701 30 No. Michigan Boulevard
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"James"

After hearing what Mr.

Glenn H. Curtiss,

the gasoline motor expert, said of **OPCO,** I tried it out and have put my discoveries into a little booklet which is yours for the asking—address "James",

American Oil Products Co., Buffalo, N. Y.

Use OPCO and get rid of carbon.

Dealers—get discounts and terms.

HANDPHONE

Hand-Operated Horns

RELIABLE AND EFFICIENT AT ALL TIMES
BEST FOR THE USER
BEST FOR THE DEALER
GUARANTEED THREE YEARS' PERFECT SERVICE

Write for Catalog Showing All Styles of Hand-Operated and Motor-Driven Horns

AUTOMOBILE SUPPLY MANUFACTURING CO
220 TAAFFE PLACE BROOKLYN, N. Y.

The Largest Manufacturer of Auto-Horns in the World

New Dover Galvanized Garage FUNNEL



The first practical large size (3 gals.) Garage Funnel at a popular price.

SEND FOR 1914 CATALOGUE

DOVER STAMPING & MFG. CO.

(3) CAMBRIDGE, MASS.



BENTON SPARK PLUG

Unbreakable wound mica insulator quickly cleaned by opening metal-to-metal joint and scraping or washing mica. Joint always gas tight. No deterioration from cleaning. Case-hardened wrench and thread surfaces. Service guaranteed.

Price $1.00.

Write for our liberal Agency Proposition and a copy of Booklet shown.



L. F. BENTON CO., VERGENNES, VERMONT 6

YOU NEED NEVER WORRY

ABOUT BURNING UP TUBES, OR ABOUT PATCHES COMING LOOSE

If You Repair Punctures and Blowouts with

TIRE-DOH

TIRE-DOH can be used anywhere—on the road or in the shop—requires no heat or tools, and 2 cents worth repairs the average puncture. At any dealer's, or direct from us, $1.00 per outfit.

Tire-Doh Repairs Are Permanent.

TIRE-DOH IS MADE ONLY BY THE

ATLAS AUTO SUPPLY CO., 680 W. Austin Ave., CHICAGO

$5.00 **$5.00**



Agents Wanted

CLEAN OUT THE CARBON WITH STEAM

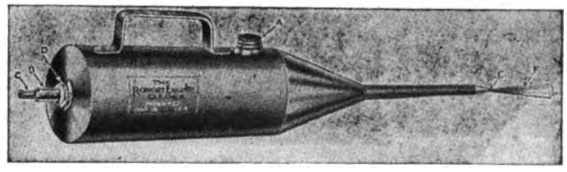
The Hart-Bell Carbon Remover cleans out the carbon with live steam. It is permanently installed on the intake manifold, and a turn of the handle admits a fine spray of water vapor that is instantly converted into superheated steam by the ignition in the cylinder. The steam loosens the carbon while the motor is running so that in five or ten minutes the carbon is blown out.

UTILITY PRODUCTS CO., Inc., 1414 Times Building, New York

THE ROMORT ENGINE CLEANER

For Automobiles and Motor Cycles

PRICE $3.00 Delivered. We Guarantee Satisfaction or refund purchase price.



Fill with two quarts common coal-oil, attach Cleaner to air supply (Power tire pumps or storage air systems preferred). Cleans the dirt and grease from the machinery perfectly. Once a week will keep your car looking new. Full directions with each Cleaner. Ask your dealer or fill out Coupon below.

ROMORT MANUFACTURING CO.,
1322-1326 Michigan Ave., Chicago, Ill., or 1810 Westlake Ave., Seattle, Wash.

Gentlemen:—Inclosed find Three Dollars, please send me by Prepaid express or Parcel Post, One Romort Engine Cleaner, subject to your guarantee of satisfaction or refund.

.....

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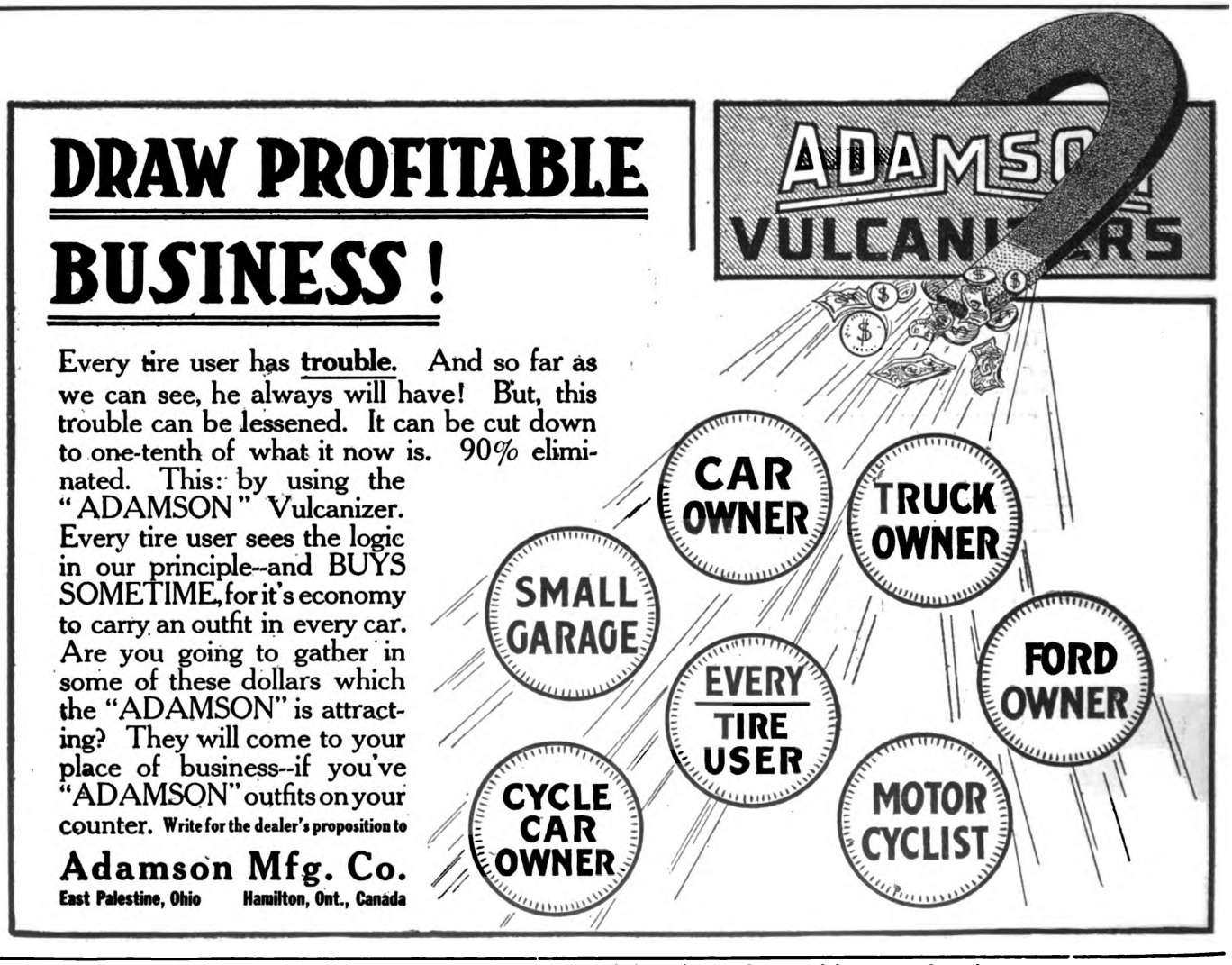
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Subscribe to the Automobile Dealer and Repairer, $1.00 Per Year.



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Hudson

ANNOUNCEMENT OF POLICY

The Hudson car will use a six-cylinder motor exclusively in all future models planned by this Company. Our refinement and development of the six-cylinder type of motor leads us to believe it surpasses in simplicity, low cost of upkeep, performance and general adaptability any other type so far developed for use in pleasure vehicles. We have built every type of motor—from one to twelve cylinders. The recognized ability of our Engineering Department insured that these motors would be the best of their kind in the present state of motor development.

The result of this research convinced us more firmly than ever before of the absolute supremacy of the Hudson six-cylinder motor. It is therefore more than pleasing to us to announce the continuation of the consistent policy which has marked our progress and advise Hudson buyers, both past and future, that they are securing the best engineering development that the industry offers.

HUDSON MOTOR CAR COMPANY
DETROIT, MICHIGAN

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The Big "Push!"

— and how you can "cash in" on it —

Our big advertising campaign of full pages in the Saturday Evening Post and seventeen other big National mediums is under way. Hundreds of thousands of motor car owners are talking of Campbell Detachable Upholstery. Thousands have already bought. Are you getting the benefit of this tremendous publicity? Is your cash register hauling in the dollars that this intensive selling is bringing to the motor car trade?

Write or wire us for details of our plan to help you get this new equipment business. Let us send samples and new prices on the most luxurious, smartest accessory you can put on a motor car.

Act now! The big "Push" is started! Pull with it! There's money in it for you. The Perkins-Campbell Co., 628 Broadway, Cincinnati, O. New York Office, 89 Chambers Street.

Dealers: Write for samples, discounts and big co-operative selling plan

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ARE YOUR TIRES IN THIS JUNK-HEAP?



Don't Throw Away Your Half Worn Tires

It's just as unnecessary—just as extravagant—to throw away your tires when they become tread worn or rut worn as it is to throw away your shoes when the first sole gets thin, for you can get 5,000 miles more service out of them by doing what European motorists have done for the past three years. This will result in a saving of from $50 to $200 a year for you.

Don't Let the Junk Man Profit at Your Expense

That picture of the junk wagon—with its heap of cast-off tires—illustrates in a striking manner what becomes of the average rubber tire after 3,000 to 5,000 miles of service—uncertain service, with the nerve-racking dread of tire trouble.

This waste in tires is distinctly an American extravagance.

What European Motorists are Doing

The foremost European engineers have for years been studying the problem of getting more miles for less dollars. With their usual painstaking, scientific thoroughness, they experimented with tire protectors and steel-studded Treads. The result—for over three years European motorists have been "half-soling" their tires with steel-studded Treads just as we "half-sole" our shoes when the original sole gets thin.

These European motorists are getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American motorists are getting from 3,000 to 5,000, and—what is just as important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim cuts.

Guaranteed 5,000 Miles Without Puncture

To many motorists this fact is of more importance than the money saved by eliminating tire repair bills—the constant dread of puncture or blowout spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop"—makes the man at the wheel think of tire trouble FIRST.

Durable Treads are backed by a signed guarantee—as good as a Government Bond—for 5,000 miles **without** puncture. Think of the joy of motoring when you KNOW in your own mind that your tires are **impervious** to the rough roads—when you KNOW that **you** won't have to get out and sweat fixing a puncture or blowout, besides, you save nearly enough to pay your yearly gas and oil bills, and the guarantee holds good no matter whether your tires are new or old, rim cut or rut worn.

How Does This Affect You?

The almost unbelievable waste in tires by the American motorist is not only national—it is vitally personal. It affects you—**your pocketbook.** Just consider what it would **mean to you** to get 10,000, 12,000 or 15,000 miles out of your rubber casings and at the same time drive your car without the constant dread of tire trouble.

In round numbers, it would mean a saving in tire miles sufficient to pay your yearly gas and oil bills—by the elimination of punctures, blow-outs, rim-cuts and skidding—a gratification which cannot be estimated in dollars and cents.

No More Skidding

Durable Treads are as sure-footed as a burro, and they're supremely convenient. Look at them—they're simply bound to be safe. The sharp-edged steel rivets make skidding almost impossible.

In London and in Berlin, as well as many other of the larger cities of Europe, ordinances compel the use of steel-studded Treads for public safety. Durable Treads are always on your tires—you don't need to worry about climbing out in the rain and mud to adjust your chains, and, **what is** more important—**you receive perfect non-skid service while your tires are protected instead of injured.**

Ask Yourself This Question

Do you intend to continue allowing the junk man to profit at your expense, by carrying away in tire miles enough to pay your yearly gas and oil bills, or will you turn to your advantage the experience of European motorists?

It is the same question of economy you decide when you "half-sole" your shoes instead of throwing them away when the first sole gets thin. Rubber tires cost several times as much as shoes and are certainly worthy of the same economy.

We Ship on Approval

We ship on approval to any motorist—without one cent of deposit—prepay the express—and allow you to be the judge. Durable Treads are easily applied in your own garage, without special tools, in thirty minutes.

If your tires are new then protect them from cuts and punctures by putting on Durable Treads at once—don't wait until they are all shot to pieces. **If they are old and rut-worn** don't sell them to Jimmy the Junkman—remember that "Durable Treads" are **guaranteed** for 5,000 miles without puncture—no matter whether your tires are old or new.

Special Discount Offered

To motorists in territories where Durable Treads have not yet been introduced we offer a special introductory discount equal to the full dealer's profit.

Will you let us give a demonstration at our own expense and risk?

Will you let us make you an offer so fair and square that you do not stand to lose one red cent, either before or after you buy? The time for action is NOW, before the tires on your car run another week in a "bare-footed" condition—before you get your next puncture or blow-out.

Cut out the coupon below. If you haven't a pen or pencil handy you can fill it out afterward, but cut it out now before you turn the page. It will be the means of adding at least 5,000 miles to the life of the tires on your car.

The Colorado Tire & Leather Co.
115 Tread Bldg., Denver, Colo.
K5 Transportation Bldg., Chicago
511 Woolworth Bldg., New York

CUT OUT AND MAIL NOW—TODAY

THE COLORADO TIRE & LEATHER CO.
115 Tread Bldg., Denver, Colo.
K5 Transportation Bldg., Chicago
511 Woolworth Bldg., New York

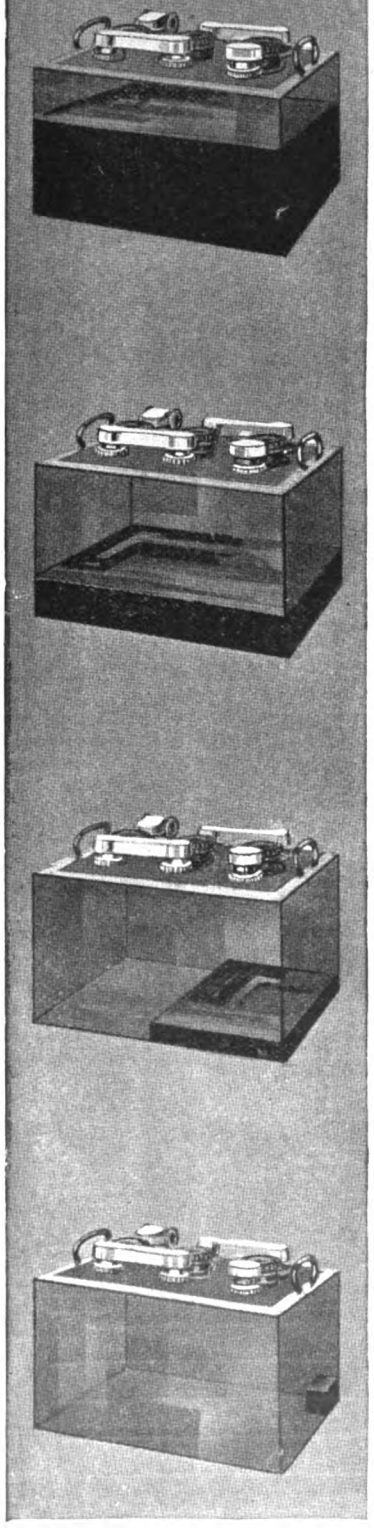
Gentlemen:
Please send **me, without** obligation, complete information, copy of 5,000 **mile guarantee,** book "10,000 **Miles on** One Set of Tires" and **tell me** about Special Discount Offer.

Name.....
Address.....
City..... State.....
My tire sizes are.....

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Atwater Kent

Perfect Ignition



Battery normal—Amount of charge represented by solid portion. Cranking, lighting normal; AK Ignition perfect.

Battery partially exhausted—Will not crank motor but will still light lamps and blow horn; AK Ignition perfect.

Battery exhausted—Will not crank motor or blow horn; lamps burn dimly; AK Ignition perfect.

Battery drained—No current for starter, lamps or horn; AK Ignition still perfect.

even with exhausted batteries.

Due to its efficient "open-circuit" principle, the current consumed by Atwater Kent Ignition is so small that it will not register on your dash Ammeter.

In fact, the storage battery on the car may be so exhausted that it will be too weak to crank the motor, light the lamps or even blow the horn—yet it will still provide the exceedingly minute current required for Atwater Kent Ignition.

Several hundred miles of steady, hot, dependable ignition, with batteries practically exhausted and generator disconnected! Because of this valuable feature the successful operation of your car does not depend on the condition of your storage battery.

By means of the Atwater Kent System with magneto replacement mounting any owner may bring his car up to date and obtain the same efficient ignition now standard equipment on thirty representative cars. Nearly 200,000 in use.

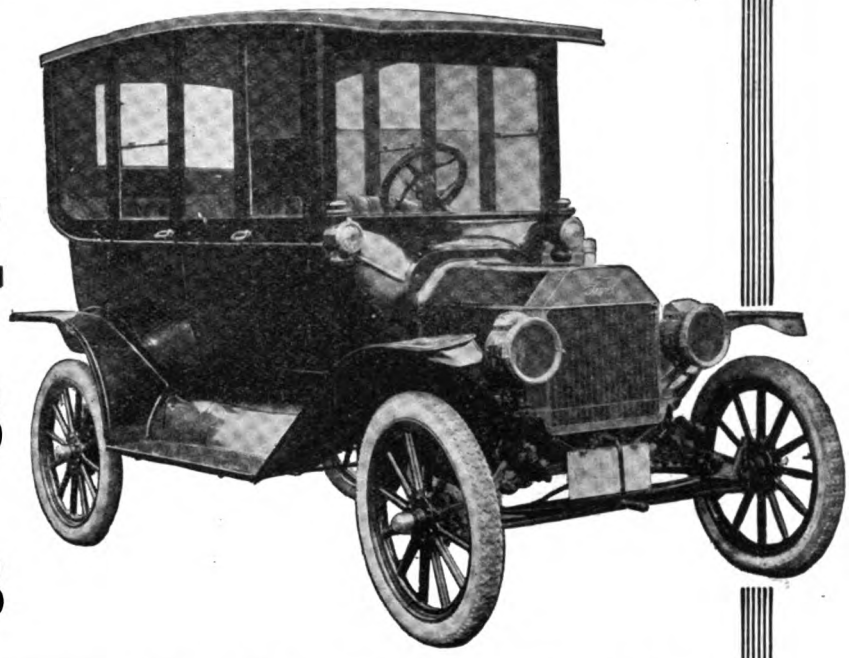
No matter whether you are a car manufacturer, engineer, dealer or owner we have valuable ignition information for you.

NOTE:—A special Atwater Kent System is provided for Ford cars.

Atwater Kent Mfg. Works
4933 Stenton Avenue, Philadelphia, U. S. A.

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REAL LIMOUSINE AND COUPE TOPS FOR FORD CARS



$75.00 UPWARDS REAL BODY CONSTRUCTION BODY FINISH BODY EQUIPMENT

UNICO FORD BODIES

Most Profitable to Dealer BECAUSE

1 Our Agency Proposition is most liberal.
Agent secures real profits, not small commissions. Returns 3 to 1 over any other active seller.

2 Ford Owners are Discriminating and know real value when they see it. Unico Bodies win when the quality test is applied.

3 No Competition From Cheap Tops of cloth or imitation leather. Unico bodies are not makeshifts or flimsy substitutes.

4 The Only Complete Line.
A body for each model (Touring and Roadster) 1913-14-15-16 Ford.

EVERY FORD OWNER A PROSPECTIVE PURCHASER.

Unico Agents are making large, quick profits. Can you afford to miss this opportunity?

Most Profitable to Owner BECAUSE

1 Greater Value Dollar for Dollar.
Unico Bodies must not be confused with cheap material or imitation leather tops, as they are of best body construction.

2 Construction Insures Durability.
Wood frame, metal panels, glass sash, minimum steel and hard wood, maximum glass. Strength combined with light weight.

3 Style, Comfort, Distinction.
Exterior seven coat coach finish. Interior full upholstered lining. Quality in every detail.

4 Equipment Complete, No Extras.
Adjustable windows set in rubber, electric dome lights, sedan doors. All necessary fixtures for quick attachment.

If you cannot locate a Unico Dealer, write at once for our Direct Sales Proposition.

WE ARE PLACING EXCLUSIVE AGENCIES

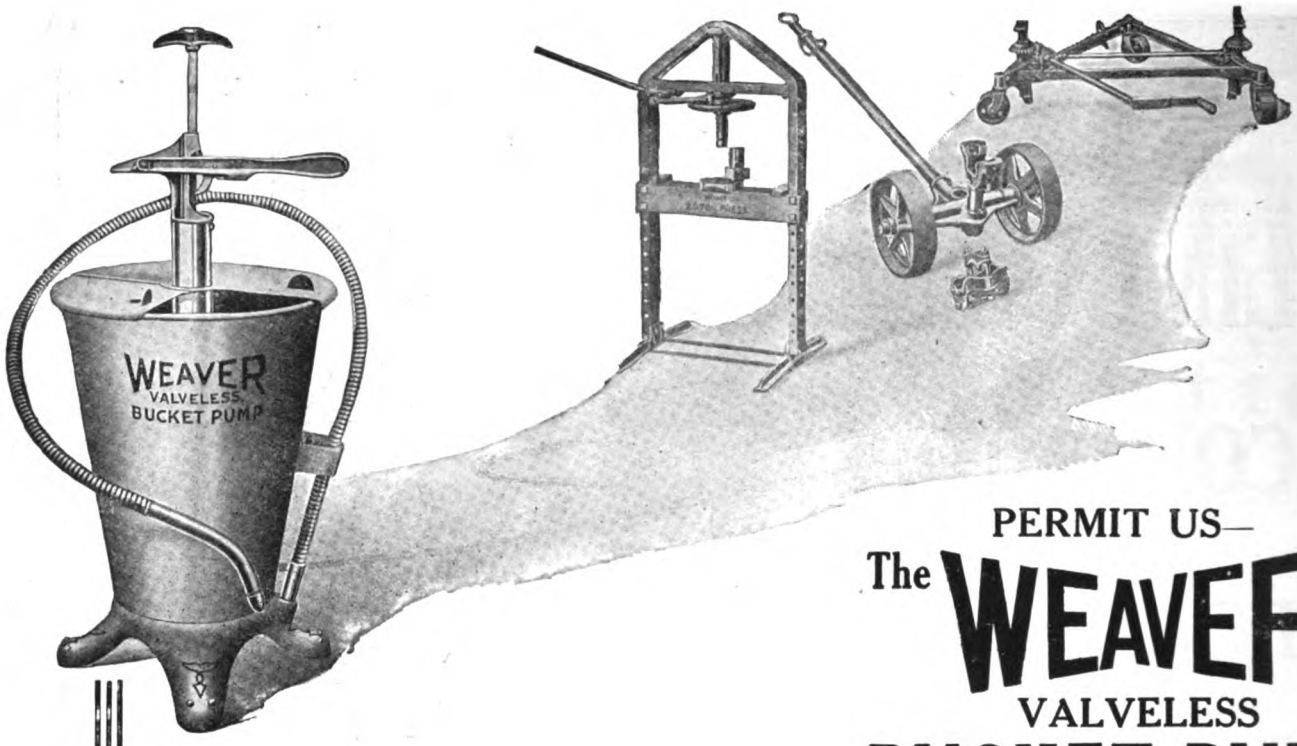
In every Town, County and City, East of the Mississippi River. If your territory is not already closed you may be able to secure agency for the most profitable Ford accessory of the season.

BUT YOU MUST ACT QUICKLY TERRITORY CLOSING DAILY

THE UNIT CONSTRUCTION CO., 125 South 31st St., PHILADELPHIA, PA.

WRITE, WIRE OR CALL TODAY

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PERMIT US—

The WEAVER VALVELESS BUCKET PUMP

WHILE the Weaver Bucket Pump is amply capable of standing upon its own merits—we do not hesitate to point with pride to its long line of "blue-blooded" ancestors—confident that they will win for our infant prodigy instant recognition and endorsement among the most exclusive of the Automobile Fraternity.

The same originality and ingenuity which characterizes each article of "WEAVER" Garage Equipment is strongly evident in this Valveless Bucket Pump.

THE "THREE-WAY" FEATURE

One great advantage of the "Weaver" Pump is the fact that our valveless construction permits lubricants to be handled in "three ways."

First—The lubricant can be forced out of the bucket and into the desired receptacle.

Second—Grease or oils can be sucked out of the differential, transmission housing, etc., and **forced into the bucket.**

Third—Where the lubricant to be removed from the differential or transmission is of a different variety or quality from that contained within the Bucket, the barrel or chamber of the Bucket may be sucked full of the foreign lubricant and discharged again through the hose into a **third receptacle without disturbing the content of the Bucket.**





SELF-MEASURING

The barrel has a total capacity of exactly one pound of grease or heavy oils. In handling light lubricating oils which are usually sold by liquid measurements, ten full strokes of the lever handle will discharge exactly one quart.

STEEL HOSE

The Weaver Bucket Pump is equipped with ⅝-inch Flexible Steel Hose which is practically indestructible and cannot be affected by the grease.

CONSTRUCTION

The Bucket proper is made of heavy sheet iron and has a capacity of 25 pounds of grease. The barrel is of 16 gauge brass tubing, two-inch diameter, containing a plunger which will not leak and is impervious to the action of grease and oils. Shipping weight, 25 pounds.

List Price, - $12.00

WEAVER MANUFACTURING COMPANY

2167-79 So. NINTH STREET SPRINGFIELD, ILLINOIS

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ON EVERY CAR IN THE ASTOR CUP RACE

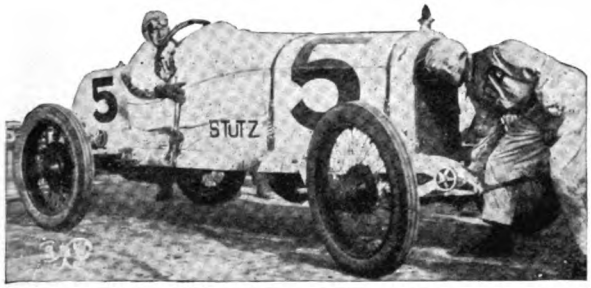
Affording further conclusive evidence that comfort, safety and economy demand the use of the

*Hartford SHOCK ABSORBER

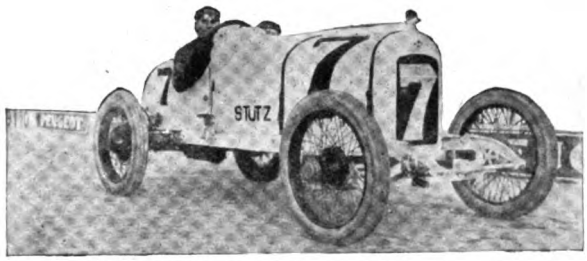
Every car participating in this world's record making event wore it—all that started, every one that finished.

The history of American track and road racing, endurance run, hill climb and transcontinental tour is a chronicle of the Hartford Shock Absorber's supremacy.

Absolutely indispensable for comfortable motoring over any road at any speed.



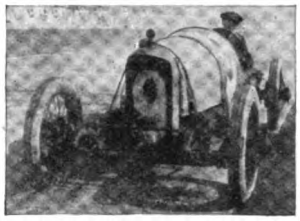
Anderson, in Hartford-Equipped Stutz, First



Rooney, in Hartford-Equipped Stutz, Second

The score of the great Sheepshead Bay event:

	Car.	Driver.	Time.	M.P.H.
1.	Hartford-equipped Stutz	Anderson	3:24:42	102.60
2.	Hartford-equipped Stutz	Rooney	3:25:29	102.19
3.	Hartford-equipped Duesenberg	O'Donnell	3:39:55	95.45
4.	Hartford-equipped Ogren	Alley	3:47:03	92.52
5.	Hartford-equipped Duesenberg	Henderson	3:47:26	92.31
6.	Hartford-equipped Delage	Limberg	4:09:23	84.22



O'Donnell in Hartford-Equipped Duesenberg, Third.

First and second cars beat all previous marks for the 350 miles.

Do as 350,000 car owners and 95% of racing drivers have done —Hartford-equip.

Tell us make, year and model of car and we will tell you how to enjoy solid automobile comfort.

HARTFORD SUSPENSION CO., E. V. HARTFORD, President **141 Morgan St., Jersey City, N. J.**

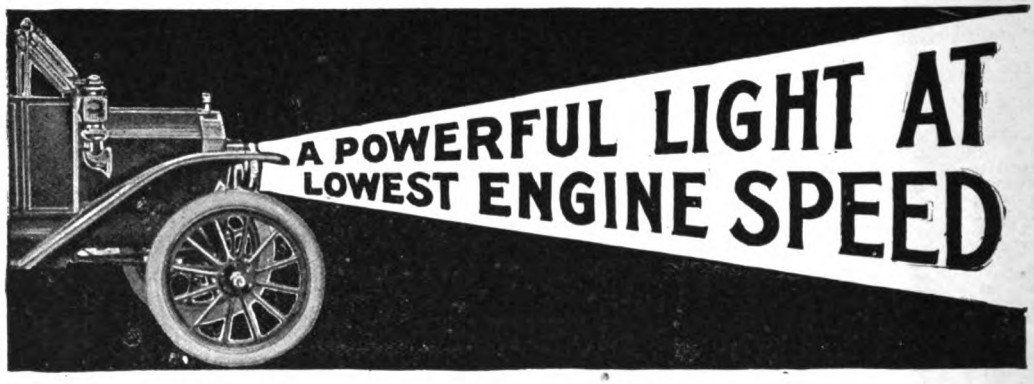
Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

BRANCHES: **Boston,** 319-325 Columbus Avenue; **Chicago,** 2637 Michigan Avenue; **New York,** 1846 Broadway and 212-214 West 88th Street; **Indianapolis,** 425 North Capitol Boulevard.

DISTRIBUTORS: Chandler & Burbery, 332 Broad St., Newark, N. J.; Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; Dyke Motor Supply Co., 600 Grant Boulevard, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Fred Campbell, 1109 Locust St., St. Louis, Mo.; Charles Rubel & Co., 1312 Fourteenth Street, N. W., Washington, D. C.

* Formerly Truffault-Hartford.

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The New York Automatic Head Light Controller For Ford Cars

DELIVERS A POWERFUL LIGHT AT THE LOWEST ENGINE SPEED.
PRICE $5.00 COMPLETE.

This is positively the only device on the market that has solved the problem of operating electric lights satisfactorily from the Ford fly wheel magneto.

ATTENTION—DEALERS: Our new catalog with 1916 prices is now ready. Our line covers the ***Famous Rhoades Battery Ignition System, Master Vibrators, UNI-Coil Ignition System,*** and many other rapid selling accessories for Ford cars.

NEW YORK COIL COMPANY, 338 Pearl Street, NEW YORK, N. Y.
Western Branch, 1461 Michigan Ave., Chicago, Ill.



Miller GEARED TO THE ROAD **Tires**

What a false bottom is to a gallon measure, so is weakened, brittle and lifeless cotton fabric to a tire.

You get a false bottom tire (no matter what its exterior dimensions are) unless the native strength of the cotton fabric is preserved intact. Miller retains the rubber's native toughness and the fabric's tensile strength during vulcanization.

Miller Rubber Company, Akron, Ohio, U.S.A.

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700,000 Ford Owners have been waiting for this—→ It's Here!!



McQUAY-NORRIS LYNITE-PISTONS ALUMINUM

The aluminum piston has arrived. It's the latest sensation in the automobile industry—the most wonderful mechanical improvement engineers have hit upon in years.

LYNITE Aluminum Pistons are die cast by a patented process, the right to use which is possessed exclusively by the LYNITE Manufacturers. The most important of many advantages they possess over sand cast aluminum pistons is their exceptional strength and hardness—insuring great resistance to wear.

We are specializing in furnishing a set of four McQuay-Norris LYNITE Aluminum Pistons—

Completely Equipped with 12

LEAK-PROOF

Piston Rings

MADE BY McQUAY-NORRIS MFG. CO.

for Ford Cars. We are going to open up a market that covers one-third of all cars in use today in this country, advertising our proposition to Ford Owners Everywhere.

You know how many Ford Cars there are in your community. Every one of them a prospect for the Dealer who handles McQuay-Norris LYNITE Pistons, LEAK-PROOF Ring equipped. Every Ford owner is going to read or hear about them, and he won't pass up arguments in their favor like these:

McQuay-Norris LYNITE Pistons are two-thirds lighter than the ordinary cast-iron pistons he is using—that means quicker acceleration, higher speed, less vibration, lighter bearing pressure and longer bearing life. Friction is 50 per cent less—that means lower consumption of oil and saving of power. They are much cooler—that means less carbon deposit on the piston head and clean spark plugs.

This offer of ours is a bargain that was never offered to a Ford Owner before. The 12 LEAK-PROOF Piston Rings alone retail for $18.00. This means the four pistons are sold for the ridiculously low price of $12.00.

It's a combination that sells itself—a bonanza for any dealer that handles it. Get started on this early and secure the cream of the demand.

Send for new illustrated folder on LYNITE Aluminum Pistons—full of valuable information. Also FREE booklet—"To Have and to Hold Power"—explaining the merits of LEAK-PROOF Piston Rings.

McQuay-Norris Mfg. Co., Dept. R, St. Louis, U. S. A

Canadian Factory: W. H. Banfield & Sons, 120 Adelaide Street, West, Toronto.

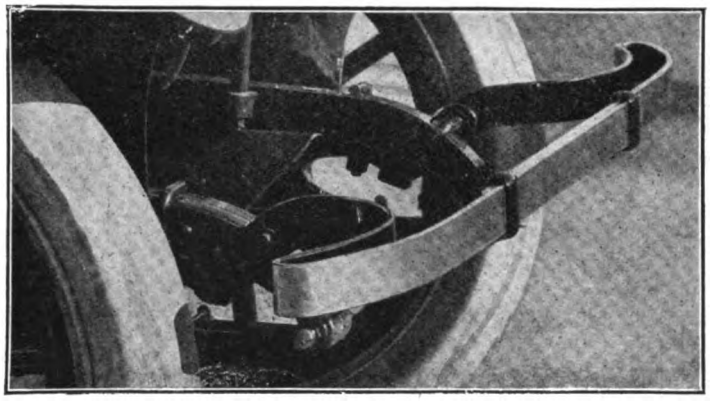
BRANCH OFFICES—**New York:** 1919-29 Broadway at 64th St. **Chicago:** Suite 718 Michigan Blvd. Bldg. **Philadelphia:** 1111 Fidelity Life Bldg. **Pittsburgh:** 902 Second Nat. Bank Bldg. **San Francisco:** 164 Hansford Bldg. **Los Angeles:** 224 Central Bldg. **Cincinnati:** 717 First National Bank Bldg. **Seattle:** 1001 American Bank Bldg. **Kansas City:** 513 New Nelson Bldg. **St Paul:** 308 American Nat. Bank Bldg. **Dallas:** 509 Juanita Bldg.

4 Pistons fully equipped

$30.00

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SELL the only BUMPER that can be struck without being damaged!



PATENTED

There are Bumpers galore—but only one that really protects and which won't break. The others are all alike. Their claims are strong—but their action mightily inefficient. The

LYON Resilient Bumper

is different. You can run it into a pole at reasonable speed without injuring either the bumper or car! Strong statement? Prove it yourself at our expense.

The LYON is resilient, having ten times as much spring play as any other make.

The LYON is clamped on any car in 15 minutes; harmonizes with streamline bodies and is guaranteed not to rattle or become loose. It is packed in individual boxes, making it easy to reship. The price is low.

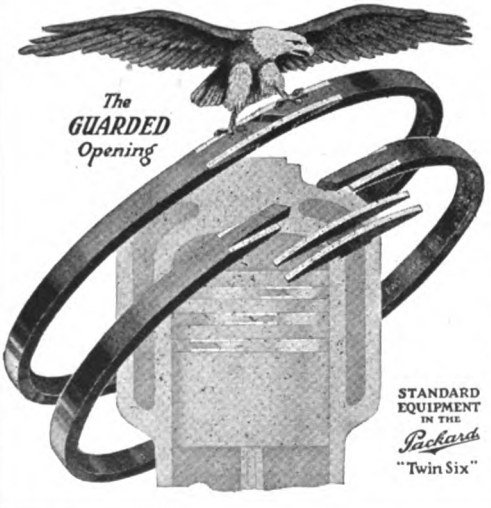
$7.50 up to $10.50; all finishes. FORD Bumpers $6.00

Why sell others that cost as much or more and don't deliver the goods? Give your customers their money's worth by selling them the LYON. We have something interesting to say to dealers and garagemen. ***Write us at once.***

METAL STAMPING COMPANY

BOULEVARD, LONG ISLAND CITY, NEW YORK

BURD HIGH COMPRESSION RINGS



A PROVEN ECONOMY

The Guarded Opening Stands Sentinel Against Waste

With Burd Rings, every drop of gasoline produces power—every drop of oil does its full duty as a lubricant. Leakage is imposible—nothing passes the exhaust but the noise. Every worth-while element is diverted to the channel that does your pocketbook the most good. They're a money-in-the-bank proposition from the day you put them on. Let us tell you what some of the large commercial car fleet owners think of Burd Rings.

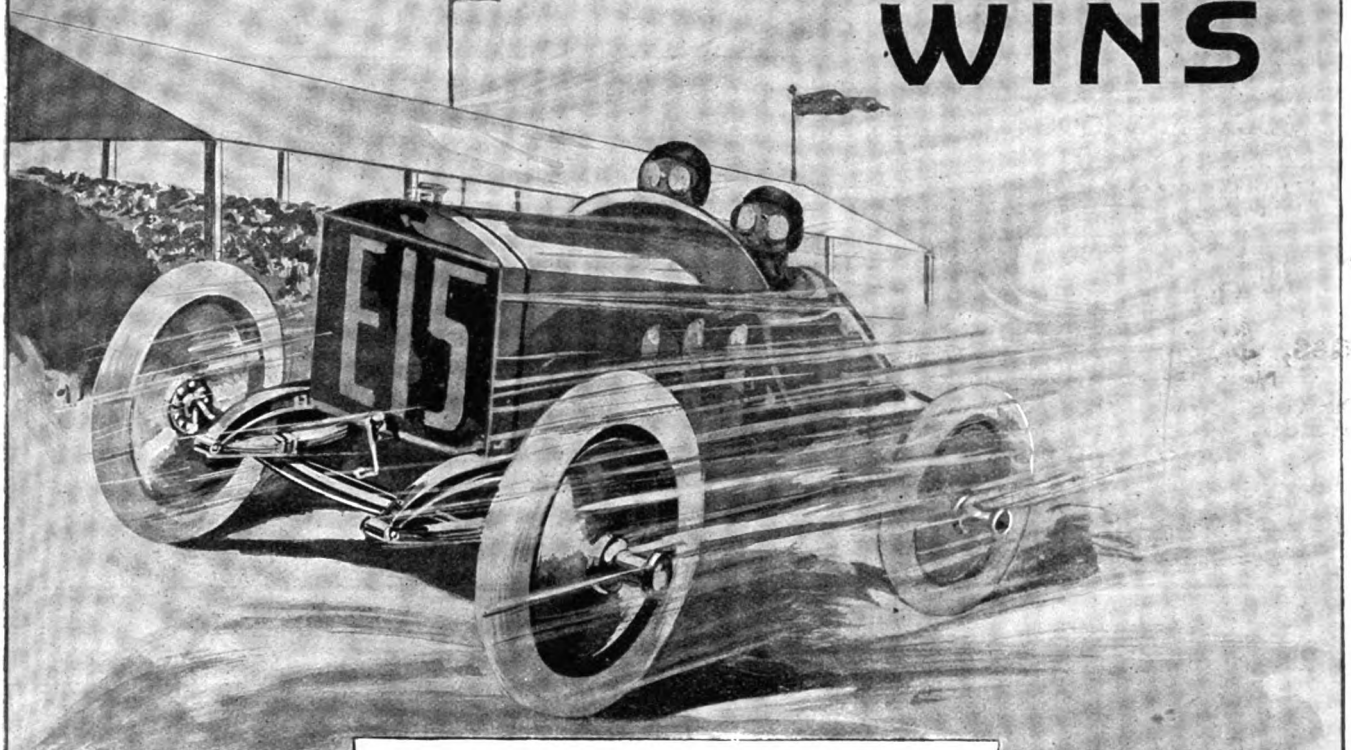
SALES OFFICES

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Los Angeles, Cal.	316-317 Hass Bldg.	San Francisco, Cal.	847 Phelan Bldg.
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Burd High Compression Ring Co. Rockford, Ill.

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AS USUAL, "NORMA" WINS



"NORMA"-equipped ignition apparatus carried to victory every winning car in the Astor Cup Race of October 9th—another link in the unbroken chain of "NORMA" victories. **You** will be assured of this same surpassing degree of dependable service if **your** magnetos, lighting generators and starting motors are equipped with "NORMA" Ball Bearings.

Shall the Catalog be sent?

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

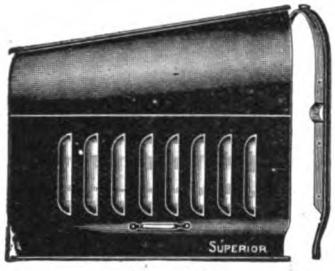
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"SUPERIOR" STREAMLINE HOODS FOR FORDS

FINISHED IN HARD BAKED BLACK ENAMEL.

Cannot be compared with light metal hoods, which are merely painted and chip off easily. Buy the Smooth Long-Line Hoods.

BUILT OF HEAVY STEEL—TO LAST. IMMEDIATE DELIVERY.



Patented

NEW SURE-FIT HOOD
Complete, $8.00
Model "A" Fits 1912-13-14 Fords
Model "B" Fits All 1915 Fords

NEW WINNERS!!

Crown Fenders, Cowl Shields, Demountable Natural Wood Wheels, Lamps, All Types, Tool Boxes, 1915 Convertible Lamp Brackets.

GET THE NEW PRICES!

Send for Latest Illustrated Sheet.

"SUPERIOR" V-Type Honey-Comb Radiators
For Ford Cars.

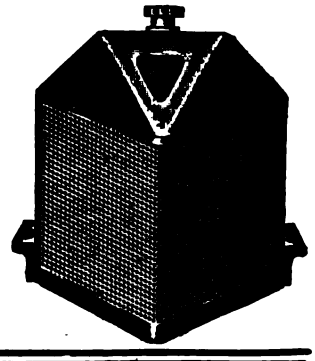
The New Constructed Vertical Water Flow Core.

Brass, $34.70 — New Proposition. Get Our Credit Allowance On Old Radiators.

German Silver, $38.00 — Write Today. All Types of Radiators Built and Repaired.

SUPERIOR LAMP MFG. CO., 136 W. 52d St., NEW YORK, U. S. A.

See Us At Space D-173, Grand Central Palace Show, New York City.



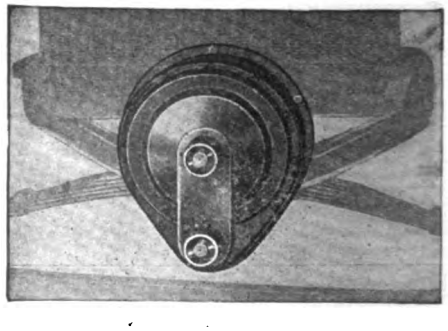
The Cleveland Spring Cranker
For Ford Cars

Is now ready for the market.

We give the dealers exclusive territory and liberal discounts.

Write for our proposition.





Designed and manufactured for Ford cars and sold to Ford owners through the dealers under the manufacturer's guarantee for one year.

THE FOREST CITY ELECTRIC CO., Cleveland, Ohio

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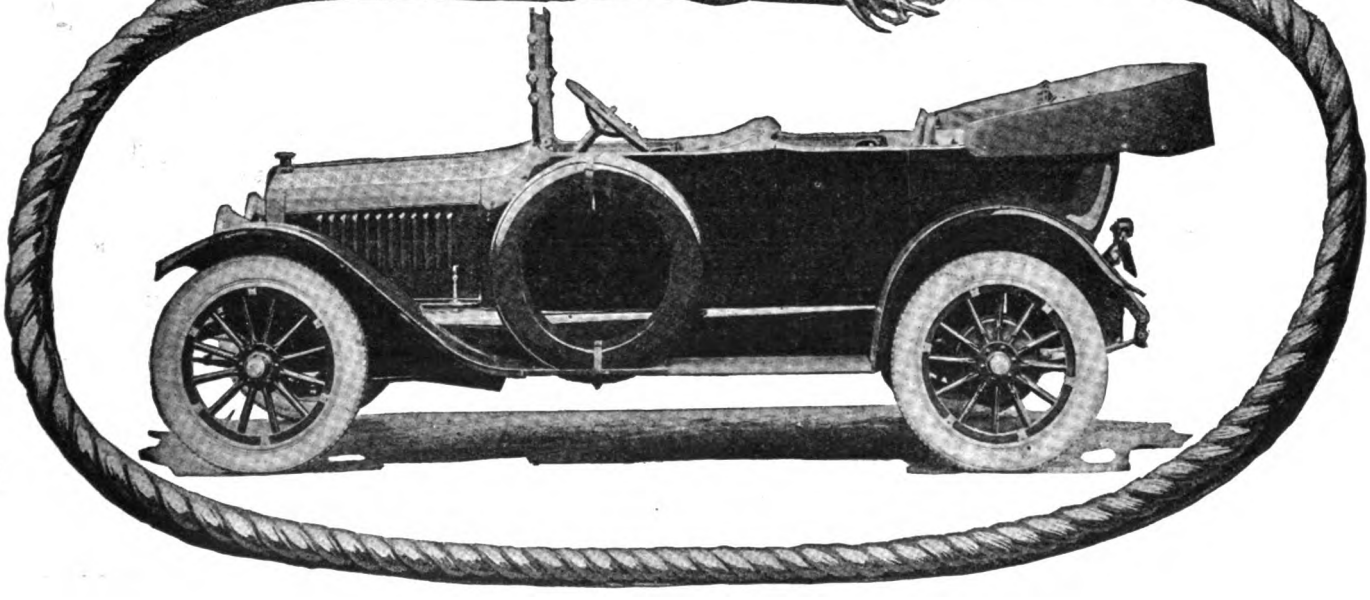
Tested in 1915
Used for 1916
Inevitably
by the

STANDARD · STEEL · CAR CO. · PITTSBURGH · PA.
STANDARD

THE STANDARD "8"

Ties up to

GOULD Storage Batteries



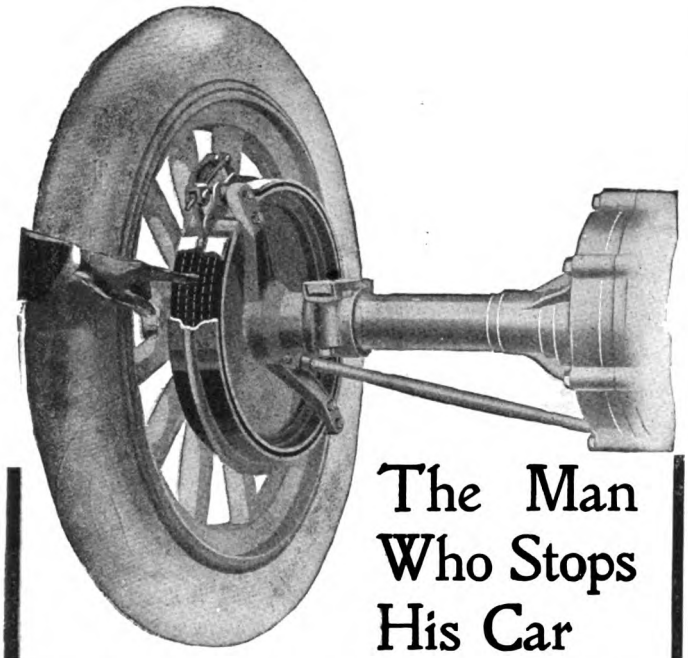
Standard Agents are urged to write for our list of service stations. **Dealers in Automobile Accessories, Garage Owners and Electrical Dealers** say our **Agency Plan** is just what they have been looking for. Write us.

Boston **Philadelphia** **Buffalo** **Cleveland**

Gould Storage Battery Co.
30 East 42nd Street New York

Detroit **Los Angeles** **Chicago** **San Francisco**

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The Man Who Stops His Car

With a brake that is lined with

Thermoid
HYDRAULIC COMPRESSED Brake Lining - 100%

doesn't go back to the repair man and say his brake is not sure. No owner wants any-old-hit-or-miss brake lining in the brake of his truck or of his pleasure car.

The repair man knows the best brake lining is Thermoid. Don't start another trip without being sure you can make an emergency stop.

Thermoid is a solid substance of uniform density, made so by hydraulic compression. It is *brake lining* all the way through. Worn as thin as this paper, it will grip and hold.

The use of Thermoid in the brake of your car means *safety*.

Will you dare to longer refuse the motoring safety that Thermoid can give you? Don't wait until you need go to a repair man—go to him now and get Thermoid lining in your brake. Don't take a chance by waiting.



Cannot be burned out, nor affected by oil, heat, water, gasoline, dirt.

Thermoid Rubber Co.
Trenton, New Jersey

—— OUR 7-WORD GUARANTEE ——
Thermoid will make good, or WE will

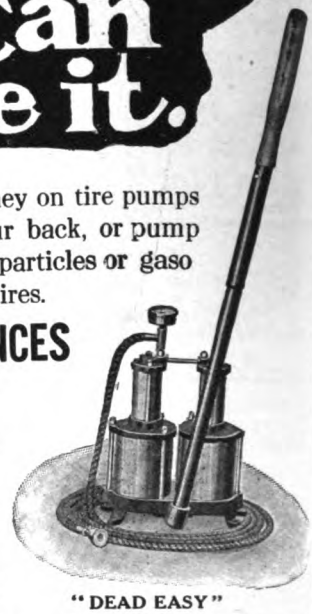
At Our Risk- You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's **"Dead Easy."**



"DEAD EASY"

FREE TRIAL OFFER

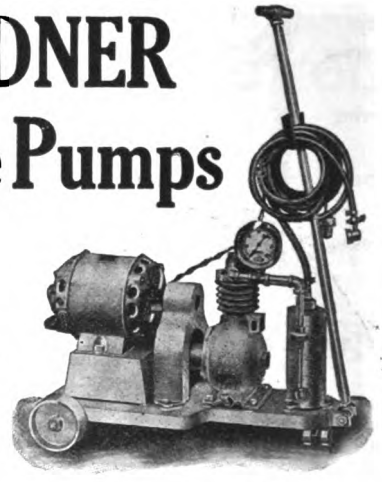
Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

GARDNER Garage Pumps

mean

Lower Costs
Better Service
Satisfied Customers



GARDNER "MIDGET" OUTFIT

The handiest, most convenient and complete outfit ever designed. Compact, small in size, light in weight, with large capacity. It is silent and efficient in operation and economical in power consumption. A simple air filter ensures absolutely clean, dry air.

Write at once for our special proposition. It will save you money.

THE GARDNER GOVERNOR COMPANY
Station R, QUINCY, ILL.

There's a Gardner for every garage—none too large—none too small.

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The Most Perfect Piston Rings Made

PERFECTION PISTON RINGS

They are made of soft, elastic steel in sections 1/16" wide and one section is required for each sixteenth in width of the groove. They give compression and power to your motor unequalled by any other rings. They present a barrier to the gas in the combustion chamber such as cannot be possible with a one piece ring.

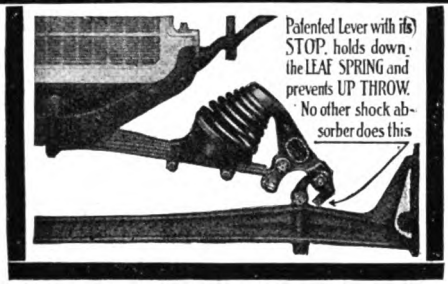
This construction gives perfect compression, maximum power, minimum carbon, smaller oil consumption, lower gasoline bills, less smoke, and saving in repair bills. These rings are put on the pistons without being stretched, and this is impossible with one piece rings, which are always distorted when stretched over the pistons.

PERFECTION PISTON RINGS are made in all sizes and can be sold by dealers to great advantage. *Let us give you special quotations for your requirements.*

Automobile Construction & Eng. Company
3326 Ludlow Street **Philadelphia, Pa.**

N. A. PETRY CO., Inc., 1309 Race Street, Philadelphia
Agents for Pennsylvania and Atlantic Coast States, South
A. H. COATES, 444 Market Street, San Francisco, Cal.
Western Representatives North and South: West of Denver

Easy Steering
Safe Driving
No Rebound
No Sidesway



$15 For a Set of FOUR

HASSLER

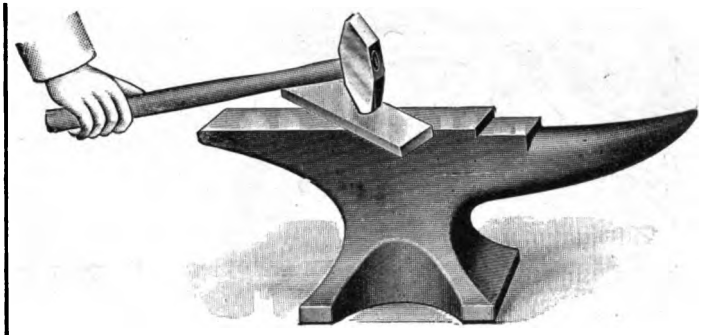
Shock Absorbers For Ford Cars

by their satisfactory service to over 50,000 owners have gained the same prestige in their field that Big Ben has among alarm clocks, Uneeda Biscuits among crackers, or Community Silver among silverware.

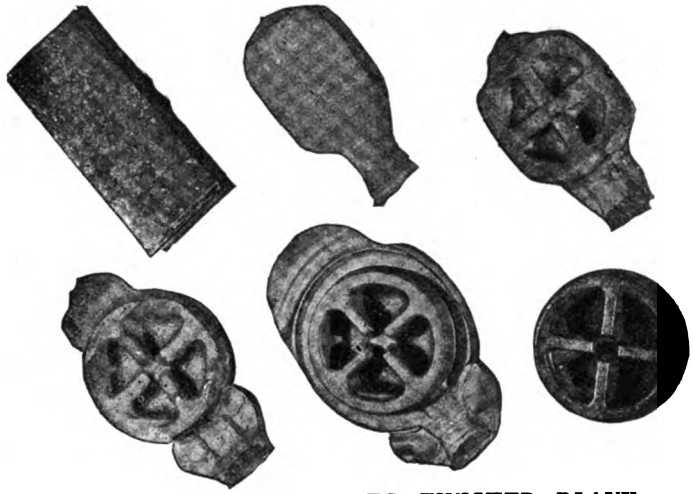
The Name Hassler stands for dependability in construction, workmanship and durability; leadership in easy steering, safe driving and perfect riding comfort; acknowledged superiority in affording maximum tire saving and minimum repair bills.

Live Dealers all over the country realize what this prestige means to their business and are "cashing in" by selling the Hassler. You can be a Hassler dealer—write today for our selling plan and a trial set. Not sold through jobbers—we protect you.

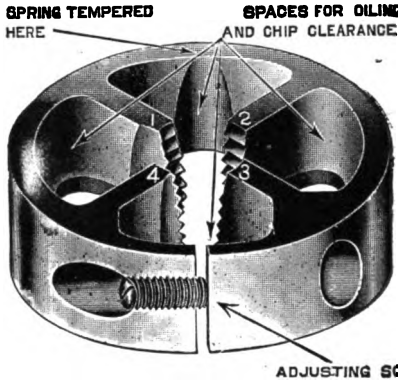
ROBERT H. HASSLER, Inc., Indianapolis, Ind.



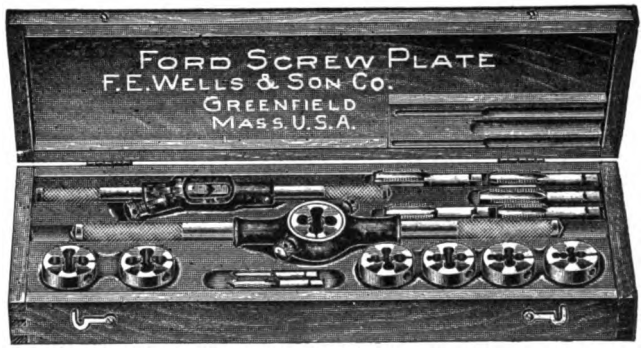
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



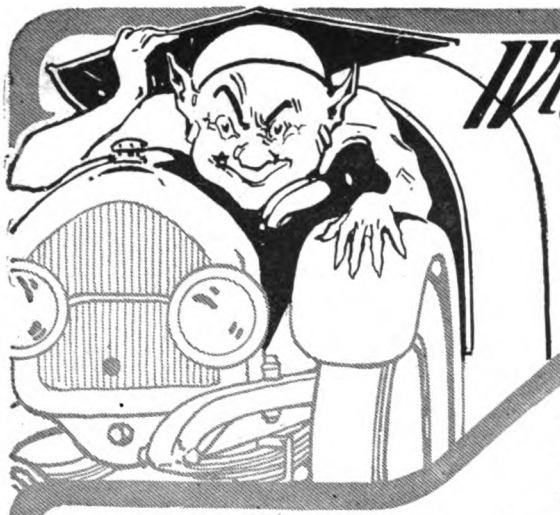
THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

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When Jack Frost creeps into Your Car— what happens-



The Famous Scientific Safety Garage Heater

Eliminates starting trouble, the danger of frozen radiators and cracked water jackets, as well as general car depreciation by **heating your garage.** Use your car twelve months a year and get full value from your investment. Feel the joy of the brisk winter's drive and the convenience of your automobile during cold weather inclemency.

A Guaranteed Garage Heating System for $25

Over 6,000 Scientific Safety Garage Heaters are giving satisfaction the world over. Uses small amount of Artificial or Natural gas. The only heater listed by world's fire hazard experts. Endorsed by insurance boards. Cannot explode. If desired a special attachment enables you to have hot water on hand for washing the car. Built in three sizes. Number 750—the smallest size, price $25, heats the ordinary two-machine garage comfortably during zero weather. By its use, batteries take full charge, truck deliveries are made efficient and pleasure cars are a genuine **pleasure,** no matter how cold or rough the weather.

A Free Book on "Winter Motoring."—Our free booklet, "Winter Motoring," should be in the hands of every automobile owner. Write for a copy today! It solves the problem of making your car 100% efficient during cold weather months. Somewhere near you there is a dealer who sells the famous **Scientific** heater. Write us and we will tell you his name.

THE SCIENTIFIC HEATER CO., 2300 Power Ave., Cleveland, Ohio

Dealers, write for our generous selling proposition. **LARGEST BUILDERS GAS HEATING APPARATUS IN THE WORLD**



REAMER IN BOX
(Aligning Shaft Not Shown)

Repair Men Get Big Returns on This Invesment!

Instead of spending from three to five days in hand scraping the bearings of motors, wise repair men now ***ream*** the bearings in less than one day, thus saving many dollars for themselves, by using a

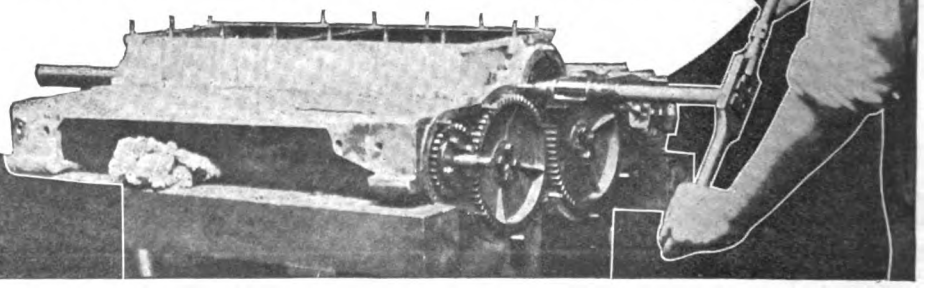
MARTELL A-L-I-G-N-I-N-G REAMER

This practical tool does away with the long, tedious process of scraping in bearings by hand Instead the reamer shaft is quickly set up and aligned by means of adjustable eccentric bushings, then located to insure perfect gear mesh, and the reamer-head run through—leaving smooth, burnished bearings, in positive alignment. From three to four days' labor are saved, representing ***clear gain*** to repair men.

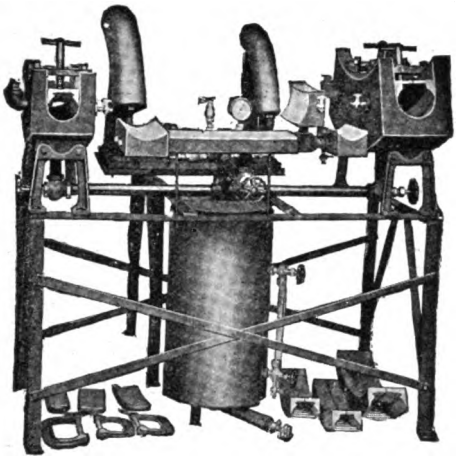
We send free booklet describing reamer and its use to responsible shops and garages.

HARDING MFG. CO., - 40 Court Street, Boston, Mass.

67-12



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Vanderpool Vulcanizers Satisfy

A. W. Childress, Richmond, Va., July 3rd, writes: "The machines that I bought from you have been in use every day, and the more I ***use them, the better I like them.*** I consider your Vulcanizer ***the equal of any on the market*** and ***better than most.***" Mr. Childress bought one Vulcanizer and after using it about 4 months, he sent us his order and check for a second machine.

Moler & Steward, Mount Orab, O., July 1st: The Vulcanizer is working fine. We have had no trouble with it since we got it. ***It is doing fine work.***

A. M. Johnston, Mechanicsburg, O., June 1st: The machine is doing good work. I am well pleased with it.

W. D. Patrick, Elba, Alabama, May 20th: Am turning out quite a nice lot of work with the Vulcanizer. Well pleased with it.

Wheeler & Wheeler, Columbus, O., June 24th: We have the machine set up and doing fine work with it.

A Vulcanizer that satisfies others is a good one to start in business with. They do good work in our shop and they will in yours.

Catalogue on request.

VANDERPOOL CO. - Springfield, Ohio



A perfect one-piece Piston Ring

that has all the virtues of eccentric, concentric and more-than-one-piece construction; and none of their disadvantages.

A continuous ring cut spirally for half its circumference; heat-treated so that the free ends hug tightly together; the result is an absolutely *gas-tight* ring that uncoils in expanding, insuring uniform pressure and perfect contact with the cylinder walls.

The strongest gas-tight ring on the market, because of its simple one-piece construction, and, for the same reason, it costs less to buy, and less to install, for it is easier to put on and will not break in handling. Made of close grain cast iron.

Absolutely guaranteed; money refunded on any ring that fails to give perfect satisfaction after 90 days' trial.

Full description in free booklet.
Dealers and jobbers should write for interesting prices.

INLAND MACHINE WORKS, 802 Mound St., ST. LOUIS, MO., U. S. A.

Run Your Car All Winter On Old Tires Without Chains

You can run your car all winter long, anywhere and everywhere, over all kinds of roads, under all kinds of weather conditions, on the tires that you have on your car right now.
Motorists everywhere are fast realizing the worth of Treads, particularly for winter. *Eventually you, too, will see it that way. Why not this year?*

Don't Throw Away Your Worn Tires Like So Much Junk!

It is unnecessary, highly extravagant, and altogether uncalled for—Retread them at a LOW COST with "Pacific Fiber Treads" and cut down your tire expense $50 to $500 a year—Our free booklet tells you how.

In 15 Minutes your old tires can be made good for 5000 Miles more

—Guaranteed
—Puncture-Proof

Blowout-Proof —Skid-Proof—Rut-Cut-Proof—Rim-Cut-Proof—Oil-Proof—Gasoline-Proof—Tear-Proof—Road-Proof—Trouble-Proof



"Pacific Treads"
Are Not Leather Treads

Leather Treads, processed, treated or tanned as many times as you can imagine, will stretch and sag and being non-resilient can never resume their original shape again on the tire, once they are stretched. Pacific Treads on the other hand fit your tire like a glove and expand or contract evenly, smoothly and instantly—as little or as much as is required—never any more.

We Ship on Approval—Pay Express Charges—Ask no Deposit

Pacific Treads will save every motorist who uses them time, worry and expense. We will prove it to you at our own expense if you will fill out the coupon below. Mail it today.

Special Discount Offered to motorists in new territory on first shipment.

Direct From Factory

.....MAIL THIS TO-DAY.....

V. K. Sturges Co., Oakland, Cal.
Gentlemen: Send me your book, **"5,000 Miles Without a Puncture"**—fully describing your new 1916 Model French Fibre "Pacific Tread."

Name.....
Address.....
City & State.....
My Tire Sizes Are.....

Our New York Office

Motorists in New York and vicinity can be served promptly by our New York office. Address—

162 W. 34th St., New York City

This

Our 1916 Model Now Ready for Delivery

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ADAMSON

VULCANIZERS

"The Stitch in Time That Saves Nine"

90% of the trouble and expense of tire repair can be saved by using Adamson Vulcanizers to mend punctured tubes; and repair tread cuts before they develop into blow-outs.

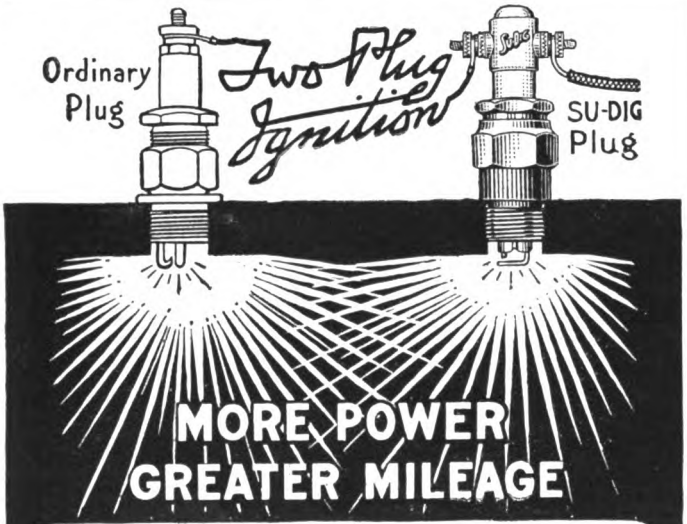
Over a Million in Use

are saving many millions of dollars annually to car owners, and increasing the sales and profits to Adamson Vulcanizer dealers.

Send for catalog on complete line.

ADAMSON MFG. CO.
EAST PALESTINE, OHIO

Ordinary Plug — *Two Plug Ignition* — SU-DIG Plug



MORE POWER GREATER MILEAGE

Show your customers how to ginger up their cars this winter!

There's no need of their "running like cold molasses," or of wasting gasoline, or of cleaning out carbon every week or two.

Quicker combustion, due to starting the flame from two points at once, **is a sure cure for cold-weather sluggishness.** One

SU-DIG SERIES PLUG

per cylinder, added to the regular plug, hastens combustion without excessive gasoline feed, thereby giving more power with a leaner mixture. No other change in system required; tap valve caps if necessary.

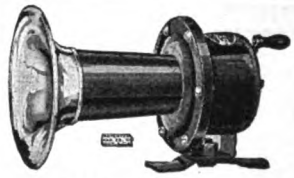
Su-Dig Plugs are nationally advertised and a profitable specialty. Write for booklet, "How to Get More Power," and special introductory offer for dealers.

Superior Motor Power Co.
24 Irving Place **New York City**

Salesmen wanted to handle SU-DIG Plugs as a side line.

SU-DIG

$4 **SEISS** Model A



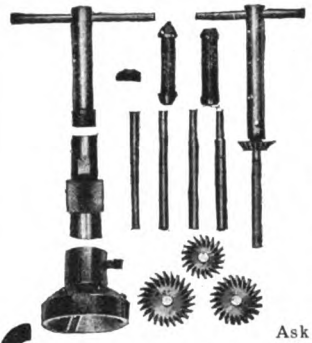
$4 **SEISS** Model A

DOUBLE ACTING MECHANICAL HORN

A powerful, Commanding Warning Signal – the surprise in Mechanical Horns. Operated by touch of hand—turning either right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

At your dealer's or direct from factory—with 10 year guarantee, only $4.00. ***Write to-day for printed matter.***

The Seiss Mfg. Co., 443 Dorr St., Toledo, O.



Every Repairman Needs This Tool

—the tool that grinds valves accurately and easily – yet does it four times as fast as you can do it by hand. The

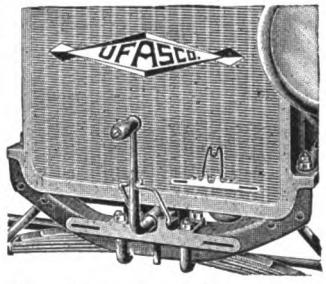
Fosnacht Valve Reseater

will save you money and draw more customers to your shop. It is simple to handle and reseats valves far better than is possible by hand. Hundreds of repairmen are making bigger profits and satisfied customers by using the Fosnacht Valve Reseater.

Ask for our booklet giving full information regarding the Fosnacht Valve Reseater—and how it can make and save **you** money.

H. G. Paro

Suite 702 **30 N. Michigan Blvd., CHICAGO, ILL.**



Easy Money

Made by Selling

TRADE MARK UFASCO.

COMBINATION CRANK HOLDER and NUMBER BRACKET No. 80

Stops Wear and Rattle
Ford Owners want it.
Increased Sales Has Reduced Price, but not Quality.

New Price, 50c.

Write for Circulars and Prices.

UNIQUE FINDINGS & SUPPLY CO., PROVIDENCE, R. I.

!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS, SMOOTH FORGED OR FINISHED COMPLETE, READY TO ASSEMBLE : : : : : :
SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY

(PLANT AT CUDAHY) **MILWAUKEE, WIS.**

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Arthur Duray, who has traveled faster than any other human being, uses



DIXON'S
GRAPHITE GREASE No. 677

For Transmissions and Differentials

Write for booklet No. 184-G.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

Established 1827

G-80



IMPERIAL WELDING AND CUTTING EQUIPMENT
OXY-ACETYLENE PROCESS

PROFITABLE REPAIR WORK

With a relatively small investment in an Imperial Combination Outfit you can make your garage headquarters for ***highly profitable repair work.***

Welding, Cutting of wrought iron and steel, and removing of Carbon from gas engine Cylinders can all be done with our No. 4 Outfit. Do not make the mistake of buying a cheap make-shift; you can fully rely on Imperial Equipment as being the best at any price.

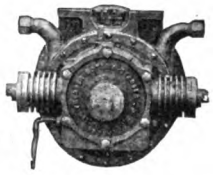
Write today for prices, data or cost of operation, etc.

IMPERIAL BRASS MFG. CO., 520 S. Racine Ave., CHICAGO

The Most POWERFUL and RELIABLE STARTER is

The Compressed Air Rotary

Thurber Starter



AND TIRE INFLATOR

Air Pumps and Starting Rotor in Combined Unit.

Can be attached to any car and will spin your motor over 200 R P M under any weather condition. Tire inflator attachment. Write for circulars, prices, agencies, etc. Hundreds in use.

NORTHERN ENGINEERING WORKS

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THE OLD RELIABLE
POLSON'S PATCHES
WON'T PINCH!

POLSON'S PATCHES WILL OUTLAST THE TIRE ITSELF

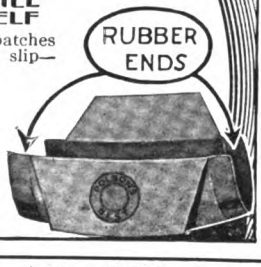
Severe tests prove them the strongest patches made. Polson's Blow-out Patches can't slip—once on they forever "stay put." The rubber ends prevent pinching.

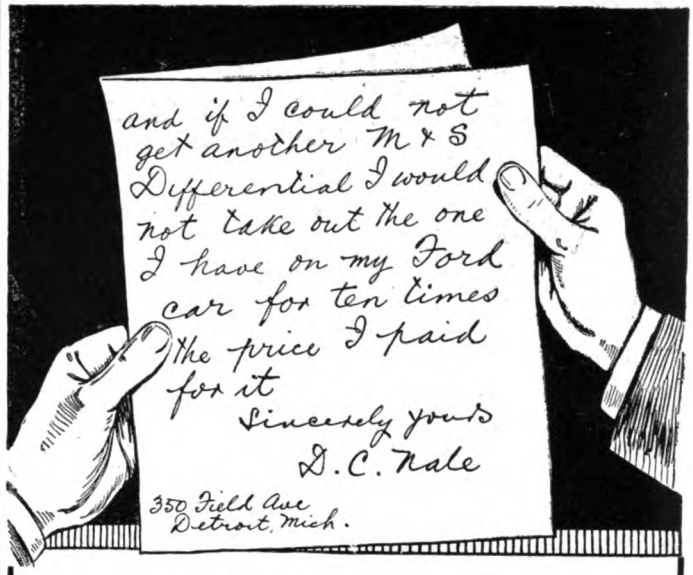
Demand Polson's Reliners, Blow-out Patches, Tire Boots, and Tube Patches. They cost no more than others. If your dealer can't supply you, write us.

Catalogue sent free.

POLSON RUBBER CO., Manufacturers

329 Southwest Boulevard, Kansas City, U. S. A.



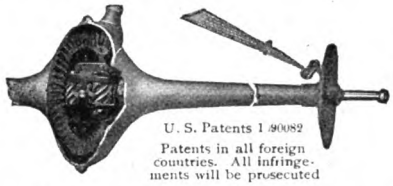


MR. DEALER—When a Ford Owner makes such a statement as this, isn't it worth while to look into our proposition on replacing Ford Bevel Gear Differentials with the

Pulls Both Wheels — **M&S DIFFERENTIAL** — Stops the "Spin" and the "Skid"

Send in the coupon and get our "Dealers' Proposition." Any mechanic can install the M. & S. Differential—Special Type for Fords—in a few hours. Fits perfectly in the Ford housing. Exactly the same in principle as the standard M. & S.

Made from the same high grade special alloy steels. Every Ford owner is impressed with the wonderful improvement the M. & S. makes in a Ford and most of them gladly buy it after a demonstration.



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Made by the greatest gear factory in the world

All M. & S. Differentials are made by Brown-Lipe-Chapin Co. of Syracuse, who can supply car and axle manufacturers direct. You know about the wonderful performance of the Jeffery Quad—it is M. & S. equipped.

—— M. & S. Ford Specialties ——

Modern Safety Steering Device. Price..... **$3.00**
Ring and Pinion Gears—Standard Ratio—special 3½% nickel steel. Price **6.50**
Write for Dealer's Discount.

Dealers, Garages, Supply Houses and everyone interested in the M. & S. for Ford replacements, write to

M. & S. GEAR CO.

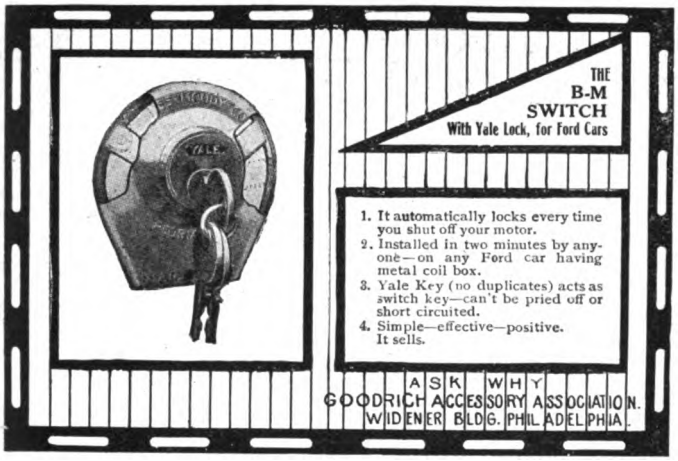
1036 David Whitney Building, DETROIT

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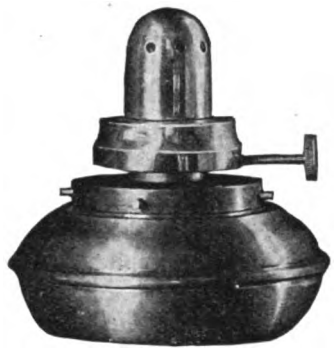
M. & S. Sales Co.....Dallas, Tex.
M. & S. Sales Co.....Philadelphia, Pa.
Hill-Smith Metal Goods Co. Boston, Mass.
M. & S. Sales Co ..Detroit, Mich.
Southern Road Machinery Co..... Knoxville, Tenn.

M. & S. GEAR CO., 1036 David Whitney Bldg., Detroit, Mich.
Without any obligation on my part, you may send me your dealer's proposition and your illustrated book describing the M. & S. Differential.
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Address .....

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OIL FOUNTS FOR FORD CARS



Also for all other automobiles where oil lamps are used.

Made singly or in quantities, any size or style.

LAMPS REPAIRED
METAL SPINNING

Send samples, blue prints or specifications for estimates.

EXPERIMENTAL WORK A SPECIALTY

Prompt Service
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Reasonable Prices

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HANDPHONE

Hand-Operated Horns

RELIABLE AND EFFICIENT AT ALL TIMES
BEST FOR THE USER
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GUARANTEED THREE YEARS' PERFECT SERVICE

Write for Catalog Showing All Styles of Hand-Operated and Motor-Driven Horns

AUTOMOBILE SUPPLY MANUFACTURING CO
220 TAAFFE PLACE BROOKLYN, N. Y.
The Largest Manufacturer of Auto-Horns in the World

$5.00  **$5.00**

Agents Wanted

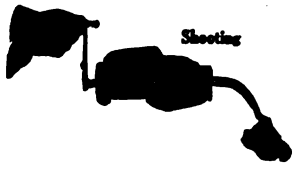
CLEAN OUT THE CARBON WITH STEAM

The Hart-Bell Carbon Remover cleans out the carbon with live steam. It is permanently installed on the intake manifold, and a turn of the handle admits a fine spray of water vapor that is instantly converted into superheated steam by the ignition in the cylinder. The steam loosens the carbon while the motor is running so that in five or ten minutes the carbon is blown out.

UTILITY PRODUCTS CO., Inc., 1414 Times Building, New York

TOWNSEND GREASE GUN





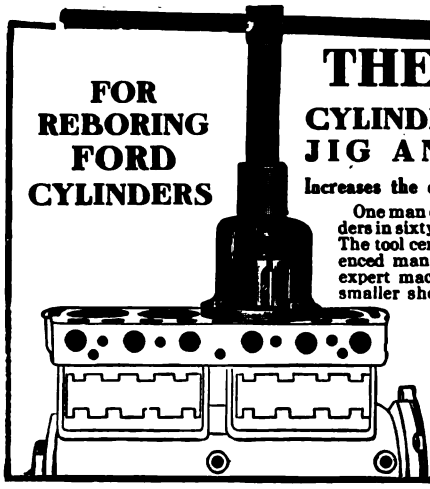
A Good gun should be
Quickly, easily and completely filled.
Quickly, easily and completely emptied.
—A pound a minute.
Not a speck should get on your hands.
The Townsend is such a gun—**the only one.**

S. P. TOWNSEND & CO.,
15 Central Avenue, ORANGE, N. J.

THE DAVIS

CYLINDER REBORING JIG AND REAMER

FOR REBORING FORD CYLINDERS



Increases the earning power of your shop

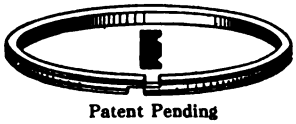
One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

Self-Lubricating Oil-Grooved

PISTON PACKING RINGS

Fill the Bill



Solve the Problem

Patent Pending

What a wheel is to an automobile, the Oil-Grooved Packing Ring is to the cylinder—let it be gas, gasoline, steam or air.

AGENTS WANTED

Rittenhouse Fleury Company, Sole Manufacturers
304 N. Holliday Street, Baltimore, Md.

"There's a mighty big difference in lubricators!"



Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.
Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.

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Schrader



FREE

AIR IS FREE—
Rubber Costs Money—
RIDE ON AIR

When the air in your tires falls below a certain pressure you no longer are riding on air, but **on rubber.**
Measure your air with a

Schrader

UNIVERSAL TIRE PRESSURE GAUGE

and save your tires.

Price, **$1.00**

at your dealer's, or

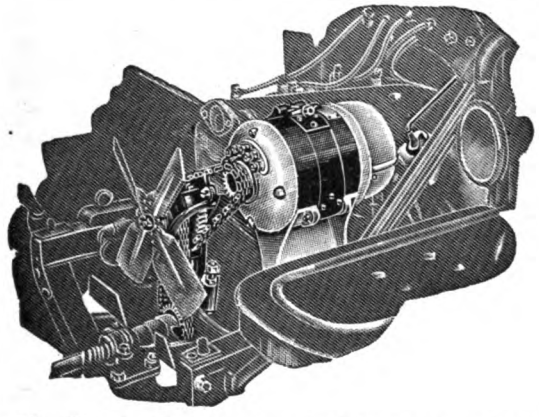
A. SCHRADER'S SON, Inc.
783-793 Atlantic Ave. Brooklyn, N. Y.

The ALLEN TIRE CASE

WHEN an unused spare shoe which you have been carrying around for six months (or three months, as the case may be) EXPOSED to all the elements, is finally put to work, and then unexpectedly "blows"—don't blame the unfortunate shoe. You could have saved it yourself with the Allen Tire Case, the perfect protection for spare shoes. It's the real "SAFETY FIRST" for service from spare shoes, and again,—just remember that when you need a spare shoe you need it badly. Moral!—Put Allen Tire Cases on your spare shoes now! $3.00 and up at your dealer's, or from the manufacturer. Booklet on request. To test the air pressure in your tires there's nothing "just as good" as the $1.00 handy, accurate

The Allen Auto Specialty Co.
Manufacturers
1926 Broadway, New York
1627 Michigan Ave., Chicago

ALLEN TYROMETER
TIRE PRESSURE GAUGE



North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.
Ask for Bulletin 33-A

North East Electric Company
ROCHESTER, N. Y.

Add $250.00 A MONTH EXTRA To Your Business

REPAIR AUTOMOBILE TIRES

Sounds like a whole lot of money to clear extra every month. Seems almost impossible, but that is what hundreds of men are doing who have added a Tire Repair Department to their business. **The investment is small, the profit large** and **returns quick and all cash,** besides the demand for tire repairing and retreading is constantly growing. Your garage is by no means complete, your business is not as profitable as it can be until you get in on the Tire Repairing and Vulcanizing end.

THE HAYWOOD TIRE REPAIR EQUIPMENT

Answers all the requirements to successfully handle this end of the business. With it and a little business judgment, success is certain. Every year adds thousands of new auto owners. They are looking more and more to economical tire service. The day of discarded tires is over, the Haywood Equipment makes this possible.

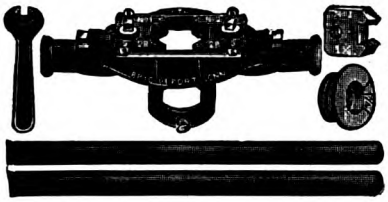
HERE IS YOUR OPPORTUNITY



Either as a side line to your present automobile business or as a business by itself, the Haywood Equipment will make money for you. **Tires go wrong all the time.** You know that. Keep them in tune. Give your customers complete service —repair their tires and all. This builds business and makes you rich. Experience unnecessary. You can learn easy—or teach a boy to handle this end. Be the boss and make the money. Learn the details now. Investigate. Act quick. Be the first. Send name and address only. A postal will do.

HAYWOOD TIRE & EQUIPMENT CO.
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GENUINE
ARMSTRONG STOCK and DIES
For Cutting
A. L. A. M. THREADS
No. 1 STOCK & DIES, ¼ to ⅝ in.
No. 2 STOCK & DIES, ½ to 1 in.
AND TAPS TO MATCH

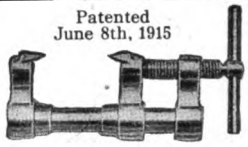
Good Tools for Repairmen. These Dies are Adjustable.

MANUFACTURED BY
THE ARMSTRONG MFG. CO.
335 Knowlton St. BRIDGEPORT, CONN.
WRITE FOR ILLUSTRATED CATALOG

Knowlson's Spring Spreader

Drop Forged
—
Nickel Plated and Polished

Patented June 8th, 1915



100% Easier Riding
—
Stops the Squeak

No. 1142280

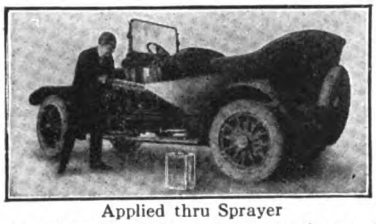
WARNING To The Trade
Our Patent is basic, covering all spring spreaders with wedges on the market no matter how operated. Our rights will be protected.

At all best Dealers, or sent prepaid anywhere for **$1.50.**
Money returned if not satisfactory.
Write for complete particulars.

Spring Leaf Lubricator Co., 1000 Forest Ave., Ann Arbor, Mich.

Brighten Up Your Car With
Marvel-Mist

Removes Road Tar, Oil and Grease
—
Prevents Rain Streaks



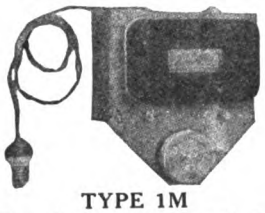
Guaranteed Not to Injure Paint or Varnish
—
Non-Combustible-Inflammable-poisonous

Applied thru Sprayer

Keeps Your Car Looking New
Midget Outfit, With Cloth, $1.00 Giant Outfit, With Cloth, $1.25
Refillers—Pint, $0.75 Quart, $1.00 ½ Gallon, $1.75 Gallon, $2.75
1 Pint of Marvel-Mist is equal to 1 gallon of ordinary polish.
Write for our attractive Dealer's Proposition.
MARVEL-MIST MANUFACTURING CO., 56 Greenpoint Ave., Brooklyn, N. Y.

ROME RADIATORS
offer the utmost in
QUALITY EFFICIENCY
DURABILITY VALUE
We Repair and Replace all Makes of Radiators
Large stock of radiators on hand for immediate shipment.
ROME-TURNEY RADIATOR CO.
WHITESBORO STREET
ROME, NEW YORK

THE ST. LOUIS BATTERY CHARGER
Works While You Sleep
Turns Pennies into Dimes



A simple—practical—fool proof device for charging ignition and starting batteries which operate from alternating current.

Price . . . $24.00

Discount to trade. Write for booklet and discounts.

TYPE 1M
For charging three cell 6-volt batteries from 60 to 120 ampere hour capacity. Will charge two 60 ampere hour batteries per day of 24 hours. A penny's worth of juice brings you 10 cents.

ST. LOUIS ELECTRICAL WORKS
5405 Easton Avenue - - St. Louis, Missouri

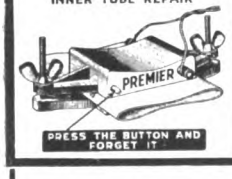
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Axles, any metals of any shapes or thicknesses, including
ALUMINUM PARTS
All work absolutely GUARANTEED
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¶ Complete Oxy-Acetylene Welding and Cutting Plants Installed.

OXWELD ACETYLENE COMPANY
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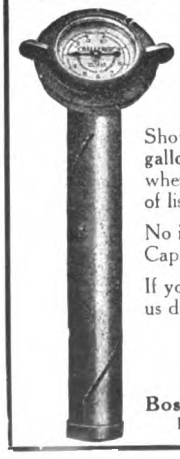


PREMIER AUTOMATIC ELECTRIC VULCANIZER

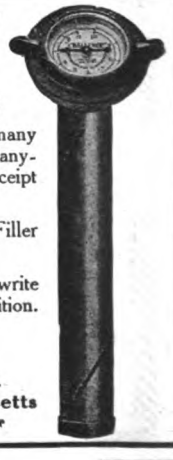
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A PERFECT Combination Gasoline Gage and Filler Cap
For FORD CARS



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is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

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The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

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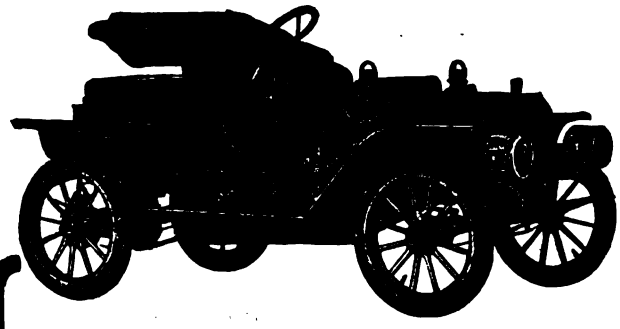
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Factories: San Francisco, Chicago, Winnipeg



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The **Auto Repairers' Guide & Price Maker** is issued in the interest of automobile repairers, dealers and garage men—**it's free to the trade** and sent to them only.

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It is the best substitute for a new cover. It is easily applied, dries quickly and makes the top bright, pliable and waterproof. Eight standard colors and special shades to order.

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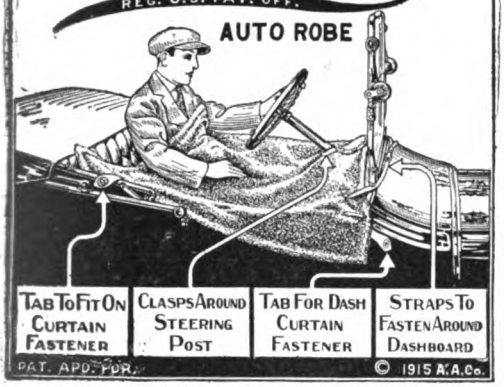
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TO FIT ALL AUTOMOBILES.

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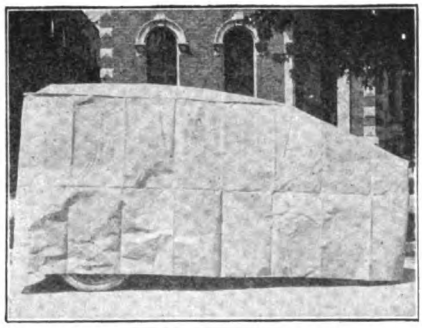
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Delivered Free.

When ordering, please mention type o. car, etc. None genuine without our label on each robe as cut here shown.

Manufactured by AUTOMOBILE APPAREL CO., Port Chester, N.Y.

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Owners will soon store their cars, and it is as much to your interest as the owner's, that these cars be protected.

KENNEDY AUTO STORAGE COVERS protect cars from Dirt, Dust, Cold and Moisture. These covers are made from a heavy imported paper; are securely reinforced to prevent tearing, and completely cover the car.

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BE THE FIRST in your locality. Get further particulars today; interesting profit and sales easily made. Do not delay—delay means lost sales. Write to

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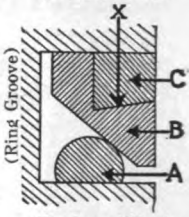
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stop oil troubles because they take up side wear in piston groove by means of the spring expander acting on the bevel on the under side of the ring. This feature appears in no other piston ring.

They are made of soft cast iron, no steel or composition to score cylinders.

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The Pressure Proof Ring will give longer service and higher efficiency than any other ring made, regardless of price or construction.

Install a set of these rings at the next opportunity. We guarantee that you will make a discovery about piston rings.

Write now for particulars and dealers' proposition.

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MARVELOUS REMARKABLE

Four to one in our favor

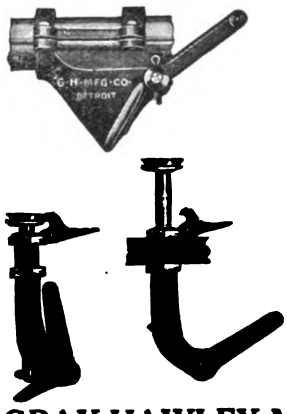


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We also manufacture Brake Shoes with asbestos lining for Ford automobiles.

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The Ideal Cut-Out

Simply Cut Notch in Exhaust Pipe and Clamp over it.

PRICES

No. 5B.	For Pipe, 1½ in. o. d.		$1.00
" 6B.	"	1¾ " "	1.50
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No. 3.	Black	$0.60
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Liberal Discounts.

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Have a feather edge. Guaranteed to stick and stay stuck in hot or cold weather. There is no uncured rubber; therefore, no chance for slipping.

Price, 50c per Box

Ask your jobber for them.

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Price $12.00. *Send for Leaflet.*

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Branches in All Principal Cities

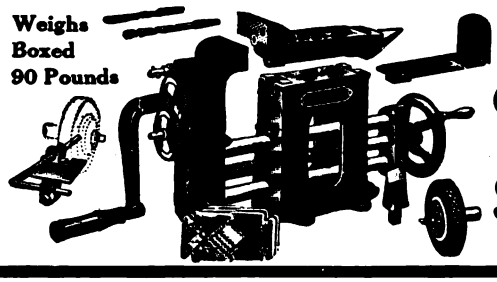
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Complete Repair Outfit

Every GARAGE, PUBLIC or PRIVATE, needs this BIG, STRONG, EVERLASTING COMBINATION OF TOOLS which we call the

STEWART HANDY WORKER

Weighs Boxed 90 Pounds



Price Complete Only $12.50

If you bought all the tools you get with it, of the same high quality, strength and durability, and the equipment to operate them, they would cost you at least $25 at wholesale price.

Each one a tool you can use every day to save time and money. A complete, compact workshop that you can attach to a table or bench anywhere about the garage and make it pay you big profits. It will enable you to quickly and easily do any ordinary repair job.

NOTE WHAT IT INCLUDES

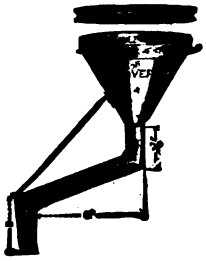
A strong, practical anvil; powerful vise, up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1¼ inch pipe; a Corundum grinding wheel, 5 inches x 1 inch; a two speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing the handle grip. It operates grinding wheel, small circular saw, buffing wheel and many other similar tools. With the Stewart "Handy Worker" you can do your own automobile repairing, etc., blacksmith work, home repairing, make plumbing repairs, keep knives and other cutting tools sharp and in good working trim.

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SEND ONLY $2.00 WITH YOUR ORDER and pay the balance when it arrives. ORDER TODAY OR WRITE FOR BOOKLET.

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NEW DOVER TWO-IN-ONE Offset Funnel



New Cone Strainer
New Braced Spout

Removable Spout Forming a Regular Funnel

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Specialties FOR FORD CARS

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AUTO PARTS COMPANY

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Will Pay For Itself In A Few Days

THE SUPERIOR VULCANIZER



Needs no experience to operate.

Repairs casings and tubes perfectly.

Inexpensive for car owners and garages.

Hundreds of satisfied users.

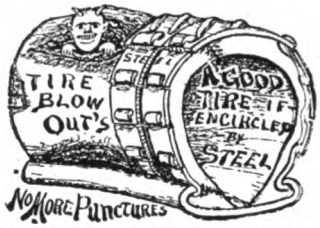
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Hang on to your old tires. They will last as long as you live if covered with steel.

The **Kimball Steel Protector** makes **Blowouts, Punctures** and **Rim Cuts** impossible. A few sections will hold any old blowout. Tires are as flexible as ever.

Special inducements to those in new territory.





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EASIER STARTING IN COLD WEATHER

is but one of the advantages of equipping your FORD with a

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Other advantages are

Perfect Ignition—More Power—One adjustment instead of Four—A hotter spark—Smoother running engine—Less carbon deposits—Less gasoline used—Cleaner spark plugs—No worry.

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Get most power from your gasoline.



Baffle reflects soot and dirt **away from** the interior and **out through** the spark gap at every explosion.

Reflex plugs are made right, stay clean, withstand heat and last longer than others.

Regular equipment on 16 leading automobiles and motorcycles.

Returnable and money back if not satisfactory after 30 days' trial.

The Reflex Ignition Co.

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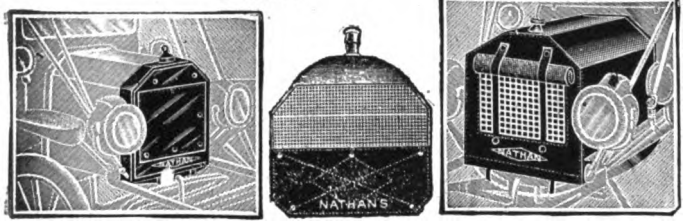


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NATHAN

RADIATOR and HOOD COVERS

They are made of the best materials and fit perfectly.
The workmanship can't be beat.
The unquestionably low price speaks for itself.
They do the work and have stood the merciless test of comparison.
They have convinced the keenest buyer of their superiority over all others.
They keep the cold out and the heat in, and prevent water from going between the hood hinges on to the plugs. Makes car start 100 per cent better in cold weather and saves gasoline. Has all necessary fasteners.



Don't accept cheap substitutes. Every genuine Nathan Radiator and Hood Cover bears our trade-mark. Look for it. Reliable dealers have them. If your dealer can't supply you, we will forward postpaid on receipt of price.

Write for full description and price. We will refer you to nearest dealer handling the Nathan Line.

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Stormy Weather Necessities — Lock Top Tire Covers — Seat Covers
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LOOK THROUGH THESE FOR A BETTER MOTOR!



"One-In-One" Piston Rings, *"Concentric,"*

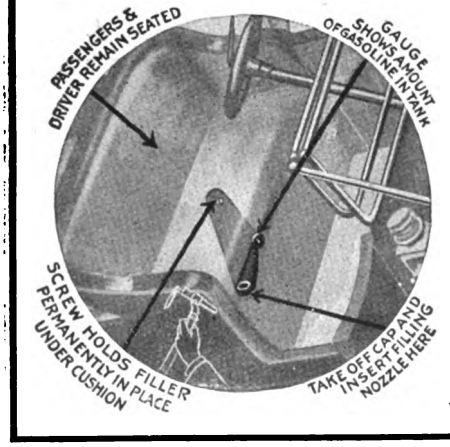
Will show better results than any other type of ring.

BECAUSE, they are made of a fine gray iron, compatible with cylinder and piston; are made and ground—true to size— in 2 units to expand equally against the cylinder wall—reducing the friction caused by a single eccentric ring—and insuring **more Compression and Power and less Carbon and Smoke.**

Write for circular.

"ONE-IN-ONE" PISTON RING CO.

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A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge. Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline. A Great Comfort Particularly In Stormy Weather.

If You Once Install a *"Fillometer"* You'll Never Part With It

THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

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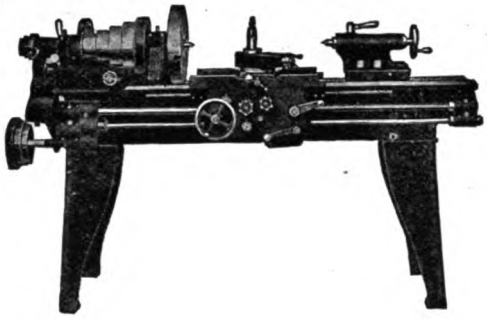
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Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

Monarch Lathes are low in price and within the reach of every garage owner. They are used in every class of work from the finest toolroom work to production work in the largest factories.

Furnished with taper attachment, milling, keyway cutting and gear cutting attachments, and other attachments useful in the Auto Repair Shop.

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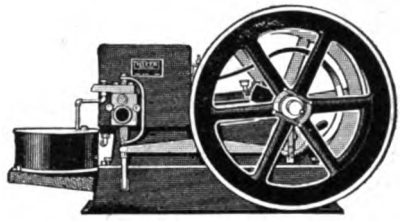
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I unqualifiedly guarantee every WITTE engine for five years against defects and consequent faulty operation. I carry the risk, as I have done for my thousands of customers during 28 years.
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Gasoline, Gas, Kerosene, Distillate

Besides lower price, WITTE engines use less fuel per horse-power hour—from one-fourth to one-third less—enough saving in a year to pay entire cost of engine. Easy starting; no cranking. Investigate these points before buying any engine.

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2 H-P.,	$34.95	8 H-P.,	$139.65
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WRITE FOR MY FREE BOOK, and all about my New Liberal Offer, BEFORE you arrange to try any engine. I save you money, besides giving you the easiest chance to get the best engine service. Write me to show you.

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Now is the time when you should go after business.

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If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

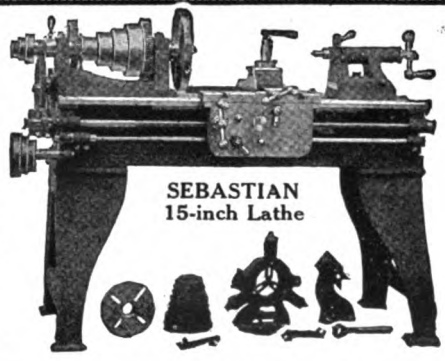
They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

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15-inch Lathe

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Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

Your Tires Rebuilt The Brictson Way

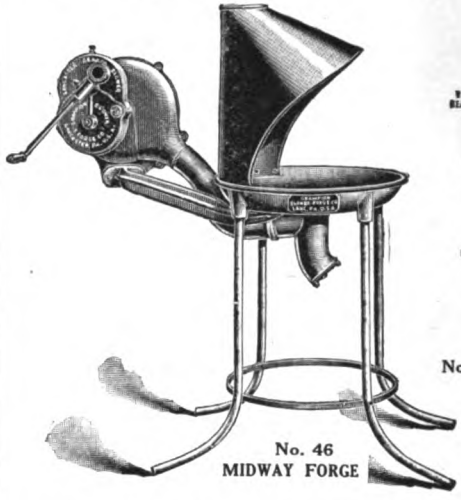
If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blowouts, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write today for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

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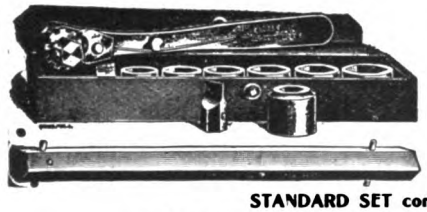


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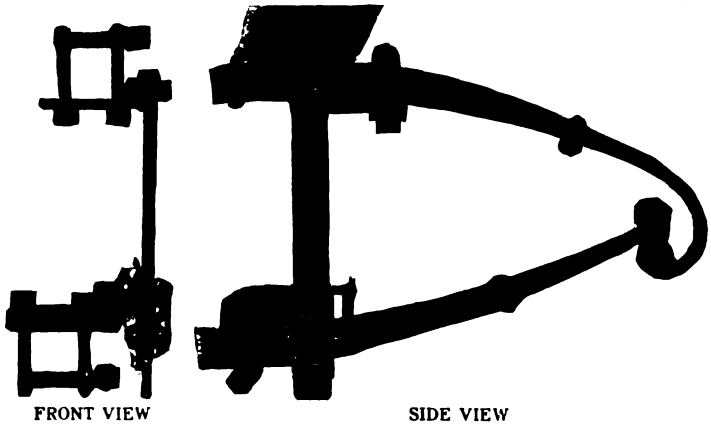
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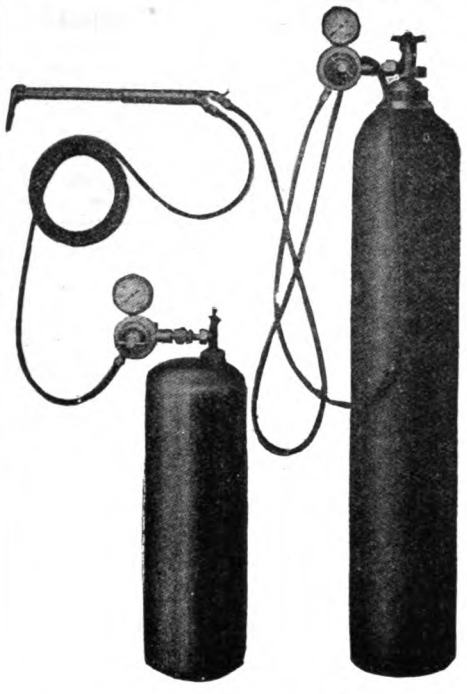
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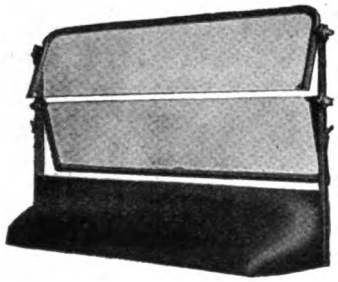
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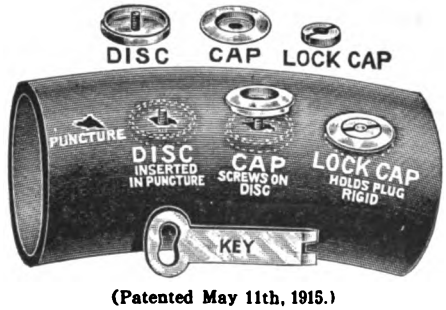
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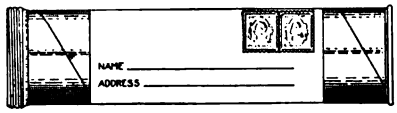
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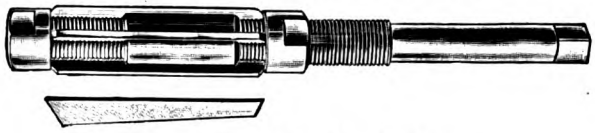
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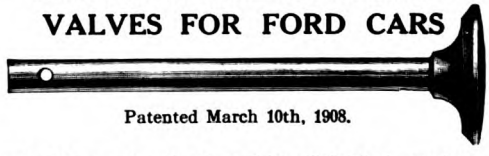
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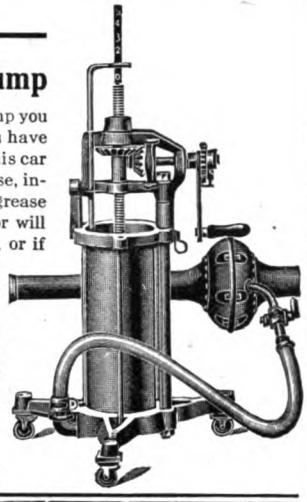
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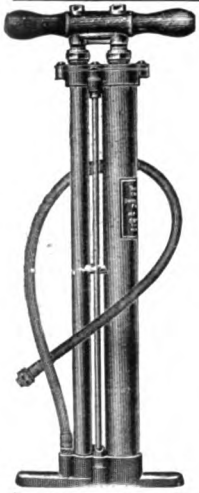
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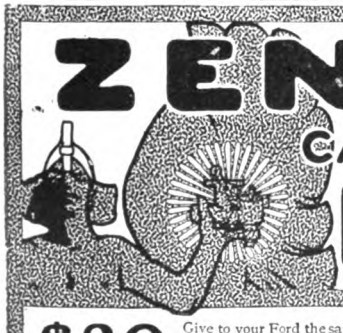
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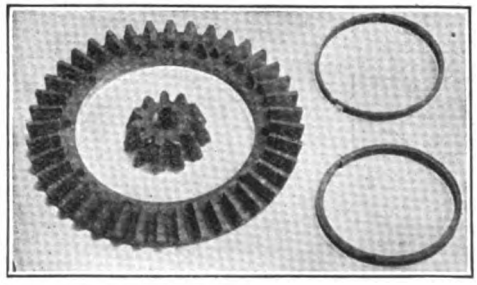
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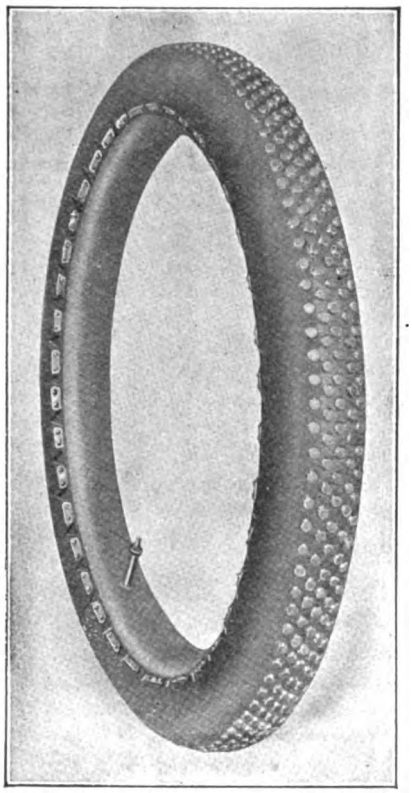
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A JOURNAL OF PRACTICAL MOTORING

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VOL. XX, No. 3. NEW YORK, NOVEMBER, 1915 PRICE { 10c PER COPY $1.00 PER YEAR

WELDING INFORMATION.

Some Concrete Examples of Simple Jobs That Require Care Only.

From J. N. Bagley, Nebraska.—It may seem that one is overdoing the welding articles when they appear as often as they do, but if we could see the unsuccessful operators over the country who have good machines we would all feel an interest in them. I have visited the smaller villages and towns and find many machines that have been sitting in the corner for many months. On making inquiry as to why they were not used I have found a number of reasons, but the most important was the fact that the operator could not get the necessary instructions, and had neither the time nor the money to get out and visit other plants where the operators were successful. One operator told me that all the cast iron he welded broke again in a short time and his customers had ceased to bring the castings to him, and he wanted to know if there was a way to avoid it. I asked him if he had some of the broken pieces and he went to the rear of the shop and brought a number, all of which had broken in the weld. He also had a few that were not broken, but they were

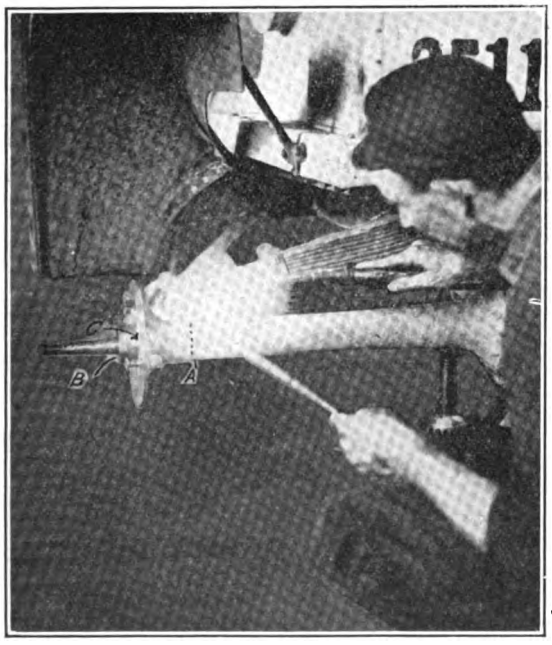


Fig. 1.

so out of their original shape that they could not be used.

Now this brother wanted to do the work but had given it up because of the lack of knowledge as to the proper handling of the outfit. The castings which broke were due to two things in particular; one was that he did not weld entirely through from both sides and the other that the flame was not properly adjusted. During my stay of a little over a half day we got the welding plant out and dusted it off, and put it into working shape and set about to reweld a few pieces that he had welded. Then we called the customers to whom the castings belonged and asked them to give them another trial, which they consented to do. They were just as

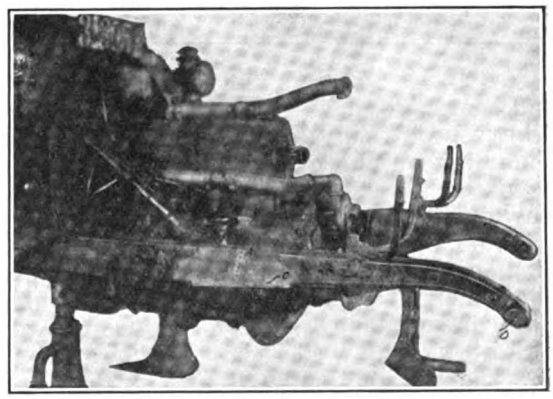


Fig. 2.

anxious to see the machine a success as he was, because it meant dollars to them in a busy season as it did to the person operating the machine.

Three months later I called on this same brother to see how he was progressing with the work, and when I drove into the shop yard I found a large traction engine standing near the shop door and he was welding a couple of teeth in the traction gear. I watched him until he was done, and he was glad to see me again. He told me that from the day I had helped him to get started he had improved and no more dust had accumulated on his machine. The teeth he placed in the gear wheel were good enough for anyone, and when dressed up could hardly be told from the teeth beside them. He also said that if I could have had some one to give him a few ideas in the beginning, he would be many dollars ahead. I advised him that he do as much for some other brother when he found him in trouble as I had done for him.

The possibility of the welding machine is almost unlimited especially in a general repair shop or a garage, and the photographs shown will give a few ideas as to some of the jobs that are possible. The writer receives every few days a personal letter from some reader of this magazine asking for information. I have always taken the time to answer the letters and do what I can for them.

Fig. 1 shows a job being done on a Ford rear assembly without removing it from the car. The cost to remove it from the car would be quite a little to say nothing of the time lost. The brake band and spring, C, were broken loose from the housing proper, and to remove it and replace with new rivets would be some little job. The wheel was removed as well as the brake band, leaving the balance as

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shown. The roller bearing and sleeve were drawn from the end, B, so that the heat would not interfere with the temper. As shown at dotted line, A, the housing was welded entirely around with Swede steel wire, and at C, on the outside, making the job as strong as before.

Now where the rivets went through was welded over to prevent the grease from working out and making the car look bad. The job was finished in a short time and the customer went on his way, while

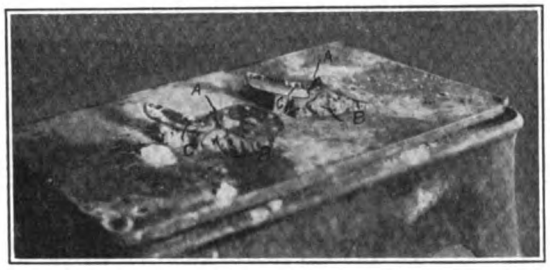


Fig. 3.

if it had been necessary to place a new part the cost would have been many times higher.

In handling things of this sort where the steel wire is used, the flame should be adjusted so that the sparks will not fly from the molten metal. The torch should be moved in a backward and forward direction, so that the flame does not get any one place hot enough to burn the metal, as in so doing the parts will be weakened. When the temperature is about right and the weld rod is touched to the work it will stick as though it was a magnet. It should be worked at about this sticky temperature, as we call it. A good flux aids considerably and can be purchased along with the balance of the welding supplies.

In Fig. 2 we have a more difficult job, and yet it is just as simple as the one just mentioned if done as it should be. Both sides of this frame were broken, as shown at A, letting the front engine support carry the load. This car was driven over a hundred miles with both sides of the frame in this condition. It is best to use a reinforcement beside the welding, where it is possible, and there will be no danger whatever of the welding part breaking again. In this instance on the under side of the frame was placed a bar of steel $\frac{3}{8}$ of an inch thick, wide enough to come flush with the outside of the frame and a little wider than the frame on the inside, say one-fourth inch. This permits the frame to be welded to the bar with ease. Large jacks were placed under the car as shown leaving the ends without support. At the extreme end, at D, a force was applied until the crack was entirely closed and the bar of iron, B, made fast with two bolts to hold everything in place while welding. When all was made secure the frame was welded to the bar at C, inside and out and across the ends. Now with a cape chisel the crack was cut out in a V shape entirely through. This allowed for the new metal to be filled in. In case the reinforcement can be placed inside the frame it would be better, but very seldom this can be done as a frame generally breaks where a cross member is found or where holes are drilled in the frame. This entire job was done at the expense of $7 to the customer, while if he had purchased a new frame and placed the machinery in it the cost would have been not less than $100, to say nothing of the time lost. This job when painted up and the fenders were in place could not be noticed unless one were looking for it, and so far as strength was concerned it was stronger than the original frame. A few jobs of this sort, scattered over the locality, are a very good advertisement for the welding machine and the person operating it.

Fig. 3, for the beginner, may seem a trifle more difficult to handle, as it is brass. Brass handles a little different than cast iron or steel, and care should be taken that it is not overheated and ruined, as it melts very easily with one of the larger tips. The parts in Fig. 3 are windshield hinges and there are many of them for repair. For some reason new ones cannot be had when wanted, especially if the old shield is out of date, so to speak. In the first place, take a ball of clay, damp enough to cling together well, and bed the broken parts into it in their original shape, as shown at B, with clay, C. A is the crack to be filled with the metal. It is a good plan to use a small tip which will heat only the parts close to the crack. Use a spelter wire which will melt easily. Now play the flame along the crack, A, quite close until the metal melts and blows out a little. Have the wire heated and fluxed, and immediately place it in the crack. As soon as the flux strikes it, it will unite at once. Raise the flame and melt the wire into the crack until it is higher than the casting and let cool of its own accord. Never

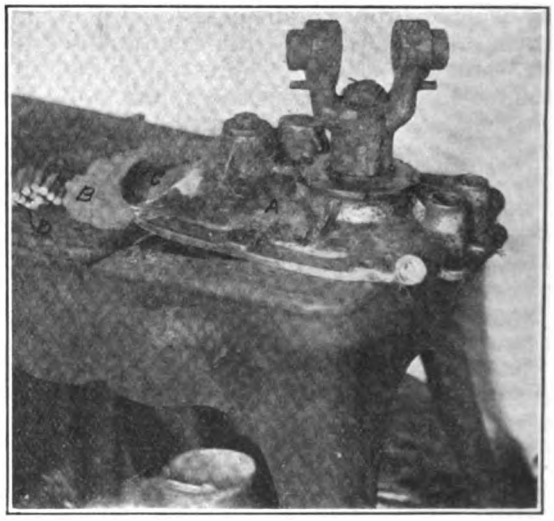


Fig. 4.

dip, as it softens the casting until it will not have the strength. If after taking the casting from the mold it has a crack on the other side, take a fresh ball of clay and bed it down into the clay as before and repeat the welding operation from the other side. Allow it to cool and file to shape. If possible leave it a trifle heavier than it originally was. The brass casting will be very easily worked if time and patience are taken to make preparation and the flame is small enough so that it does not heat too far each side of the crack.

Fig. 4, we have something a little different, and sooner or later every operator will come up against this as many times the broken pieces are lost and it is necessary to "puddle" in new, as we call it. To do this it is necessary to make a form or mold to hold the metal in place as it is run together. At A we have a portion of a transmission case with a part of it gone as shown. At C we have the space to be "puddled" in. Around the outside edge we build a

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form of clay which will serve as the outside diameter of the case when finished as shown at B. D is a small bundle of weld rods broken in short lengths to be placed into the mold and melted, as it would take too long to feed the metal into the space with the weld rod, and some of the metal would be over-

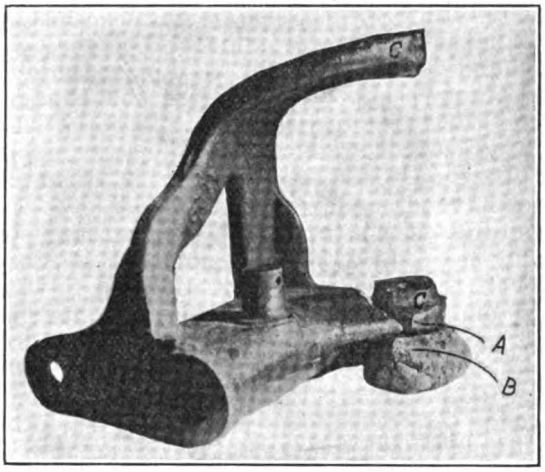


Fig. 5.

heated. The metal should be heated just hot enough to fuse well for if heated too hot it will have hard places in it and make the machining difficult. In case there are holes in the edge of the casting to be preserved it is not a bad idea to fill them with clay, and when the job is finished the clay may be removed and the holes will be in place. Care should be taken in a job of this kind that the puddled metal is firmly united with the balance of the work as flowing it in is not sufficient. This should be allowed to cool entirely in the position shown, as if removed from the table while hot it would either warp or cool with hard spots in it. I have found a very good plan to handle a job as shown is to cover with air slacked lime as soon as finished and leave until entirely cold. This takes much longer time but adds a great deal to the quality and strength of the material. The table shown in Fig. 4 is a base of an old cream separator with a planed block of cast iron placed on it. This can be moved about with some ease and the cover adjusted to any angle by blocking up under it.

In Fig. 5 we have a casting from a mowing machine that was brought to the shop by a farmer in a terrible hurry, as most farmers are in a hurry

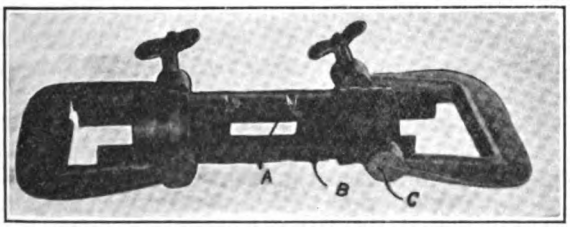


Fig. 6.

during their busy seasons. The casting was welded in less than an hour and the farmer went on his way rejoicing. The casting was broken at A and ground to the V shape as shown. The clay was used as shown at B to hold the parts in place. A rod nut shown was passed through the hole from C to C, which kept the parts in exact alignment while welding. After the job was welded up as shown it was turned over and welded from the opposite side, as there was no danger of it getting out of shape, and the rod passing through C, C, held it in place. Farmers appreciate jobs of this kind. In building large V notches of this sort, play the flame along the edges of the break from one side to the other, until the metal is in a melted condition, then dip the weld rod into the flux and apply it to the edges until the metal is melted. Now by playing just enough heat on the casting and the greater amount on the weld rod, the metal can be builded in without danger of flowing it out at the sides. When the metal will run out at the sides of the casting it indicates that the flame is played too strong on the casting and not strong enough on the rod. In placing teeth in a wheel, etc., this will be noticed more than anywhere else, for if the heat is not properly distributed, it will cause the metal to run down the sides and it will be difficult to remove. With practice a tooth can be builded an inch above the wheel so perfect it will hardly need dressing to mesh into the tooth on the wheel running it. This is all in controlling the flame and watching that the metal does not get too hot. Metal handled carefully as described will remain soft enough to file easily.

In Fig. 6 we have a part of a steam pump broken as indicated at A. Both sides being broken it was necessary to hold it perfectly straight and this was done by placing along either side heavy straight bars of steel as shown at B. These bars were clamped tight to the pump with two clamps, C. The space below the notched part, A, was filled with clay

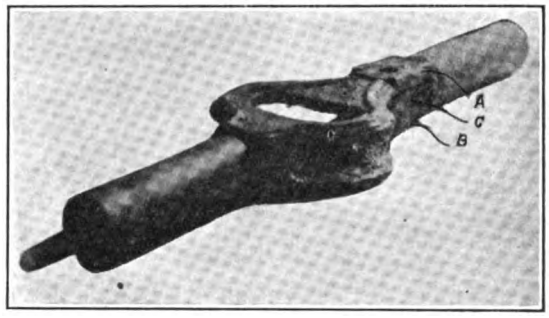


Fig. 7.

to prevent the closing or changing the opening. The welding was done in the usual manner, care being exercised to heat the metal only hot enough to fuse as there was some filing to do before replacing the cylinders in the pump.

Fig. 7 we have another part of a steam pump which was broken as indicated at A, the side, B. remaining unbroken. The part of the casting broken out had a small hole in it but not being able to line it exactly it was welded solid. The piece was supported in position by clay at C while making the weld. After welding the casting was turned over and a drill the proper size was run through the hole on the opposite side, coming through the part welded in leaving both holes in exact line to receive the pin which worked in it.

The writer has found best to use only cast filler rods on the cast work as it gives much better satisfaction than using the brass. Tobin bronze works very well on the castings made of malleable, while there are malleable filler rods that answer well in ordinary cases. It is a good plan in welding malleable casting to reinforce either with a steel patch or with an excessive amount of metal where possible.

I trust that in preparing these articles some reader will be benefited by them and that some un-

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successful operator will stick to his machine until such time as instruction comes to his aid that will start him on the right track, which will result in a profit both to himself and to his customers.

TWO CYCLE ENGINES.

Mr. Duryea Passes Over the Fact That They Have Been Tried and Found Wanting.

From Charles E. Duryea, Pennsylvania.—Your reply to B. Weems about the 2-cycle engine seems to have been not fully considered. While based upon experience with the common or garden variety and quite correctly representing the usual results obtained therefrom, it is far from stating the actual facts. I confess to a feeling against the 2-cycle equally strong at one time, but I have seen 2-cycle engines that were really good and what can be done once can usually be done again.

There is nothing in the 2-cycle design that prevents it functioning as well as the 4-cycle if it is as well perfected and made. On the contrary, it has less parts, less friction load and so may be more economic. It holds the hot gases a less length of time and so can be cooled easier. That it must exhaust earlier is incorrect. In both cases the exhaust must get out before the piston starts back or there will be negative work. By having a light check in the transfer passage there is as much time after dead center for the new charge to enter as before for the exhaust to get out, so the 2-cycle can be given the same timing as a 4-cycle so far as the exhaust is concerned. Usually the timing is somewhat earlier, as you correctly state.

That this early opening of the exhaust is a loss is not necessarily true. Did it ever occur to you that it expands its working charge as far as it compressed the new charge, whereas a 4-cycle always opens its exhaust many degrees ahead of the point of beginning compression? The 4-cycle compresses 180 degrees and expands about 130 degrees. The 2-cycle compresses about 125 degrees and expands the same. That the compression pressure may be the same, the compression space must be smaller. Most folks overlook these facts.

There is no difficulty about getting the exhaust gases out. Their own energy will take them out several times if permitted free action. Indicator cars of the 4-cycle exhaust often show several waves of vacuum and pressure during the expelling stroke of the piston. The gas goes out and comes back again. So there is needless time and friction in this expelling stroke.

Let us study the matter a little. The new charge goes direct from the carburetor into the cylinder of the 4-cycle and too often the fuel never gets vaporized. I have seen liquid gasoline running from the muffler of a cold 4-cycle engine. Not much of course but enough to know that the fuel went through without burning and continued to do so but was not visible because the parts and pipes became hot enough to vaporize the fuel. Then nose instead of eyes told the story. The waste went on. But in the 2-cycle the liquid largely stops in the crank case. This case is usually big enough to hold 3 to 5 charges at a time. Of course as one is transferred another is admitted, but the effect is that much of the new charge remains, and the average is that the charge sent to the cylinder has been exposed to the motion and heat of the crank case during several revolutions, and so is better vaporized and more powerful and economic than the usual 4-cycle charge.

If the ports and deflector are right the new charge is thrown to the head of the cylinder and pretty well spread out there so that very little if any of it gets to the exhaust port. This is particularly true if running at part throttle, which is the usual auto custom. With a proper size of engine there is not often call for full power and so the small charge that is admitted does not fill the top of the cylinder and does not escape. In boat use full charges are used and there is much escape. Any one can test this by noticing the exhaust. The rank odor of a wasteful exhaust tells the facts. A good 2-cycle does not have this odoriferous exhaust.

The crank case is not a good pump and so does not draw in quite such large charges as does the cylinder of the 4-cycle, but when drawn in they are warmed and expanded, and so have somewhat increased in volume before being used. Moreover, since full charges are seldom used, they are large enough. If not, let a slightly larger engine be used. As already explained, the cool gases rush in and crowd the hot ones out. This cools the walls from the inside and finishes vaporizing the new charge. Such heat as goes into the new charge is there ready to do work on the down stroke. This adds economy. Then the compression is always constant. The early makers of stationary gas engines did not attempt to throttle because this reduced compression and economy so much as to be considered very bad. The auto man ignores the loss of economy and throttles that he may get smooth action. But the 2-cycle with its constant compression, gets the most economic condition possible. If the cylinder does not fill with the new charge it fills from the exhaust. It then expands to the full length of the compression stroke instead of about three-fourths that far. This is what every gas engine man wants.

Most people say it has one fault, in that it will not idle like a 4-cycle. Surely the exhaust gases dilute the small new charge till it does not ignite as does the almost uncompressed but more nearly pure charge of the 4-cycle. But every user of a 2-cycle has noticed that if he cuts out half the sparks it idles beautifully. What has the cutting out of the sparks done to the mixture? Simply this. The remaining cylinders must do double duty and so they take charges large enough to fire every time, just as do the charges in a 4-cycle which having half its strokes idle must do double duty on the working strokes. Even at that the advantage is with the 2-cycle because it has no cam shaft and valves with their springs and friction to act as a load and require still larger charges.

It is very easy to make 2-cycle engines of the auto sizes that will pull well at 3,000 r.p.m., and develop their maximum power at 1,400 to 1,800 r.p.m. Surely no one need complain about such speeds.

These remarks refer to the crank case compression types. By adding the complication of a compression cylinder, much better results can be obtained but probably not proportional to the added cost and parts.

So long as we are adding nearly as many new buyers per year as there existed users before, it is hard to get a new thing introduced. The new man naturally follows precedent and buys what he finds in use. Some of these days we will find the market

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filled and then makers will begin to cater to the experienced man and he will want to know why he must carry 4 cylinders to do poorer work than 2, and eight valves to do work where none are needed. Then the 2-cycle will begin to come to its own. About that same time people will also ask why we should muss around with water and radiators when the air finally must absorb the heat anyhow and when the air cooled cars are holding all records for economy and efficiency? The only answer is PREJUDICE.

DRY BATTERIES.

Their Lasting Qualities for Ignition and for Lighting.

BY SYDNEY F. WALKER, M. E.

No. 6.

The dry cells of the Le Clanché type are supposed to give 1.5 volts when they are new. They rarely give more than 1.4 volts on open circuit, and when being discharged the voltage falls. Perhaps a point in connection with this had better be cleared up. The 1.5 volts of a dry cell is only furnished when

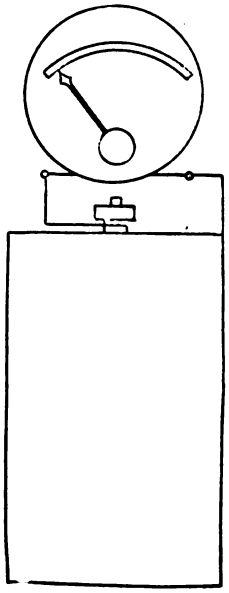


Fig. 18—Diagram showing the connections for testing a dry cell with a small voltmeter.

practically no current is being taken from the cell, or say only the very small current required to measure the pressure across its terminals, with a high resistance voltmeter. Some of the voltmeters that are employed for testing small batteries of accumulators and dry cells are wound to a comparatively low resistance, so that the current passing out during the time the cell is being tested is comparatively large; and hence the pressure as measured by those small voltmeters is usually in the neighborhood of 1.3. The useful pressure furnished by any battery, or for that matter by any source of electricity is of course the pressure obtained when the useful current is flowing. Where a battery is to furnish current for lamps, we have to take the resistance of the lamps, and the resistance of the battery and the pressure of the cells during the time the current is passing. To put the matter in another form, if we know the current which has to pass the resistance of each cell and the resistance of the lamps, we can find the number of cells required. Or again having the resistance of the lamps, we can find the resistance which the cells must have and their number in order to furnish the requisite current.

Now as to what batteries will do. The present writer made some experiments some months back upon an ordinary quart wet cell Le Clanché and a

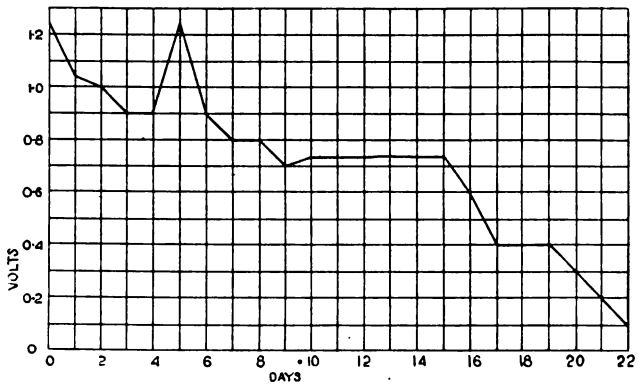


Fig. 19—Curve showing the gradual fall of pressure of a wet Le Clanche cell under the test mentioned in the text.

number of dry cells of various sizes. The test was conducted on the same lines as those which he made a good many years ago to obtain a good working cell for the work of those days. A large number of cells of various types were included in one circuit with an artificial resistance, a length of copper wire so that a small current was continually passing through them. The cells were kept in the test for about three weeks and the pressure between the terminals of each individual cell was tested every morning. The writer gives the curve of the wet cell as a sort of standard, then the curve of a cell which he believes was made in Germany, and which gave very good results.

The wet cell, it will be seen, started at about 1.25 volts, dropped to 0.9 in four days, then rose to 1.25 again, and then fell more or less continuously, till at the end of three weeks the pressure was practically gone. The German dry cell, of which the curve is given in Fig. 20, it will be seen started at 1.40, it fell to 1.25 in one day, maintained that pressure for seven days, then fell again to 1.1 in one day, and then maintained the varying pressure shown. The writer's object in showing this last curve is to enable it to be seen that a cell made on the same lines as the German, when furnishing a certain current, would keep its pressure practically constant for something like two weeks, and therefore, as ex-

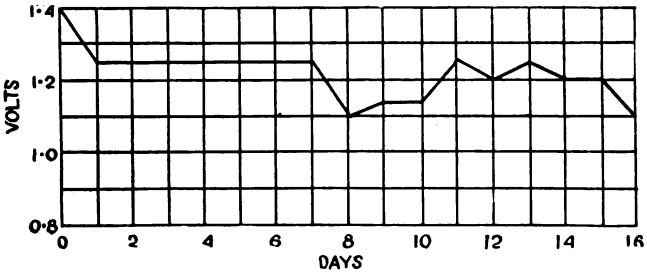


Fig. 20—Curve showing the gradual fall in pressure of an Obach dry cell under similar test to that of the wet cell.

plained above, if the quantity of oxide of manganese and salammoniac and the general dimensions of the cell are proportioned to the work there is no reason that cells should not last for three weeks at any rate when doing all that is required of them for lighting and for a longer time if they are made in

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larger sizes. It appears to him that it would be much simpler to have a battery of cells working in this way and changed when the lights ran down than to have all the trouble of looking after accumulators, dynamos, etc., required with that arrangement.

In Figs. 22 to 25 the curves are given of some cells made by the Western Electric Company and tested at the National Physical Laboratory in London. The writer gives these curves as they show in a very striking manner what dry cells will do. The test to which the cells were submitted is again a very practical one. Six of them measuring 6¼ inches high by 2½ inches diameter over all were connected in a circuit including a resistance of 5 ohms, as shown in Fig. 21. The cells were connected

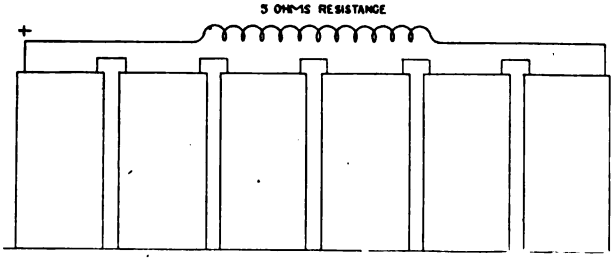


Fig. 21—Diagram showing the connections for the test of 6 Blue Bell dry cells in series at The National Physical Laboratory.

to the resistance for six hours per day, resting the remaining twenty-four hours. This is a pretty close representation of the work that cells would have to do in furnishing current for the lamps of a motor car. It is probably in excess of the average, though six hours work might be required of them in winter time. The cells also rested on Saturdays and Sundays; this rest would probably make up approximately for the difference between the time usually required for lights on a motor car and the six hours test. In a great many cases the writer believes the time the lamps would be required would be smaller.

Fig. 22 is a curve showing the variation of the internal resistance of the cells. It was mentioned above that cells lose their power in two ways by decrease of pressure and by increase of resistance. In the figure the vertical distances, the ordinates as they are usually called, represent the resistance measured in ohms, and the horizontal distances, the abscissoe, the number of days the cells were at work. It will be noticed that at the commencement the cells had a resistance of about 0.5 ohm each and that the resistance decreased slightly at first; this would be due to the percolation of the liquid from the sal-ammoniac into the manganese portion; that it remained fairly constant for twenty days, then rose slightly and continued to increase until the end of the test. For practical purposes there was no increase of resistance for three weeks. This bears out the test made by the writer upon the German cell which showed that it could be depended upon for two weeks at least.

Fig. 23 shows the pressure furnished by the cells on open circuit. It will be noticed that the curve zigzags very much. It commences at a little over 1.5 volts, falls to a little under 1.4 in a few days, rises slightly, again falls, rises slightly again, and so on. For practically six weeks the open circuit pressure, it will be seen, did not fall below 1.2 volts.

In Fig. 24 the curve shows the pressure on closed circuit, that is to say, when the cells were connected up to the resistance. It will be seen that the pressure commenced at a little over 1.4 volts, fell exactly as the open circuit pressure did during the first few days, rose slightly and zigzagged down. It will be seen that the closed circuit pressure remained 1.15 about after twenty days.

The curve in Fig. 25 is the average pressure of the cells at the end of each day. It was mentioned above that one feature of all batteries is; accumulators are subject to the same; that they fall with work and rise again with rest. This is particularly true of the Le Clanché cell and of the dry type variety. It will be seen that the pressure at the end of the first day was rather under 1.3 volts, and that it fell very much in the same manner and that it was still over 1 volt after ten days, though it fell very rapidly afterwards. This type of cell was able to furnish a current of say 1 ampere at least for for ten days without falling below a pressure of 1 volt, so that if 6 volt half watt lamps had been employed the 6 cells would have been able to furnish 12 candlepower for the six hours and for ten days.

Now we come to another part of the problem. A little back the present writer had a long argument with a large firm of makers of dry cells in the United States on this very point that he is working out in these articles. The makers of the dry cells very properly pointed out that with cells of a certain size it was no use adding them in series if current of a certain strength was required; the course that should be adopted would be to connect them in parallel, as electrical engineers call it, on the lines mentioned below.

Taking the tests on the Blue Bell cell as a starting point, it will be easy to see how cells of larger working capacity can be provided for. Merely doubling the height of the cells, making them 12 inches high instead of 6 inches, will double their working capacity, the quantity of current that they can be depended upon to furnish for say six hours a day for a certain number of days and it will also halve the internal resistance. Fig. 26 is a curve showing the effect upon the capacity in ampere hours of increasing the height of the 2½ inch diam-

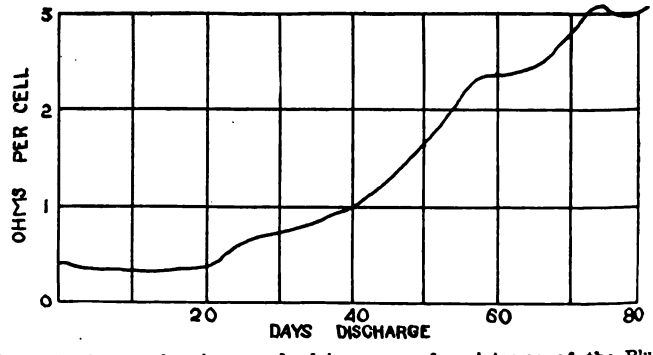


Fig. 22—Curve showing gradual increase of resistance of the Blue Bell dry cells under test.

eter cell from 6 to 12 inches by successive inches. Fig. 27 shows the effect upon the resistance. Another method of increasing the capacity of the cell is by increasing its diameter; and Fig. 28 shows the increased capacity of cells each 12 inches high, and ranging from 2½ inch diameter up to 6 inch diameter by successive half inches. Fig. 29 is a curve showing the effect of the increased diameter of the cells 12 inches high upon their resistance.

It will be seen that by increasing the height and increasing the diameter of the cell practically any conditions that may be required can be obtained. The capacity of the 6 by 2½ inch cell, it will be

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remembered, was at least ten days furnishing a current of 1 ampere for six hours. In the writer's experience with cells of the Le Clanché type, he has found that increasing the size of the cells increases their staying power in a very much greater proportion than the difference in size. Where the larger cell is worked to its full capacity the staying power would probably be simply in proportion to the difference in size; but where the current taken from the larger cell is smaller in proportion than the test current taken from the smaller cell, the writer believes that the staying power would be very much increased. He estimates for instance that the staying power of the cells that he shows below would furnish the necessary current for the lamps required by a motor car; as it is below what they could furnish on the basis of the Blue Bell cell mentioned above, and that they would furnish that current for at least three weeks, possibly for a month. This means that the changes of the cells would be comparatively infrequent. The writer takes it that it would not be a serious matter to a motor car owner to change his cells say once a month. At the present time probably the cost of the large cells that would be required for the work would be high, but so also is the cost of the complicated arrangement that the cells would displace; and the use of the cells would so simplify the whole arrangement and neutralize so much apparatus to look after that the writer suggests it would be worth a little more outlay. In addition, as is well known, once there is a demand for a particular thing, and particularly in America where there is a genius for designing machinery that will turn out very large quantities of any object that is required, the cost of the cells would probably be considerably reduced.

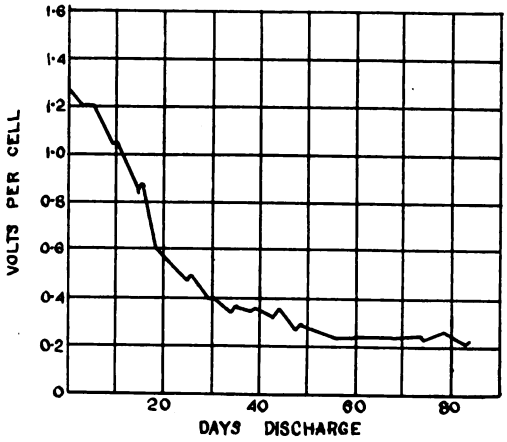


Fig. 23—Curve showing the gradual fall in the pressure of the Blue Bell cells under test, the cells being disconnected when pressure test was taken.

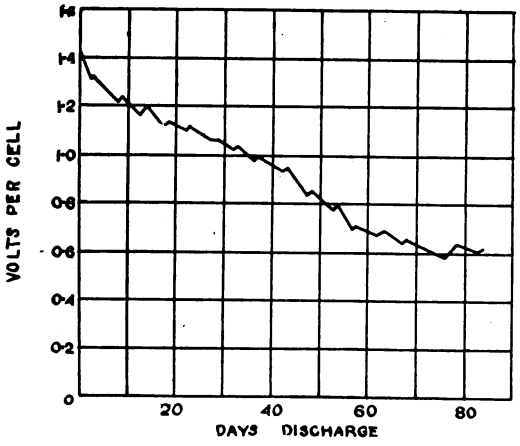


Fig. 24—Curve showing the gradual fall of pressure in the Blue Bell cells at end of each run; the cells being disconnected when pressure test was taken.

And now we come to a point that is partly dealt with above, viz., the effect of the resistance of the cells themselves upon the current actually furnished to the lamps. The resistance of the cells necessitates a larger number being required to furnish a given current. The writer makes out that the following would be the requirements of an ordinary motor car under the present conditions, for the one watt lamps at present in use. Two headlights, each of 6 candlepower, and each taking 1 ampere; four lamps for side, tail and dashboard, taking together 1 ampere. The lamps would be arranged to furnish their light when a pressure of 6 volts was delivered to their terminals. The combined resistance of the lamps themselves, the writer makes out, would be 2 ohms. He makes out by calculation that 12 cells would be required, and he takes it that they could be depended upon to furnish a pressure of 1.2 volts each before renewal. The resistance of the largest size cells shown in the curves in Figs. 28 and 29 would be .1 per cell, so that their combined resistance would be 1.2.

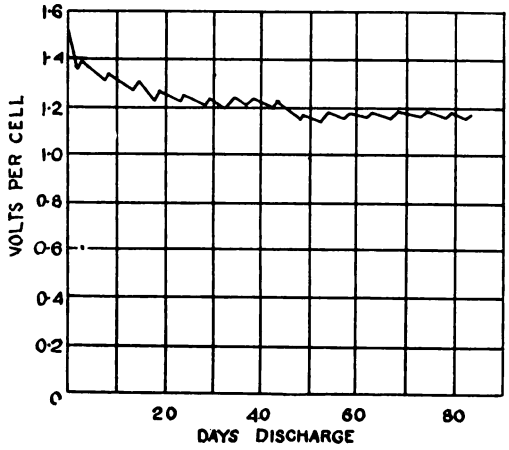


Fig. 25—Curve showing fall of pressure of Blue Bell cells, the cells being connected in series and to the resistance when test was taken.

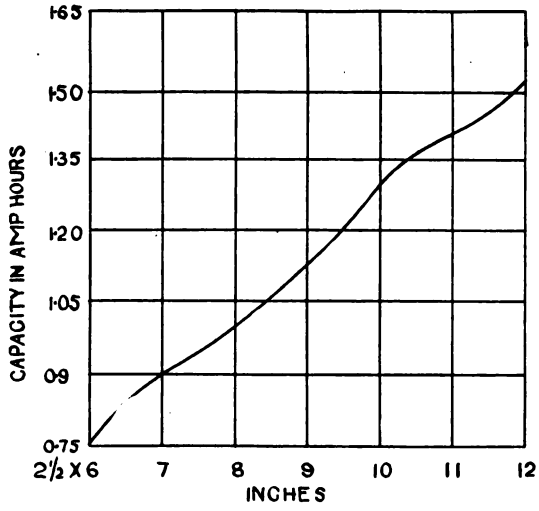


Fig. 26—Curve showing the increase in the capacity of a dry cell 2½ in. in diameter, as its height is increased from 6 to 12 in.

It will be noted from the curve shown in Fig. 28 that the capacity of these cells for six hours per day,

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based upon the tests of the Blue Bell cell, is 8.7 amperes. It is more than probable therefore that they would last out their full month, and possibly longer.

Another point occurs here that has to be taken account of, viz., whether the large cells mentioned above, 6 inch diameter should be employed, or a

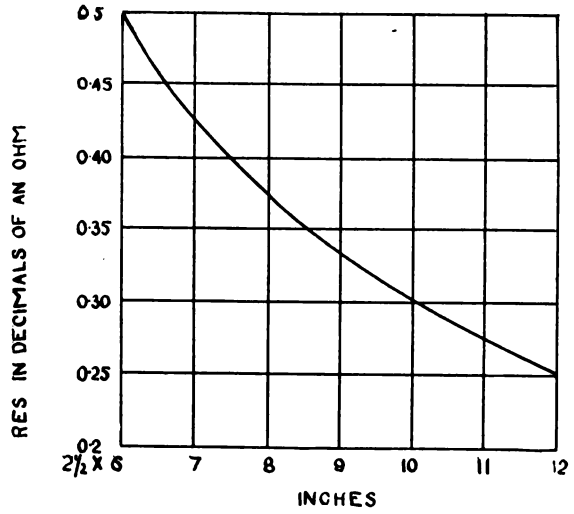


Fig. 27—Curve showing how the internal resistance of a dry cell 2½" in diameter decreases as its height is increased from 6 to 12".

larger number of smaller sized cells. The writer strongly urges that the larger cells should be employed. There are two principal reasons for this. It is well known that in work of this kind, making up battery cells, and similar work, it is the labor that makes the heavy cost. The labor for instance of making a 6 inch cell would be very little more than of making a 2½ inch cell; and once machines had been designed to turn out all the parts of 6 inch cells, and to put them together, the cost of making them, labor and machine, would be very little above that of the 2½ inch cell. The material of course

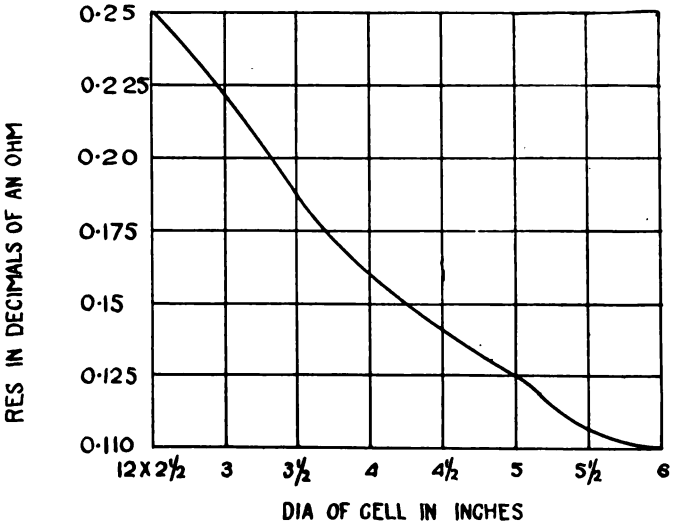


Fig. 28—Curve showing how the capacity in ampere hours of a dry cell 12" high increases, as its diameter is increased from 2½ to 6".

would be in strict proportion to their size, but again the cost of the zinc cylinders which forms a large proportion of the cost of the cell would not increase in the same ratio as the size of the cell. A cylinder whose diameter is double the capacity, double the sectional area, does not contain double the quantity of zinc so that the cost of the zinc would be relatively smaller. As the size of the cells increased it would be necessary to use a thicker zinc plate to form the cylinders out of; but again the relative cost would not be increased in the proportion to the ability of the cell to furnish current. The carbon also would not be in the same proportion as the size of the cell, and there would be one terminal screw for each carbon and one wire to solder on to each zinc cylinder against the number of terminals for the number of smaller cells and the number of zinc wires.

There are also two more serious objections. One is the greater complication in the matter of connections when cells are arranged in parallel, as electrical engineers call it. Fig. 30, three sets of 12 cells each connected in parallel. The number of extra connections will be noted. For connecting cells in parallel it is necessary that each series shall be connected together as shown in Fig. 15, and then the separate series shall be connected together, the end carbons and the end zinc as shown in Fig. 30. Where the cells are sent out in battery boxes ready connected,

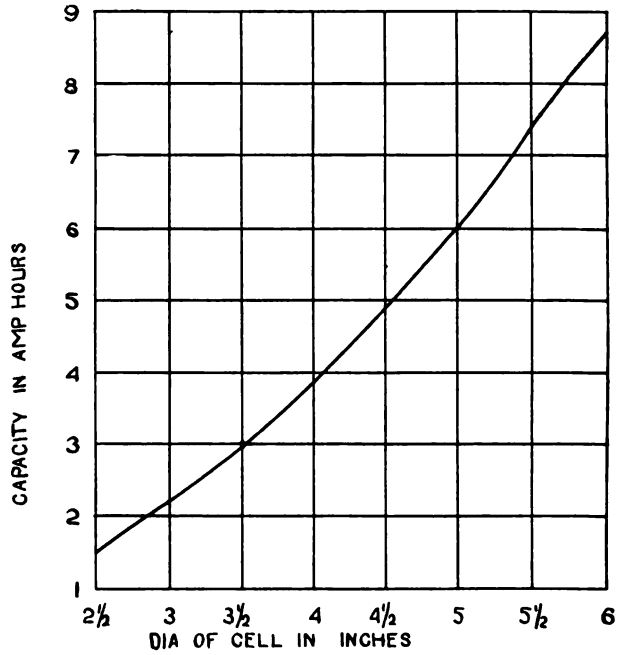


Fig. 29—Curve showing how the internal resistance of a dry cell 12" high deceases, as its diameter is increased from 2½ to 12".

as is shown by the battery company mentioned in the previous part of the article, it is perhaps not of much consequence, but if the question of disconnecting any of the cells arose, and of re-connecting them, a motor car driver might find some difficulty.

The other objection is a far more serious one, and it affects the staying power of the cells very considerably. When batteries of cells are connected in parallel, it is assumed that each series has exactly the same pressure between its end terminals as all the others, and therefore the pressures at the carbon ends and at the zinc ends balance one another, no current passing through any of the cells except when the outer circuit is complete, when the lamps are in use. In practice it is found that individual cells are never alike and that any series of cells connected together are never alike. In manufactured articles there are so many of what mathematicians call "independent variables." A slight difference in the carbon of one of the cells, in the quantity of oxide of manganese or of crushed carbon in one of them, in the rolling or the burning of the zinc of one of

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them, in the sectional area of the connecting wire, in the resistance of the soldered connection to the zinc, will cause a difference in the pressure of individual cells, and in their resistance. Unless the individual cells are all exactly alike in pressure and in resistance, and unless each series is exactly alike in pressure and resistance, there will be a small difference of pressure between different parallels, and the result will be that a small current will be passing through the cells when no current is passing outside. It will be remembered that while the cells say are

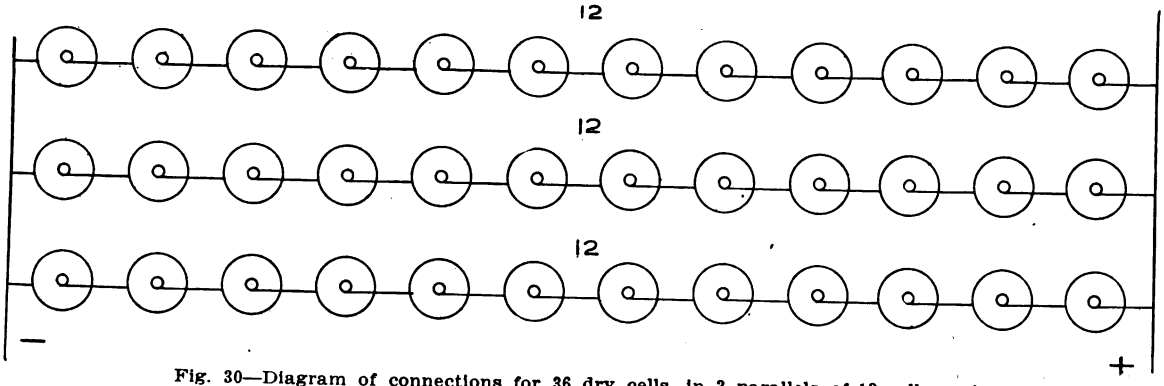


Fig. 30—Diagram of connections for 36 dry cells, in 3 parallels of 12 cells each.

doing useful work for from four to six hours a day, these secondary currents will be flowing for the whole of the twenty-four hours, and though the currents flowing are small, experience has shown that the cells connected in parallel tend to work down very much more quickly than cells in series.

END.

THE AUTOMOBILE ROUND TABLE.

Some News and Views and Pointers for Car Owners and Repair Men.

From G. D. Crain, Jr., Kentucky.—The garage proprietor who has his repair shop on the second floor, as many members of the trade have, often regrets that this fact prevents him from using a pit for the inspection of the under-side of the automobiles which require attention of that kind. True, he might build a box of some sort in which the mechanic could stand, but unless the height of the first floor was considerable there would be danger of accident on account of the projection.

A simple and satisfactory substitute for the pit is in use in some garages, consisting, briefly, of a seesaw device carrying a frame or track on which it is possible to roll the car. After it is run up the incline, its weight swings the frame to a horizontal position, and hinged supports at the end are then let down to hold it in position. The top of the fulcrum of the seesaw, and consequently the entire frame, is about three feet from the floor, and this, added to the amount of road clearance afforded by the car, enables the mechanic to get under and make the inspection without much difficulty, though he must still stoop to some extent. But the arrangement is so far superior to the plan of lying down on the floor, and operating from this awkward position, that it is certainly to be recommended for garages where it is not possible or convenient to provide pits.

In the garage where the device was first seen by the writer, it was found that it took up a good deal of room, though as it was frequently in use this was not a serious objection. However, this condition could be remedied rather easily by hinging the frame at the center, and allowing one section to fold back over the other when not in use. Thus just half the usual amount of space would be needed, and the "pit" could be shoved back out of the way until it was wanted, when it would be the work of only a moment to get it in position.

Study the Instruction Book.

The veteran automobilist who buys a new car sometimes assumes that he knows it all, and that he can take hold of the new machine and operate it without any trouble at all. Of course, this is true in a measure, as far as driving it is concerned, and the ordinary features of supplying oil, water and gas are naturally well understood. But this does not mean that the motorist can afford not to get all of the features of the car well in mind. There are bound to be differences in design that it is well to understand, and many of them may be so important that ignorance of the proper way to deal with them may be extremely costly. The conclusion that one reaches is that the manufacturer's instruction book, though much of it is written for the tyro who has never owned a car before, is important enough to justify careful study on the part of the new owner, no matter how many other automobiles he may have driven in his time.

This is especially true if the owner is changing, say, from a car without starting and lighting devices, and with ignition supplied by a magneto, to one with a starting-lighting-ignition unit introducing battery and other elements with which he has not been familiar. It is like starting all over again, and it is well worth while to give concentrated attention to getting all of these features straightened out, mentally, so that they can be dealt with in the concrete effectively.

One owner recently found, on studying his instruction book, that the universal joint of his new car must be oiled separately, the regular oiling system not taking care of this. It is necessary to supply about a pint of oil every 1,000 miles. If he had not happened to notice this in the book, it might have been overlooked altogether, especially as the car had not been bought from a local dealer.

Competition and Courtesy.

It pays to be polite, always, and it is politic to be courteous, even though you may have all of the business "sewed up."

It is not only humiliating, but rather funny, from the outside, to have to change one's policy in this regard all of a sudden because dangerous competi-

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tion has entered and has made it seem necessary to "play" to the owner.

Not long ago a new tire and supply house entered a town where one company had had things its own way for a long while. The head of the latter concern is a fine, likable fellow, but his business had grown rapidly, and he couldn't be blamed for feeling and acting a little chesty over his success. Besides, not all of his employes were under his immediate supervision all of the time, and the result was that most of those in the organization acted as though they were doing motorists a favor when they gave them attention, even though the company got good iron dollars for all the material and service supplied.

The new concern went after the business aggressively. It offered more tire service than had ever been available without charge before, and it put in a stock of accessories and supplies that proved very attractive to the rank and file of the owners. Pretty soon it had eaten quite a large hole into the business of the original house, and the head of the latter, who is a good business man, started in to fight for the trade.

Everybody in the concern was given specific instructions about waiting on car owners, and courtesy and politeness were explained on business, rather than ethical grounds. The result was that employes, who were really loyal to the house and wanted to see it hold its position of leadership, were as "sweet as sugar" to those who had any dealings with it.

By this and other methods, the concern will probably hold its own hereafter in competition with the newcomer; but, as suggested, it ought to be rather irritating to the head of the supply house to realize that it took competition to awaken him to the necessity of supplying courteous treatment and polite attention to his customers.

A Discount on Labor Items.

A garage man who found it necessary to devise some methods of improving collections has adopted the plan of allowing a 2 per cent. discount on all labor items charged against the customer, if paid within ten days after the rendering of the bill. The discount is not large, but on a bill of any considerable size it constitutes a sufficient inducement to justify the customer in making a point of paying the bill at the time indicated. The same concern uses a plan which is in more or less general use, that of sending a memorandum giving a full description of the work done the day after it has been completed. Then at the end of the month the regular bill merely indicates the dates when the service was rendered. This insures the customer having a complete list of all of the items for which he was charged. and anticipates any complaints that he is being billed for service which he did not receive. Unless the memorandum is sent out promptly, the motorist may easily forget such things, and hence use of the plan is sure to save a lot of friction in handling accounts.

Watch Your Battery.

One of the most annoying troubles to which the motorist may be subject is a run-down battery. Yet it is, at the same time, one that is as easy as any to avoid. The requirement is simply giving attention to the condition of the battery, on the one hand, and not using current from it unnecessarily, on the other. The man who keeps his battery well supplied with water, and who watches his ammeter to see that the battery is being charged most of the time, is not likely to have much trouble. The motorist who is most frequently in need of battery recharging is the one who doesn't get a very big mileage, but who makes many stops and starts. For this reason such an owner would do well not to stop his motor if he is to be out of the car for only a minute or two, as the power required for starting the engine is so considerable, as a rule, that it takes a lot of running to replace this loss.

Wasting current in lights that are not needed is another way to hasten the complete discharge of the battery. Some drivers have their headlights turned on, if city ordinances do not hinder this practice, even on a brilliantly lighted street, not only irritating other motorists, but creating dangerous conditions for pedestrians, while they are likewise burning up "juice" that may be badly needed later on for cranking purposes.

The battery proposition, in short, calls mostly for common sense and ordinary good judgment, and if these are in evidence the owner will have a minimum of trouble.

MAGNETO CONSTRUCTION.

Outline of the Contact Breaker Mechanism of the Dual Type.

The majority of owners hesitate to attempt to correct magneto troubles other than those of a simple nature because of the instructions of the manufacturer. Instead of being an instrument of mystery the magneto is very simple. The writer ran across what proved to be a puzzling case for the owner and other automobilists who attempted to assist the motorist in trouble. The car was a 1915 model Maxwell and was equipped with the Simms-Huff lighting and starting system and the Simms dual magneto. Although the motor starter rotated the crankshaft the motor would not start either on the magneto or the batteries and the last named tested 20 amperes.

The location of the magneto on the car is such that the operation of the circuit breaker mechanism could not be readily seen, but by using a small mirror the parts were illuminated. The movable lever or arm H, shown in the drawing, was frozen and naturally the primary circuit was not established or broken. For the benefit of those not familiar with the operation of magnetos it is explained that the lever H carries a fixed platinum screw which is normally held in contact with the movable contact point on the screw F by the spring X. When the fibre block H, contacts with cams, it is moved inward, as is the lever, causing the points to separate. Contact is re-established when the block H passes by the cam.

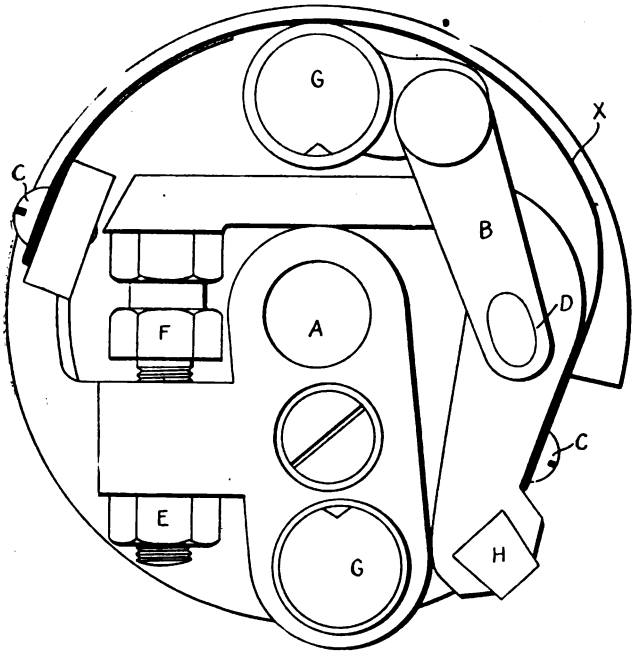
The movable lever is pivotally mounted at the point D. There is a small steel stud which rests in a fibre bushing in the movable lever. This bushing is a snug fit to prevent lateral motion, and if moisture or oil reaches the fibre it swells, causing the lever or arm to stick. In the case referred to by the writer the car had been left for a couple of days in a shed near the salt water and during the time it rained considerably.

When the movable lever sticks—it should move freely and easily—it will be necessary to disassemble the breaker box. Remove the dust cap, and at the point A, will be noted a small hexagonal nut.

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This is part of a long screw which retains the contact breaker to the armature shaft. Use the wrench accompanying the magneto and take out the screw. This will allow the breaker to be drawn out. In replacing it, it can go on but one way as there is a slot cut in it.

With the breaker removed, slip the spring B, to one side. Next displace the screws CC, which provide the tension for the spring. The movable arm can be then pulled off. The maker of the magneto



Magneto Mechanism.

recommends using a small reamer, but in lieu of this can be used the finest of emery paper, rolling it up in the shape of a reamer. Be careful not to remove too much of the fibre bush else lateral play will result. The best method is to make a slight cut, then try the movement of the arm. Do not use any oil whatsoever on the stud or the bush. In reassembling, reverse the order and when the parts are all together test the action of the lever by pushing the fibre block inward. In using the wrench in tightening the screw holding the circuit breaker in place, it is well to exercise care, for should the tool slip the brushes GG are likely to be broken or the springs bent. After replacing the parts, have some one turn the motor over by hand and note the action of the contact points. When correcting a magneto fault of this kind it is well to examine the condition of the platinum contact points and if they be pitted, true them. To adjust the points, loosen the lock nut E and turn nut F to the right to decrease the space and in the opposite direction to increase the gap. Use the gauge if good results are to be expected.

DRY CELLS.

Something in Relation to Their Construction and Wiring.

From C. P. Shattuck, M. E., Rhode Island.—Motorists employing dry cells for ignition, lighting small lamps and for operating horns and other electrical devices, have viewed with alarm the steady rise in the retail price. The increase in price is stated to be due to the inability to secure manganese owing to the war. Manganese is utilized as the depolarizer, it surrounding the carbon rod or post in the center of the cell. As the cost of a cell has practically advanced 40 per cent. it behooves the automobilist to give his set of batteries the care and attention making for maximum service. Much of the failure to obtain full value from dry cells is due to faulty installation and lack of attention.

A brief description of a cell will be of value in conforming to the suggestions contained herein for their care. It consists of a zinc shell to which is soldered a terminal. This shell is protected by a wrapper of heavy paper or cardboard which is flush with the top of the shell. All types of cells are round, but some are placed in square boxes. Although the wrapper is tough it will not withstand rough usage, and if there be movement of the cells within the battery box, the paper will chafe through, causing the zinc of one shell to contact with the other. This contact may be only momentary but it will be sufficient to cause trouble. This is illustrated at Fig. 2, A, which shows an installation of batteries in a metal tool box having a compartment for the cells. Cells 4 and 5 have been rubbing against each other, destroying the protective paper, and the zinc are in contact. Another condition frequently existing where cells are hurriedly and carelessly installed is illustrated by cells 2 and 3. Here the terminals, which project beyond the periphery of the shell, are making contact. Still another fault is shown by cell 1, the negative terminal of which is touching the metal side of the battery box. The drawing also shows how it is possible for the leads from the battery box to become short-circuited by the insulation becoming chafed through vibration. With any of these faults the owner will experience trouble, and sometimes it will puzzle him to locate it, especially if the contacts are only established when the car is traversing rough roads.

The sketch at B shows how the cells should be arranged, and as may be noted, none of the zinc terminals have an opportunity to come in contact with the metal of the battery box. Of course if the

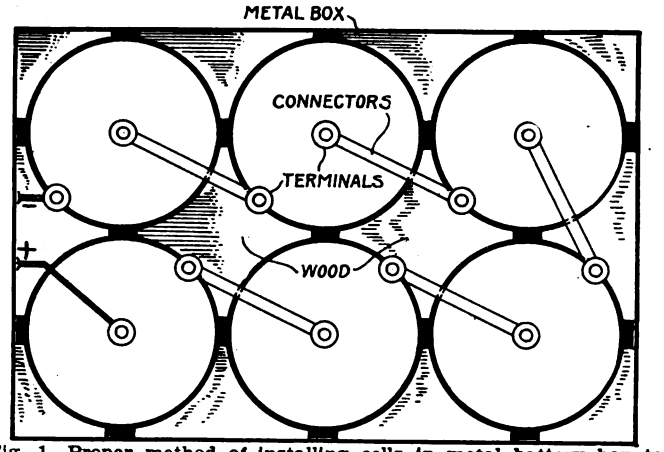


Fig. 1—Proper method of installing cells in metal battery box to prevent short circuits.

box be lined with wood, no trouble of this nature will be experienced, but many owners have converted the all metal tool box into a battery container. If an all metal box be used, or even a lined one, it is a good plan to fit a fibre or porcelain tube for the leads to pass through. These are inexpensive and can be easily fitted by drilling the opening larger and making a drive fit. Both sections of the positive and negative lead should be taped separately, then together, where they pass through the insulator.

Many owners are content with stuffing old paper

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between the cells and the box to prevent movement. A much better method, and one recommended by the manufacturers of dry cells, is to have some wooden blocks turned to the shape shown at Fig. 1. These will not only prevent movement of the cells but prevent their contacting with one another. All of these suggestions may appear to call for unnecessary work but in view of the high cost of cells it is warranted.

Poor contacts at the connections and attemtping to utilize one or more old cells with new ones are responsible for inefficiency. If plain connectors are employed the terminals should be set up snugly with pliers and gone over again in a day or so. In setting up the terminals on the zinc post do not exert too much energy as the threaded post is only soldered to the shell. If unfortunate enough to separate a terminal from the shell, it can be re-attached by a drop of solder. In testing cells for amperage, do not keep the instrument in circuit but a second. If a cell reads less than six amperes (some designate eight) discard it and replace with a cell of practically the same reading as the good ones. Old and new cells are not practical because the low reading batteries set up a considerable resistance. Always use one make of cells together as it is not practical to wire two or three different types. A very high reading cell does not always indicate long life. A poorly constructed cell can be made to read high by using a strong electrolyte.

In view of the high prices it is best to connect dry cells in series-multiple. For example: If one employs six dry cells in the ignition system, purchase 12 and connect them as above stated. Assuming that the cost is double it is estimated that the service obtained will be greatly increased. This is due to the fact that the discharge rate of a cell is governed entirely by its power of depolarization. Most depolarizers are sluggish in action, and the lower the discharge rate the longer the cell will endure. Another advantage in wiring in series-multiple is that each cell of the set is called upon to supply a

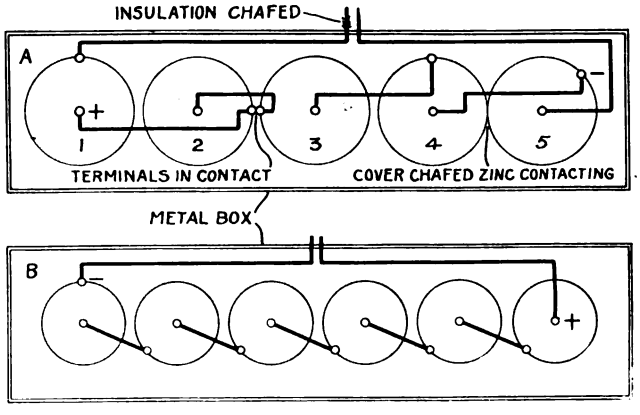


Fig. 2—Right and wrong way to install dry cells. A, careless installation. B, proper method.

relatively small amount of the total current consumed.

It is a simple matter to connect cells in series-multiple. A study of the wiring plans at Fig. 3 will enable the reader to connect cells according to requirements. The sketch at A shows six cells wired in parallel; that is, the zincs are connected together and the carbons. Such a wiring will obtain amperage and in the case illustrated it will be six times that of a single cell, but the voltage will be that of a single cell. To obtain voltage the cells are wired in series, as shown at B. Here the unlike poles of neighboring cells are connected together; for example, the zinc of one battery is wired to the carbon of the next. The voltage will be six times that of a single cell. The amperage will be that of a single cell.

The sketch at C shows 12 cells wired in series-multiple. It consists as may be noted of three sets of four cells, each set being wired in series. This arrangement will leave three free zinc posts on one side and a like number of carbons on the other. By

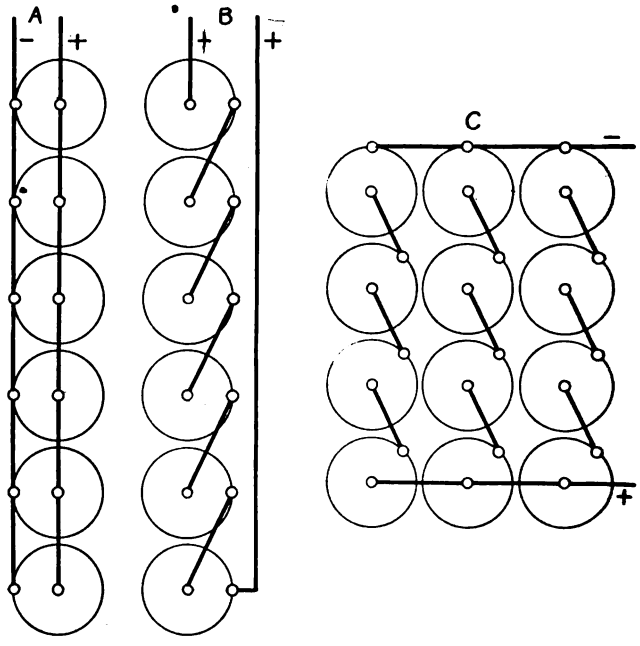


Fig. 3—How to wire dry cells. A, parallel to obtain amperage; B, series to secure voltage; C, series multiple to obtain economy.

connecting the zincs by wire and the carbons in a similar manner the series-multiple is obtained. It is a simple matter to determine the voltage and amperage of any number of cells wired in this manner. The voltage will be that of a single series. Assuming that each cell in the sketch is 1½ volts, four wired in series will obtain six volts. The amperage of each group being 20, three groups will afford 60. Assuming that this be true, 12 cells are more economical than six which afford but 20 amperes. True, the first cost is greater but the investment is warranted in these days of the high cost of dry cells. And it is not unlikely that the retail price will again advance in the near future.

Ohio Operators' Association.

The object of this association which has headquarters in Cleveland, is to improve the conditions of chauffeurs and to win public approval and co-operation. Four hundred members are now registered upon the charter of this association, each member paying the admission fee of two dollars, when five hundred have jointed the charter will be closed and the admission fee advanced to five dollars, there will be a charge of fifty cents per month to active members. The association employment bureau will supply instructors to accompany new drivers of cars who have received the preliminary lessons from company instructors. Unfortunate accidents due to lack of knowledge of properly controlling a car under various conditions may thus be reduced and the commonly accepted rules of the road more thoroughly learned by this association plan.

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1707 Driving Laws.

From F. Straub, New York.—1—Please let me know, in your next issue, if under the laws of this State, any other person or relative to owner of a car, can drive his car, and if so, who assumes the responsibility for accidents, etc., should such person drive his car, owner being in car or not. 2—I also wish to know if such person, except owner, can drive his car in the State of New Jersey.

Reply.—1—The owner of a car can permit any one he pleases to drive his car so long as he does not operate it for hire or the car is not used for other than pleasure purposes. Owners, as well as operators, are civilly liable for damages, while operators only are liable criminally. 2—Under present arrangements of comity, cars from the State of New York are allowed to be operated in New Jersey for a limited time, and New Jersey cars similarly are allowed to be operated in New York so long as the laws of the State wherein registered are observed, but in case of accident the fact that neither the owner of the car or his paid chauffeur was not operating it would materially increase the responsibility of the owner and might increase the amount of the fine or the length of the sentence imposed upon conviction for infraction of the law.

1708 Lubrication Trouble.

From John H. Davis, Indiana.—I have some trouble with an Oakland car, about the oil sight feed. It fills up and overflows and does not feed back to the engine. I have taken the oil tubes off and they are not clogged up. If you know a remedy for it, publish it in next month's magazine.

Reply.—Pressure leaking past the piston rings probably prevents the oil from running back. If such is the case a standpipe of say ½-inch brass pipe tapped into the crankcase and extending upwards 8 inches or so, its open end covered by brass gauze should remedy the difficulty.

1709 Spark Plugs Leak.

From F. C. Humphrey, Texas.—I have a Maxwell runabout, model about 1909, which runs well for a car of that vintage, but I cannot keep the compression from leaking out past the spark plugs. I cannot screw plugs (standard ½ inch) in tight enough to prevent leaking. The threads were rough in one of the holes so I had it tapped out deeper, but that does not stop the leak, and the plug screws down so far that the heat breaks the porcelains about as fast as I can change plugs. I would like to tap the holes for A. L. A. M. plugs, if practical, so I could tighten up on gaskets, but I can find no pipe taps (⅞ inch diameter, 18 pitch thread) of that size listed in any of my catalogues. I don't think there is room to ream out and put in a bushing. Please advise me how to fix it.

Reply.—One-half inch standard pipe taps give a tapered thread which corresponds to the taper of the thread of the spark plug body. If the top of the thread is burned off, broken or corroded, there is bound to be a leak of pressure between the plug itself and the tapped hole. Such being the case your only remedy will be to order some plugs from some spark plug manufacturer, with extra size of thread, and tap the spark plug holes sufficiently large to receive them, or purchase adapter bushings of extra size thread, which will permit the use of metric size plugs. You have not sufficient metal to tap for S. A. E. standard, ⅞ inch, 18 threads to the inch, and even if you did this standard is straight and not taper like a pipe thread, and there would have to be a flat surface true with the thread, against which to screw the shoulder of the plug with a gasket between in order to prevent leakage. It is the leakage of hot gas past the spark plug body which overheats it, this extra heat communicating with the porcelain insulator causing it to break, rather than permitting the plug to extend too far into the explosion chamber on account of the extra size of the tapped hole.

1710 Platinum Points Trouble.

From J. Buickrood, New Jersey.—I have a Ford 1913 model to repair. It has a K.W. master vibrator. The platinum points give out when the car is run about ten miles, and this occurs as often as I replace them. I am not only at a loss as to what causes this, but also as to why it should occur almost invariably when the car has run ten miles. Can you help me out?

Reply.—Our reply to Harold D. Roberts, Oregon, should interest you. There is no doubt that the condenser connections are defective. In other words, the condenser does not prevent sparks at the contact points, which soon burn them up.

1711 An Auxiliary Carburetor.

From H. W., Rhode Island.—A few days ago something was brought to my notice that I want some more light on and thought I would write to you. I saw on a large Locomobile car a tank, and was told it was a Hawxhurst auxiliary carburetor, that it was filled with water and this water was turned to a spray and was injected into the manifold and here mixed with the gasoline vapor, the object being to keep the cylinders from carbonizing. It also helped the power. Can you give me any information on this subject? Is it a fact that this moisture keeps the carbon from forming in the cylinders, and does it help the power? The man who showed this creation to me said it was made in California, that the car used to be taken down every 1,000 miles and carbon scraped out, but since having the article put on the car that it had been 18,000 miles and was clean when taken down. This would prove it to be a good thing on this particular car. Now I own an Overland car, 1914 vintage. In your opinion would it be a good thing for my car? If it worked well on

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one car would it not work on another? Do you know anything about this method or this particular one? I know by experience, having owned automobiles for twelve years, that carbon in the cylinders spells trouble, and if this method would relieve me of some of that trouble I want to try it. Before doing so I want to hear from someone who knows.

Reply.—Your inquiry is not an unusual one from readers who fail to appreciate that we should not for obvious reasons condemn or recommend any device which may or may not be advertised in our columns. Water has long been used in connection with gasoline and kerosene in stationary gas engine practice. Its mission has been two-fold, to soften carbon deposits and to prevent preignition by increasing the length of the duration of the combustion. Stationary engines employing water are of the slow speed type, and when equipped for auxiliary water supply the ignition can be set considerably earlier, and added power results. Frankly, we have never made any experiments with water, such as you describe. If too much water is used it would interfere with ignition. Water taken into the cylinders of a cold motor would hardly aid starting. If the Locomobile had to have carbon removed every 1,000 miles there was something radically wrong with its operator. Manufacturers and salesmen who have meritorious devices and apparatus should be willing, at least until sufficiently well introduced to be recognized as such, to put their product out on a definite guarantee agreement. If you have any doubts as to the efficacy of this particular device you can figuratively be "From Missouri." Its use could not do any injury to your motor, and if it interfered with ignition you could easily observe it and disconnect it.

1712 Coal Oil in the Cylinders.

From W. N., Cleveland, Ohio.—A good many automobile owners and drivers occasionally use a little coal oil in their cylinders, claiming that it serves to cut the carbon and keep the valves clean. Will you kindly advise in your next issue if you think that this does the work and whether by any possibility it could do any damage to the motor.

Reply.—Coal oil, or kerosene as more commonly called, is more or less efficacious in cutting carbon deposits. We do not know how it could affect a motor as you seem to fear it might.

1713 Carbon Trouble.

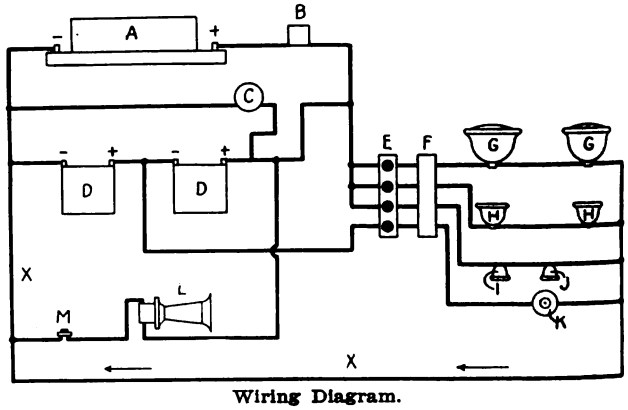
From William A. Butler, Rhode Island.—I have an Overland car, 1916, model No. 83, and it seems to carbon up about every 1,000 miles so that it absolutely refuses to climb hills, even of very slight grade. I use S. O. Co. gasoline and Polarine oil. I keep the level about ¾ full instead of full as the instruction book says, and I run about 80 miles to the quart of oil. I have tried carbon removers, kerosene, denatured alcohol, and have put the same in the cylinders after each day's run, while the cylinders were hot, and I cannot get but a slight increase in the mileage before the engine is full again. The car has been run about 2,300 miles and I have had the carbon burnt out and valves ground once and now it is full again.

I have been told by a friend to put a small piece of camphor in on top of each of the pistons and run the car as usual, his argument being that the camphor kept the carbon from forming in cakes on the inside walls of the cylinders and top of the pistons, and also kept the cylinders bright and clean. Will you kindly advise if there is anything in this scheme that would be a benefit to the motor or if it would be harmful? Also will you advise if there is anything I can do more, to help this trouble?

Reply.—It is our opinion that you have been running with a very rich and uneconomical mixture, due to improper carburetor adjustment. The result is, probably, that the piston rings are stuck in their grooves, thus causing the inordinate consumption of oil. We do not believe you will be able to get your car to run satisfactorily until the pistons are removed and the piston rings loosened in the slots. If you have this work done, and then find that your spark plugs accumulate oil after a short run try an oil of heavier consistency. If the camphor treatment were to prove efficient the demand would soon boost the market for this commodity. Local treatment such as is proposed to you, will not take the place of a necessary major operation. It would be like trying to reduce a fracture by the application of a liniment. Do not forget that a too rich mixture, more gasoline than is necessary, costs money, reduces the power and causes serious trouble in the motor itself. The moral should be obvious—use as little gasoline as possible. It is abuse to use too much.

1714 Diagram for Lighting.

From E. Z. Adams, Louisiana.—Will you kindly give me a wiring diagram of the lights on my auto-



Wiring Diagram.

mobile. It has two headlights, two sides lights, a speedometer light, an electric horn, dome light and tail light. These lights are run from two storage batteries and the two batteries are charged from a Vesta generator. There is also an ammeter, a four-way switch and a horn button. Could you give me an idea how to wire this up on a four-way switch, so that one button would light one headlight, another button the other headlight, the third button the two side lights and another button the tail light. Also to show when the battery is being charged or discharged through the ammeter. I have tried to figure this out myself, but with my limited knowledge of electricity I could not do it. I would certainly appreciate it if you can help me out on this.

Reply.—You probably did not realize how much of a job your request would entail, to tell you all we can concerning automobile lighting, especially as we have no means of knowing whether the system to be employed is the double or single wire, nor the voltage of the lamps and type of switch, as well as the magnetic relay and fuse block. Our advice to you is to employ some capable electrician to lay out

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the circuits and perform the actual work, your confessedly limited lack of knowledge rendering it more than likely that you would make an unsafe and dangerous installation, possibly ruining your battery and generator, even if you do not burn up your car from accidental short circuits. We are, however, as requested, giving you a diagram which employs 6-volt lamps exclusively, three circuits having two lamps in series, the fourth using but one-half the battery voltage to operate the single dome light. Of course if you desire to have this fourth circuit contain two lights you would have the voltage 12, same as of the other three, arranging the two lights in series. You must remember that this layout is only one of a large number that could be made. We do not claim anything great for it except that the lamps may be all of the same voltage. If the voltage of the generator is but 6, it would not be practicable at all, except the two storage battery containers were wired in parallel, and a separate and distinct circuit were established for each lamp.

In the illustration, A represents a 12-volt generator, B a magnetic or centrifugal circuit breaker to prevent discharge of the storage battery through the generator winding when the voltage of the current generated is less than that of the storage battery, or when the generator is at rest, C is the ammeter, DD the storage battery, E the four-contact switch, F the fuse block, GG the headlights, HH the side lights, I the tail light, J the speedometer light, also acting as a telltale light for the tail light, K the dome light, L the horn and M the horn push button. Arrows show the direction of flow, while XX show the common return from the lighting and horn circuits.

1715 **His Car Stalls.**

From S. C. Adams, Massachusetts.—I have a Ford 1914 car, and would like you to answer through your magazine, why it stalls with the gas lever on the third notch of the quadrant. It runs on first and second notch, and if I jump it from second to fourth it runs, but put it on third and it stops.

Reply.—There are three possible reasons why the motor will stop when the throttle lever is advanced to the third notch, while operating on both second and fourth. The least probable of the three is that in this position the primary ignition circuit is either short circuited as would occur if the carburetor throttle lever or rod should touch some bare spot in the primary wiring. The other two causes would be too rich or too poor a mixture at the troublesome position of the throttle lever. This you should be able to determine, for by your carburetor needle valve control you should be able to increase and decrease the amount of gasoline. If increasing it by turning to the left keeps the motor running it conclusively proves the mixture to be too poor, while conversely if shutting off a part of the gasoline by turning it to the left keeps the motor running it proves too rich a mixture. It matters not whether your motor has a Kingston or Holly carburetor, to correct this condition you should raise the float, or lower it, the former if the mixture is too poor and the latter if too rich.

1716 **Will Not Stay in Gear.**

From Henry Trolio, Mississippi.—I have a 1912 E. M. F. 30 touring car which a few days ago got so that it would not stay in high gear. On examination it was found that the bolts in the radius rods where they are connected to the frame of the car were loose and allowed a good deal of play in the rear wheels. My repairman fixed this and said that it would be all right, but it continues to jump out of high gear. Can you tell me the cause? He says that the gears are in first class condition.

Reply.—The loosening of the bolts may have been the result of poor alignment of the two shafts within the gear box, which in turn causes the jumping out of high gear. You will probably have to have the gear box bushings renewed and the transmission shaft lined up with the crankshaft. If the driving shaft has not been sprung or bent this should remedy the difficulty.

1717 **Battery Inquiries.**

From George Taylor, Maine.—My present car is a Reo the Fifth. The headlights are 15 c.p. and small tail lights, dry cell ignition and magneto. I have the Gray & Davis lighting and starting system. 1—My battery, I suppose, is a 6-volt, marked L. B. A. What make is it? 2—The battery tests by a volt meter, 6-2. The hand on the ampere meter on the dash used to point to 0 in the center, when the engine was stopped. Now it goes over about 1½ amperes on the discharge side. Does it keep on going over if the battery goes down? 3—How far would it have to go before it ought to be recharged? 4—When the engine is running, the ampere meter registers about 5 on the charge side. Can you tell by voltmeter at what degrees it would freeze or would I have to have a hydrometer? 5—Is there any safe arrangement that you know of that I could get to recharge at home from the common house lights?

Reply.—1—The battery is manufactured by the Willard Storage Battery Co., Cleveland, Ohio. 2—The ammeter shows the amount of current going into or coming out of the storage battery. If your lights are switched off and the generator is not running the indicator should be at zero. If, however, the automatic cut out, which normally prevents the battery from discharging through the generator, is not functioning properly it will soon ruin it. It is possible that your ammeter may be out. You can tell whether the battery is discharging through the generator by temporarily disconnecting the wire from the generator. If the needle does not change position it shows that the ammeter is out. From this you will note that the ammeter could not indicate the condition of the battery. 3—If you are using more current than you are putting into the battery you will soon ruin it. 4—The voltage remains fairly constant until almost totally discharged or in such condition as to demand expensive replacements. For this reason the voltage should not be depended upon. Use a hydrometer. 5—We do not think you should consider such an installation. The generator on your car is the proper method of recharging, and if working properly should keep the battery fully charged. We advise you to write the Willard Storage Battery Co. for their full and complete instructions for the care of storage batteries, read and believe what they say and do not attempt any experiments unless you are prepared to buy a new battery. If kept fully recharged they will not freeze unless the temperature goes considerably below zero. If fully discharged they will quickly

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freeze, which should not do any more harm than already done.

1718 **Magneto "Goes Dead."**

From J. Bell, Maine.—My car is a Maxwell, model I, of 1911 make. The engine is started by four dry cells, and runs on a low tension Splitdorf magneto. Here is the trouble. The magneto will work perfectly for a while and then go dead, and I have to use the dry cells. Perhaps then the magneto will work perfectly for 100 or more miles and then go dead. The speed of the engine or the temperature seem to make no difference. Repairmen are unable to locate the trouble. I have put new points on the magneto, the coil is in perfect shape and there are no loose or broken wires. The trouble seems quite blind. The ground wire is all right and the car operates perfectly on the dry battery. Please locate the trouble.

Reply.—The fact that the magneto will generate current only part of the time, while the battery ignition is dependable, proves conclusively that there is an occasional short circuit within the magneto itself. The current is generated in the armature winding, picked up by a so-called collector ring and conducted to one pole of the make-and-break mechanism. If a short circuit is completed at this collector ring or in the winding of the armature by oil carrying small particles of carbon there will be the same effect as would be produced by switching to the "off" position, which opens the battery circuit and short circuits the magneto circuit. The magneto should be cleaned by some one who really knows how, else there will be danger of demagnetizing the magnets when the armature is removed. Our advice is that you send the magneto to the nearest service station of the Splitdorf Electrical Co., or such people as the Holzer-Cabot Co., Boston, for an overhaul.

1719 **Largely Curiosity Queries.**

From Horace P. Nichols, Connecticut.—I would like some information regarding dry cells. 1—Supposing 4 dry cells are reduced to 20 amperes and one wishes to strengthen the current by adding four 20 ampere cells, multiple series of four cells each. Will this increase their voltage and would there be a loss of current on the 30 ampere cells? 2—Also in working a 6-volt lamp, what would be the advantage or opposite result of this connection of 20 and 30 ampere battery with dry cells? 3—I have put in two gas cocks in the tube connecting with the gas tank (Presto) drilling one for a 2-way connection, and another connected with a hole drilled in the side to the manifold, to be used in starting in cold weather. Now, can any harm result by using too rich a mixture, other than waste of gas? 4—Would enough current of gas to supply one ½ foot burner be about the proper amount of gas to let on? If this rig works all O. K. it makes a check ring, 2 cocks, 20 cents, 3 feet tubing, 18 cents, connected with manifold with solderless union 10 cents. 5—I would like any information in regard to connecting up dry cells of different amperage. 6—Also what would be the effect of grounding the current of 4 dry cells through the magneto of a Ford car? This was done by mistake, and I wonder whether it has injured the magneto. 7—If not, how much current can be thus used without injuring the magneto, and how can the amount of injury be determined? 8—How can it be ascertained whether the magneto of a Ford is up to what it should be? 9—Will ammeters and voltmeters indicate and what should they indicate?

Reply.—1—Four dry cells connected in series would give the same voltage as several hundred cells connected in multiples of four in series. In like manner a single dry cell as big as a barn would show the same voltage as one used for a pocket flashlight. The amperage of the two multiples of four would be much more, consequently the actual current consumption would therefore be less out of each cell, and they would last longer than if each series were used alternately. 2—Longer life. 3—Not from using too rich a mixture, but from using too much of the proper mixture you may blow out a cylinder head. 4—You can get several times as much as you need providing you let it run into the cylinders long enough. Our advice is not to attempt any amateur acetylene starting experiments unless you have positive means for measuring the amount of each explosive charge. 5—The strength of a chain is only that of its weakest link. A battery of dry cells has only the amperage of the weakest cell when connected in series or as a chain. In multiple-series the amperage would be the total of the weakest cell in each series. 6—Ruin your battery and probably demagnetize the magnets of the magneto. 7—None at all without danger of injury. 8—If it furnishes sufficient voltage to light the usual 6-volt lamps in series of two, and also to operate the ignition, it is proof positive. 9—If the voltage is up to standard, the amperage should not matter, as ammeters show not the amount of current being generated at a certain voltage, but the amount being used. As we have previously advised you, voltage is the strength or intensity of the current. The quantity of the flow of electric current can only be measured by knowing the voltage and amperage, their product being the actual quantity, expressed in units of watt-hours. For instance, a rectangular plot is 40 ft. long and 20 ft. wide. Its area is 800 sq. ft. Again a 6-volt current is flowing at 20 amperes per hour, equivalent to 120 watts per hour. If the voltage were 12, and the ampere hour flow 20, the equivalent would be 240 watt hours.

1720 **Engine Stops.**

From Walter Evans, Indiana.—I have been working on an Overland car, 1914 model, with a Splitdorf magneto, model A. The engine will stop dead, also sometimes it will not start. I have traced the trouble right to the coil. I was called to this car and it was dead and had stopped when running, and there was no electric current at the breaker nor at the coil connection. All I did to start it again was to take hold of the ground connection and pull it backward and forward and it started right from compression and the engine ran O. K. You can take this coil off and connect it with other wires and away from the engine and magneto and it will play the same trick once in a while without moving the switch, coil or wires, and when it works it throws a good blue spark at the high tension wire, and no blue spark at the primary contact. It seems to make no difference whether it is on the magneto or battery current.

Reply.—Probably a defective switch which occasionally gets short circuited or a connection jars loose. If you will persist in trying the coil to see how long a spark you can pull you had better order

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another to have it in reserve. Coils are not designed nor constructed to stand such abuse. You should not get any spark when breaking the primary current. The condenser is used to prevent it.

1721 **Spark and Coils.**

From Ewing McLean, Indiana.—1—A spark advance of from 30 to 35 degrees is generally provided for, but how many degrees from the dead center of the retard should be provided for? 2—How are coils boiled out? Are they baked out in an oven or boiled out in oil or paraffin of some kind? 3—In repairing coils we find some filled with common sealing wax, some with paraffin and some with a black, sticky compound similar to ozite. Which is the best? 4—Has anyone experimented in using a water-cooled engine as an air-cooled one, by making water jackets to the air inlet of the carburetor?

Reply—1—For running, not any. For starting, no more than absolutely necessary to start the car safely. 2—Never heard of such an operation as "boiling out coils." The K-W Ignition Co. heat them in a vacuum chamber, exhausting the moisture as it is driven off by the heat, and when thoroughly dried out the impregnation compound is admitted to the chamber. 3—That which contains the least moisture and the highest dielectric properties is the best. 4—Probably. Our advice is that you do not make the experiment unless you use some one else's motor, as it would soon ruin it.

1722 **Hard to Start.**

From J. H. Mills, Jr., Texas.—Seeing that you help so many others in their troubles, perhaps you can help me. I have a Ford that has been run 6,000 miles. It runs perfectly but was hard to start at first and has been getting worse in this respect until now it has to be cranked 25 to 30 times to get the first explosion. Then it will run one or two revolutions and stop. When cranked again it will start immediately and run 3 or 4 revolutions and stop. Each time it is cranked it will run a little longer than the last time until it will finally run all right. After it finally gets started it runs perfectly, does not miss and has plenty of power. The compression is extra good. The spark coils are new K-W coils put on about a month ago. I have no master vibrator. The vibrators buzz every time the timer makes contact, so it is not caused by the points sticking. The carburetor is a Holley and has been recently cleaned. The gasoline stands about half full in the well in the carburetor, which is as the makers say it should. The spark plugs are in perfect condition. The commutator is clean and perfectly oiled and the commutator wires are new. The spark plug gaps are 1/3[illegible] inch, which is, according to the K-W instructions, with the coils. I have always used good oil and it has never been down to the lower gauge or above the upper one since the car has been from the makers. I get 25 to 30 miles per gallon but I open up the needle valve about ¼ turn to start. If the car did not run so perfectly after it is finally started I would think there was something seriously wrong with it. but I have been unable to find the cause of the hard starting, and if you can give me any suggestions I will greatly appreciate it.

Reply.—Looks very much as if your gas was too rich when starting, as a result of a leaking gasoline inlet needle valve in the carburetor, although lowering the level of gasoline in the carburetor should make starting easy. The fact that you neglect to give the date of model leads us to think it may not be of recent make, consequently an early model of Holley carburetor. If this is the case try a later model, one that will handle the hard-to-vaporize gasoline of to-day more effectually. In Texas one should expect a car to start more easily than in higher latitude. You should have your carburetor so adjusted that the needle valve will be open the same amount when starting as for ordinary running. The float level adjustment should care for starting and needle valve opening should regulate the amount of fuel for usual operation. If you try and adjust the carburetor fuel supply for various throttle positions you are not getting all that you should out of it.

1723 **Radiator Types.**

From John J. Martell, Michigan.—1—Is a vertical tube radiator more efficient than a honeycomb? I mean, will it cool the engine better than a honeycomb? 2—Which will get the least damage from freezing? 3—In which of these radiators are leaks easier repaired? 4—Will a honeycomb clog easier than a vertical tube radiator? 5—Which radiator would you advise me to purchase, a honeycomb or a vertical tube? 6—Where could I get a radiator tha[illegible] the outer shell would be seamless? I mean the sides and top. 7—Give me the address of some radiator manufacturers that make radiators for Ford cars. My car is a 1915 model Ford.

Reply.—1—The honeycomb type of radiator is usually considered more efficient and it is more expensive to construct. It is, as a rule, used on the higher priced cars. 2 and 3—We are inclined to think likewise that the honeycomb radiator would be rather more difficult to repair in case of a leak although there are several different styles of construction of both the honeycomb and the tubular types. 4—No. 5 and 6—You must govern yourself in the purchase of a radiator by the replies to your previous questions. 7—The Candler Radiator Co., 1086 East Jefferson Ave., Detroit, Mich., and the Auto Sheet Metal Works, 1532 Michigan Ave., Chicago.

1724 **Horsepower Queries.**

From F. Dave Moran, Colorado.—1—I would like to know how to test a stationary gas engine in order to determine the horsepower at a given number of R.P.M. I have a 4 horsepower gas engine, of 450 R. P. M., and am sure it is not developing the horsepower and would like to know how to test the same, as it is a new engine in first-class shape, as valves, compression and ignition are concerned. 2—The difference between or the percentage an 8 horsepower gas engine will develop against 8 horses, or please compare an 8 horsepower gas engine with the power of 8 horses. 3—Please explain to me why a steam engine of 10 horsepower will develop more horsepower than a 10 horsepower gas engine, at the same number of R. P. M., on the same test, and how much more horsepower will it develop and steam more than gas. 4—Also please tell me how to test the horsepower of a gas tractor on the draw bar or the belt or pulley.

Reply.—1—Rating the horsepower of gas engines is frequently a matter of conscience on the part of the manufacturer. If properly designed and constructed a four-stroke-cycle stationary gas engine should develop a mean effective pressure of 67 pounds per square inch against each piston. This 67 pounds multiplied by the length of the stroke ex-

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pressed in feet, this by the area of a cross section of the piston or bore of the cylinder expressed in square inches, multiplied by the number of explosions per minute and this total divided by 33,000 will give the developed horsepower that one should expect. Thus a single-cylinder four-stroke-cycle engine 5 inches bore and 6 inches stroke, at 450 revolutions per minute, should develop $67 \times 6/12 \times (5 \times 5 \times .7854) \times 225 \div 33{,}000 = 4.48$ horsepower. Just what your engine develops can only be told by means of a Prony brake, dynamometer or some similar device. 2—An 8 horsepower engine that will really develop 8 horsepower has sufficient power to raise 33,000 pounds 8 feet in one minute. This standard horsepower was established as about the average amount of work that an average horse would perform per minute during ten hours. 3—The ratings of steam and gas engines are purely nominal. A gas engine is more likely to be overrated than a steam engine and a steam engine can usually be operated at a higher steam pressure and longer cut off, using much more steam as a result, and thus develop more than the rated horsepower. 4—We do not know nor do we know of any one who knows.

1725 **Lubricating Oils.**

From Lincoln Riley, Nebraska.—1—In the October issue in answer to No. 1689 you say "Ford cars should not use light oil. Use medium or heavy." Is this statement correct and when was the discovery made? The Ford people are strong in recommending only light oil for use at all times. 2—Also I would like to know if Polarine is made in more than one grade? A dealer told me that it comes in light, medium and heavy, but I have only seen the one kind which seems to be about medium.

Reply.—1—Reference was made to Ford cars that have been in use for some time, the bearings being worn, when it was stated in our October issue that light oil should not be used. 2—There are at least two grades of Polarine oil, medium and heavy, and quite likely there is a light grade also.

1726 **Recharging Batteries.**

From R. B. Ireland, Louisiana.—I come to you for a little information in regard to charging storage batteries from a direct current. Now we have here a direct current of 220 volts. How many lights of 16 candlepower (carbon) lights would I have to use to reduce it low enough for charging batteries? As we have a number of carbon lights here which are available they are no longer used for lighting. Any other information which you can give me in regard to charging storage batteries from direct current will be appreciated.

Reply.—Were we to devote a column or two to reply to your inquiry, we would not be able to give you nearly so complete information for the care and recharging of your storage battery as you could get from the printed instructions which any storage battery manufacturer will be glad to mail you on request. Charging storage batteries from a 220-volt current is possible, but unless one knows a good deal about electricity it might be a rather dangerous operation and expensive to replace possibly ruined batteries. Were we to tell you just how to proceed and you were not to follow instructions absolutely and get into trouble as a result, we would probably be blamed. In this case we advise you to secure the services of some capable electrician to install the necessary bank of lamps and instruct you in the operation of recharging, etc.

1727 **Tire Chains.**

From Emil Miller, South Dakota.—I will be greatly obliged if you will answer the following questions through the columns of your valuable paper: 1—When driving a car in the mud and using zigzag chains on the front wheels, is it best to use a chain on each wheel or just on one front wheel? 2—When using chains on both front wheels, does it have a tendency to draw the front wheels together. or crowd if the wheels are otherwise in line. 3—Which do you consider the best chain for mud, a zigzag or a straight cross chain?

Reply.—1—Both wheels. 2—No. 3—Straight cross chains for mud. For ice, probably zigzag chain.

1728 **A Motor Knock.**

From S. H. Showalter, West Virginia.—I would like information regarding a pounding knock in the motor of my model T, 1913 Ford car. It sounds like a crankshaft main bearing knock, but it is not, as I have examined all the bearings thoroughly two or three times and they all fit tight enough.

Reply.—The knocking you refer to usually indicates loose bearings somewhere, especially if these knockings are heard when traveling over rough roads, and regardless of speed or spark lever position. However, engine knocks are likewise due to carbon deposit and something wrong in the mixture, and sometimes to a leaking of water-logged carburetor float.

Experience with a Buick Car.

From Walt Von Seggern, Wisconsin.—I have a model 10, 1910 Buick car. Have owned it three years and have driven about 5,000 miles each season over hard roads. It has two speeds and I have often driven three and four miles on low speed without changing. I use Stearn cylinder oil in the transmission and rear axle, and I think it the best. I tried to use air-cooled gas engine oil in the crankcase, because it was heavy, but I had to clean the exhaust valves every 200 miles so I stopped using that. I am using the heaviest oil I can get now from dealers, and I haven't cleaned or ground the valves for about 1,000 miles. I don't add oil to that in the crankcase any more. I fill it, which means one gallon, and run about 200 miles, then drain out what is left and fill with new oil. It pays on this car to do so. The bearings wear too fast otherwise. I do everything myself except if there is any lathe work or blacksmithing. When I can't vulcanize my tires with my little Marvel I discard them.

I am a steam hoisting engineer and I guess that helped me when I started driving and caring for my own car. I am using the Remy type S magneto, and a one-inch, model L Schebler carburetor. The old model D would only run in hot weather. The car runs good and is quiet. Maybe I can get along for four or five years yet, but I expect the cylinders will need regrinding and new pistons. I fitted new rings on the old ones some time ago. The bearings and axles on the rear end have been removed twice since the car was new. If the bearings are loose on the lower end and the differential gear, you can expect broken or stripped gears. I haven't had any bother with the transmission and hope I never will. It works just right.

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Need of Air Filters.

From Charles E. Duryea, Pennsylvania.—On pages 62 and 67 of your September issue I find some very interesting mentions of the dust and grit we expose our auto engines to and then wonder why we get no better results. "Carbon" is a common complaint and many things are taken to cure the trouble. Yet as Mr. Stratford truly pointed out, "large percentages of road dust" are to be found in what is called "carbon." What you say about the accumulation of dirt and dust in the dust pan is correct, but if it gets into the dust pan it certainly gets into the carburetor inlet and so into the cylinders. Is it any wonder that piston and rings wear out rapidly? This constant supply of grit is reason enough for overheating because it makes the walls of the cylinder rough when we all try to get them smooth. It reduces power first by friction and later by leaks. There is absolutely no excuse for it. What is the answer? Easy. Some sort of air filter. Years ago a few makers fitted cloth screens to the carburetor inlet but the average driver took them off at the first cleaning day and they never went back. Now that we know more and need better things let us hope the air filter will stay before the public and be regarded as necessary as a starter or a magneto.

Engines for Motor Boats.

From A. J. Applegate, Kansas.—In recent issues of your publication I find you have advised two different subscribers that it is impracticable, if not impossible, to have an automobile engine work satisfactorily in a motor boat. I wish to state that for the last 4 years I have had installed in a 16-foot Racine motor boat a 20 horsepower automobile engine giving perfect satisfaction. It holds seven people easily, has a three-blade, 14-inch propeller with a 26 degree pitch, as I remember. I can get 15 miles per hour out of this, which is sufficient to easily beat any boat on the river, so I have never tried to run it any faster. It has a regular automobile outfit equipment, including gear pump, exhaust covered with asbestos rope, and muffler under the seat in the rear, discharging the exhaust above water, and the pump takes water in from one side of the bottom of the boat, makes a circuit of the engine, and also exhausts under the bottom of the boat, making the engine absolutely cool at all times. I have arranged to this an improvement on the Atwater-Kent distributing system for ignition. The flywheel is just back of the front seat underneath, and is the only awkward proposition about it, that I must raise the front seat (which is hinged) apply the handle, start the engine and then lower the seat for the passengers. I steer this with a cord running around inside of the boat so it can be steered from any part of the boat, making it a one-man proposition. I worked out this plan without any pattern or other assistance.

The sub-frame is firmly bolted to the interior of the boat and the engine is held in place with four long bolts passing through the sub-frame and headed through steel plates on the bottom of the boat, which being drawn tight holds the engine perfectly rigid. This boat is perfectly dependable, starts at any time easier than most automobiles, can maintain almost any rate of speed within its limit, can be throttled down so it barely moves through the water, or starts ahead, taking up its speed almost immediately if the occasion requires.

I could arrange a starter on this engine, which with the other accessories that I have would, as far as I can ascertain, from reading the Motor Boat and other publications, give me as good a boat as anyone would wish, and I would be glad to answer any questions about this to the end of contradicting the statements that have been frequently made that an automobile engine cannot be successfully installed in a motor boat, because I have known other instances where such installations have been perfectly satisfactory.

I had the usual two-horsepower, two-part, two-cycle engine in this boat when I purchased it and so have all the other boats around here, and I have cranked a solid hour in a vain endeavor to get the engine started or I would go down to the boat and it would start off with a touch. I have had this engine stop absolutely still, five miles from the boat house and no possible persuasion would make it go, and this experience is that of all the other boats on the river, and I made up my mind that I did not want any engine like that in my boat, so I took it out and installed in its place the engine described above, which starts and stops exactly as I want it, and I have read accounts of high power boats whose engines refused to start even in racing, when thousands of dollars were at stake, so I say an automobile engine perfectly installed is superior to anything I have discovered in marine engines.

Reply.—In case anyone wishes to consult Mr. Applegate, his address is Wichita, Kansas. Although this publication is devoted to motor cars and not motor boats, we still believe it is not advisable to use automobile motors in motor boats. The requirements of running an automobile and of running a motor boat are decidedly different, and with this idea in view, the construction of the engines widely varies as regards strength and speed for rated horsepower and in other respects. That an automobile motor can be applied to a motor boat is demonstrated by Mr. Applegate's experience, but this by no means proves that it is advisable to do so. We are afraid, likewise, that those who have had extended experience with motor boats would be somewhat sceptical that a 16-foot Racine boat could make 15 miles per hour. However, we gladly publish Mr. Applegate's letter, and if any reader desires to equip their motor boat with an automobile rather than a marine motor, he will do well to consult him.

Ignition Trouble of Mr. Brown.

From Carl F. Gentner, Oregon.—I would like to offer a few suggestions in regard to the ignition and the troubles of the Ford cars. I have owned and repaired them ever since they were put on the market and I find invariably that very nearly all the trouble is in the oil which is used in them. In regard to the ignition trouble of John A. Brown, of Rhode Island, with his high tension Bosch magneto, I believe if it is set right he should have no trouble with a light oil. The trouble with the Ford car starting all lies in its multiple disk clutch which drags when being turned over, as does the flywheel which rotates in oil, and troubles especially if too heavy oil is used. I notice he says after the car is started, there is no trouble with it the rest of the day. I find a very quick flop is all that is required and they seldom if ever kick back if given the quick turn. I leave my car out all night, and with a good priming it

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starts off all O. K. I would not be troubled with all the coil and timer troubles on a Ford car again for one. Just try a high grade light oil, and see if your troubles are not eliminated. Valvoline is what I use. I enjoy reading your magazine and would like to hear from more Ford car owners.

Carburetor and Cold Weather.

From Chas. A. Rawstrom, New Jersey.—If it would interest you, I learned something last week about my car which I have run for three years and never found out before. I have generally had a little trouble running in cold weather, but last week I could not get it to hit on all cylinders no matter how I tried. The spark was fine, there was plenty of gas and all adjustments as usual, still a lot of skipping and jerking. A friend said, "Have you shut off your air since the cold weather came on?" No, I had never thought of it. Well, after I had more than half, almost ¾ closed the air inlet to the carburetor, it ran like a top.

He Has No Trouble.

From J. H. Clare, Kentucky.—I have a two-passenger runabout Schacht car, made in Cincinnati, Ohio, that I have run for six years and have not had any trouble with it. I have taken care of it myself. I use Polarine cylinder oil all the time. It is the best oil that I can get. It doesn't carbon like some others. I use coal oil in the differential, once in a while. It makes my car run mighty nice. I keep all nuts tight and all connections tight and right and I have no trouble.

Remedy for Leaking Grease.

From B., New Jersey.—The inquiry of A. J. Morel, No. 1688, brings to mind a remedy for grease leaking out of the axle which I think was published in your journal some time ago and which I think he will find the only remedy for the trouble. It is to bore a ¼-inch hole through the axle casing six to ten inches from the wheel; this he will find effectual. If there is grease enough in the differential to keep it properly lubricated it will eventually follow the shaft to the wheel.

Cure for Cramps.

From F. Lee Rogers, New York.—Referring to No. 1695, of your October number, would say that I think Mr. Harvey E. Harris, of Connecticut, will be able to get great relief from the cramps of which he writes, if he will put extra covers over his feet and limbs on retiring. If he will keep his feet and limbs quite warm during the night, I believe he will not have much trouble with cramps.

The Road for Garage Use.

From J. W. M., Fergus Falls, Minnesota.—The way in which automobile accidents may happen are as numerous as the stars. No matter how careful a driver may be, if a d—d fool is at large, no one is safe.

The other evening about 4 o'clock my wife and I started out for a little drive up to a town called Elizabeth, along one of the most traveled roads leading out of the city. As we were driving along just outside of town, we passed several fires by the roadside where the railroad men, or others, were burning up rubbish by the roadside. There was very little wind and what there was came from the south and the smoke drifted over the road, and naturally, I drove through it. A little way ahead we saw a larger smoke which, apparently, came from the grass on the south of the road, and about twenty rods on the further side, I saw an automobile coming toward us. As I was near the smoke I slowed down and turned slightly to the right as a precaution against the approaching machine, which I thought might meet us in the smoke, not knowing just how wide it extended. As I entered the smoke, which was much denser than I supposed, I jammed into the rear of an automobile in which were four ladies. The owner, I learned after the collision, was out at the side of his engine pouring kerosene through the carburetor to clean it out. My right front wheel struck his left rear wheel and both machines were damaged. Fortunately, no serious injury was sustained by the occupants.

I asked him his reason for stopping in a main traveled road to flush his engine with kerosene, and he said he did not like to do it at the garage as it made so much smoke.

Now, I think that there should be a general, mental test applied to every man who wants to drive an automobile, and all such fools as that should be denied a license. The damage to my machine does not trouble me, as I was so thankful that no person was seriously hurt. The only regret I have is that I did not smash his auto to such an extent that it would be, forever, out of commission; but as I could not have done this without injury to his passengers. I am glad that it was no worse.

I do not know whether this will interest your readers, but feel sure that it was a new kind of an accident. There should be stringent laws to prevent accidents, but what law could make one immune from the acts of such an idiot?

(Note by the Editor.—We have again and again encountered automobiles standing and occupying half or more of the road. Sometimes the driver may be working upon them, and at others the occupants are either enjoying a lunch or a ramble in the fields. Of course, they are totally oblivious of the fact that they have no right whatever to occupy any part of the road for such purpose. The highways cannot lawfully be turned into repair shops or for garage purposes. If a car is to be stopped, it should be left by the roadside and not allowed to take up any part of the road. Many seem to feel that if they occupy but half of the road they are within their rights, but this is not the case. They have no right to use any part of the road for such purposes.)

Weight of Cars.

From R. R. Shepard, California.—Anent your editorial, "Second-Hand Car Prices," it is not singular that high priced cars are offered at a greater per cent. of reduction in price when second-hand than low-priced ones. The reverse should not be the case, because the second-hand-car goes to the man economically minded. The high-priced car is always the heavier. The heavier the car the greater the operating expense: Corollary, Mr. Second Hand Buyer takes that car which may be operated for the lesser expense—and he is wise.

I have offered 75 cents a pound for a one-ton car which shall be worth the money, and can find no manufacturer to satisfy the demand. My first car

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weighed 1,875 pounds ready for the road. The subsequent cars I have had from the same manufacturer weighed 2,500 pounds ready for the road. The maker now offers me none but a 3,000 pound car ready for the road. The maker and I have parted company, and I have degenerated from a four-cylinder user to a six-cylinder driver in order to get a car of 2,200 pound weight ready for the road. The greatest manufacturer of automobiles in the world to-day has succeeded by reason of the fact that he is furnishing a car of ability without unnecessary weight.

For Noisy Gears.

From Reader, Nevada.—I had a trouble similar to Mr. Revelette of Kansas. It was the same hum of the gears and like his it only came at certain speeds. For a long time I could find no one who could locate it or give me any idea of its cause. I believe with you that the "Buick people" were right, for a competent garage man solved my troubles. He told me that it was in my differential and that he could stop it. Knowing he was a capable man I turned my car over to him and sure enough he fixed it and while doing so he explained to me the fault.

In order to get efficient and silent service the

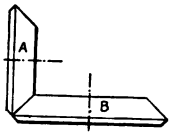


Fig. 1.

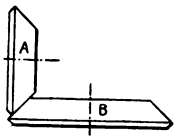


Fig. 2.

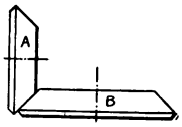


Fig. 3.

gears in the differential must be perfectly adjusted. Some people in assembling the rear of the car do not appreciate the necessity of this question. In taking up the lost motion between the gear of the drive shaft, A, and the differential, B, they either adjust the gear on the drive shaft back until the lost motion is taken up, as in Fig. 2, or they adjust the differential to the drive gear, as in Fig. 3.

Now the only way to obtain silent service is in the right adjustment, as in Fig. 1. Any competent mechanic knows the necessity of this. Not only for silence but for the efficient service of the gears. I think if Mr. Revelette will look at this point he will find his trouble.

For Mr. Gardner of Long Island, I, being a wagon-maker by trade, his trouble sounds to me like a "rim-bound wheel." Tell him to have his wheel examined by a competent wheelwright.

Brake Leaking Grease.

From C. Edner, Colorado.—I have had lots of trouble with my brake leaking grease, but I have now fixed it so it never leaks a drop. The ring that went next to the Timpkin bearings was sprung. I had it in the shop and straightened it and in place of leather washers I cut two washers from an old felt hat and cut a copper washer and put the felt between the two and it doesn't leak a drop. My car is an E. M. F., 1912 model.

"Uses Too Much Oil."

From R. O. Dulaney, Oklahoma.—In your October issue, under No. 1697, "Uses Too Much Oil," if you will advise Mr. Coy P. Smith to put a leather washer in his oil filler cap and after putting in oil, screw the cap down so it will be air tight, his trouble will stop. I had the same trouble with my Maxwell 35 until I read the instruction book that goes with the car and found the trouble to be as I have above stated.

For Leaking Grease.

From H. R. F., California.—Having noticed several subscribers complaining of grease leaking from rear axle housing of their Ford cars, would say I have had some trouble with two Fords and tried everything but met with no success until I applied Perfection grease retainers. Several of my friends are using these and are greatly pleased with them.

OLLA PODRIDA.

Being a Mixture of Practical and Theoretical Automobile Topics.

BY JAMES F. HOBART, M. E.

It happens that I live upon an unpaved, oiled street, which has a single car track in the middle, and which street is used a good deal by motor trucks, particularly large trucks. Naturally I have a good chance to observe motor trucks in action, under all sorts of conditions, and it is safe to state right here and now, that there soon will have to be a big change for the better in operating motor trucks, or there won't be any trucks! Of all the rattling abominations seen upon the streets, these trucks take the "blue ribbon."

Some trucks run over this street which I do not think have had any slack taken out of their connections since they were put out of the factory. Judging by the noise, these trucks must be loaded with "lost motion" principally. If there is a single part of one of them which does not rattle as it goes past, then it is because the other parts make so much noise that the rattle cannot be heard!

A few evenings since, there was a heavy shower coming up; it was nearly dark; the wind was almost cyclonic, when down the street came a noise which completely drowned all sounds of the approaching storm. Three heavy, 3 ton trucks, driven at the highest speed they were capable of making came along, one close behind the other, all making for their home garages, and trying to beat the coming storm. Noise? The two Irishmen were not "in it" when they were awakened during the first night in America by the passing of two fire engines, which were responding to an alarm. Pat rushed to the window, thrust his head out into the noise, saw the thundering smoking vehicles and called to his friend: "Mike! Mike! Come here quick! They're movin' hell and there goes two loads!" Trucks or any other machinery left without adjustment will soon wear out and call for costly renewals, and the problem right now is: "What are we going to do about it?" Owners do not often see their trucks in action. They send them to the service shop as often as seems necessary. Truck drivers (some of them at least) seem oblivious to the need of better care of machine connections. I have heard of garage repairmen who deliberately send out cars with certain nuts left loose so as to make it certain that the machine came quickly back again for more adjustments and repairs.

As things are now, it is of no use to tell truck owners that their property is threshing itself to pieces for lack of proper care and attention. They won't believe any such line of talk. It is breath wasted to talk to the truck drivers. They seem to

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be more interested in packing a load upon their machine than in keeping it in perfect running condition, and the louder the rattle, the better some of the truck drivers seem to like it! Tell one of them about "taking up lost motion" and he will grin and say nothing. Sometimes it seems as though half the truck drivers were standing in with the repairmen and "shaking down" truck owners to a division of spoils.

The problem resolves itself into one of educating the public until rattling vehicles will not be tolerated in the streets. And it also seems to me that the Automobile Dealer and Repairer will do a great deal of the necessary educational work among truck owners, drivers and users, and the people who must listen to the unnecessary racket some of these trucks constantly make.

Let us then go after noisy trucks at every opportunity. Tell those who should know how the noise should be abated and avoided. educate all concerned to a slight idea of the better service to be obtained from trucks which are so well adjusted and cared for that they are practically noiseless in operation. By so doing, we will be doing good to ourselves and our nerves and aiding a grand industry, which as yet is in its swaddling clothes, at the very beginning of its infancy. Motor trucks of to-day will, ten years later, be viewed with as broad a smile as we give to the little "lunger" which chugs, chugs contentedly past occasionally; odd looking and noisy, but still serviceable and doing its "get-there" stunt seven days in the week. The motor truck of 1930 will be a far different machine from the rattling abomination which we are tolerating to-day, while awaiting progress to something better. But. while waiting, let us keep at everybody concerned, in season and out of season, to make the most of the crude motor trucks we are using to-day, for with proper care and constant attention, they may be separated from two-thirds of their noise-making capacity by simply keeping connections well set up, all nuts well tightened, and parts prevented from becoming loose and rattling against each other. That's just what makes most of the noise. And remember, the trucks of 1930 will have four power wheels instead of two.

Sand Puffing Tires.

Recently, as a large touring car was passing along a sandy road, I noticed a very peculiar action in one of the power wheels. It was a sort of puffing action, and (the car was running very slowly) as every two or three spokes passed, a jet of what seemed to be sand, would spurt upward from between the tire and rim. The action did not take place at the bottom of the wheel, but just above the point where the tire touched the ground and was flattened a bit as the weight of its share of the car came upon the tire.

The action did not seem to be a mere shaking out of sand from between the rim and the tire, for there was none of the action at the upper portion of the wheel, only just a few inches ahead of the bottom part of the wheel, as stated above. Apparently the sand jets spurted up from four or seven inches and I could see both sand and dust as the car rolled past.

What could cause such action, and what effect would it have upon the rim and the tire? Sand cannot be sucked into a wheel and spurted out again, time after time, without some affect upon the wheel, and it is idle to say that such affect could be beneficial.

"Cranky" Automobiles.

Now and then I have noticed a car which seems to steer very badly and to sometimes deviate from its proper course without any apparent movement of the steering wheel. Two such cars chanced to pass in a crowded thoroughfare and a collision was averted by less than an inch between the passing cars. The drivers of the two cars "looked daggers" at each other, but passed without a word. The incident reminded me very forcibly of the cross-eyed man who ran against a pedestrian upon a broad sidewalk. "Why don't you look where you're goin'?" shouted the cross-eyed man. "Why don't you go where you're looking?" retorted the other man. And it is much the same with the two cars which nearly grazed each other. They both ran crooked paths. Like the wagon wheel, which was badly sprung, "it would run out of the track, kill a snake and come back again," as its action was aptly described by a farmer. But these automobiles would vary their courses sometimes, apparently without cause and seemingly quite beyond the control of the drivers.

A few days since I saw one of these "wobbly" cars turn into a garage and being acquainted with the garage owner, I soon found opportunity to look the car over a bit. By standing beside one of the forward wheels, and pressing or pulling against the top thereof, in the direction of the opposite wheel, there apparently was nothing the matter with either of the wheels. They both seemed firmly attached to the axle and to the steering mechanism.

Not being satisfied we jacked up the forward portion of the car, placing two jacks, one just inside each steering knuckle to which each forward wheel was attached, and then, when I tried a wheel, I found something. I could move the top or bottom of that wheel back and forth nearly three inches, and either wheel was equally loose. The cause was found to be in the wear of the connections between the axle and the short steering knuckle.

Very little attention is given to the matter of knuckles by the average garage man, as this part seldom gets "out of kilter." But the knuckles should as surely be looked after as should the engine or the gear case. Many a car driver has come to grief by taking something for granted. Just know that a thing is so or is not so, then you are as safe as it is possible to be.

Don't take anything for granted when you are "tuning" up" your car. In the days of the old "lungers" when 100 miles was a great non-stop endurance run, the writer rode as observer in a car which made the distance with no engine trouble whatever and with a small gasoline consumption. But the car made too many penalized stops. The driving chain jumped off the sprockets twice during the run and that killed the chances of the car for the prize. The point of the matter is this: The driver of the car knew the chain was a little slack and he took chances that the chain would stay on, rather than tighten the chain as he should have done.

Don't take chances with the steering knuckles or anything else pertaining to safe and sane automobile driving. Be sure of things and you won't have trouble. Worn knuckle connections may cause a serious accident when you are not dreaming of trouble. And you have got to look pretty closely at a car, sometimes, in order to find knuckle troubles

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when they do exist. The writer tried the forward wheels of the machine for a side-swing, but could find none, push as hard as he might, until after the front axle had been jacked up, leaving the front wheels hanging clear and free. Then knuckle trouble showed itself a-plenty.

The reason that the trouble did not reveal itself when pressure was put against one of the forward wheels was that the wheels at that instant happened to be standing so as to brace each other. They were both pulling in at the top and out at the bottom, or the opposite way—out at top and in at the bottom. As long as both wheels stood bracing each other the car could not be swayed sidewise, but had the wheels happened to have been in any other position—one leaning in, the other out, the knuckle looseness would have revealed itself and probably would have been attended to at once.

It is a mighty good thing to jack up both front and rear axles once in a while. It gives you a chance to see what is going on in the knuckles, also in the wheels, and when the rear axle is jacked up, you can get someone to hold one wheel, or you can leave one on the floor, and find out a whole lot regarding the condition of things in the differential by turning one wheel back and forth as far as it will go. Then when both power wheels are clear of the ground, by revolving one wheel and noting the smoothness of that wheel in one direction and the working of the other power wheel in the reverse direction, the "feel" of the gears will sometimes tell a whole lot as to their condition.

Next, let the man at the other wheel do the turning while you let your wheel slide through your hands with just enough pressure placed upon it to make the gears work a bit. The manner in which the wheel moves through your hands, smoothly or "lumpy" will tell whether the gears work well, or whether they are badly worn and "caterpillar" from one tooth to another.

Oil and the Gear Case.

At least once a month the gear case should be "bled" a little, either by opening the drip-cock placed for that purpose, or by removing a screw which will allow a teaspoonful of oil to escape from the gear case. Only a very small quantity of oil need be drawn off, for it is only drawn for the purpose of finding out whether the oil in the case is still fluid or whether it has become so thickened with ground-off metal particles that the oil will stand "straight up."

You never can tell the condition of oil inside the case unless you test it in a manner something as above. When making the test, and no oil comes out when the petcock is opened or the screw is removed, don't jump at the conclusion that the oil has gone bad just because none runs out the instant the case is opened. There may be plenty of good oil in the case and still none may show itself at the opening. The oil may be thickened with dirt or metal dust and no oil can escape until a hole has been dug through the thickened stuff with a wire or a bit of wood.

Test out the gear-boxes in this way and don't neglect to look after them until the oil has become mud and will not flow out when a hole is made in the case. Test out occasionally as above noted and if there is no test hole in the gear-box, then make one forthwith. If a screw already in the case cannot be made to do the trick, perhaps by the hole being drilled clear through into the space inside the box, then drill a hole especially for that purpose and tap the hole for either a petcock or a plain pipe plug. The latter is rather the more desirable, as petcocks clog so readily that one must have a wire run through it before it can be trusted to tell the condition of the oil. But put in a good ¼ inch pipe plug, and when you remove that there will be no doubt whatever regarding the condition of the oil in the gear case. Be sure to make the hole well down to the bottom of the gear case so it will surely come below the level of the oil.

Cold Weather Cars.

Some car owners run their automobiles all winter and seldom have trouble from freezing or in starting. The magneto certainly "has it all over" the dry cell for cold weather starting, for when a dry cell is frozen, or cold enough to freeze, there is little chance of getting current out of it, while the magneto will work at any old temperature, which is not hot enough to drive the magnetism out of the permanent magnets or to destroy the insulation of the armature winding.

If cars are to be used in below zero weather and must stand in that temperature when not running, then means must be taken to keep them thawed out. Storage cells and dry cells as well, will seldom freeze while at work, for the very act of providing electricity keeps them from freezing. If a dry cell be so very cold that you cannot get current out of it, then just get two or more warm cells, couple them in series, and connect them in series with the frozen cells.

The carburetor is another cold weather danger point, as far as starting is concerned. I have seen car drivers who kept an old flatiron, a brick, piece of soapstone, or some other convenient article, upon the stove and when the car was to be started on a cold morning, the hot object was placed beside the carburetor for a short time and the heat imparted to the carburetor and to the gasoline, caused the car to start readily and easily.

There is a way by means of which a carburetor and the dry batteries may be kept warm even in the coldest weather, and by means of a little engineering, the radiator circulation may be protected also. The material required will be a gasoline blow torch of sufficient capacity to operate continuously during the longest period the car is to be left exposed to freezing temperature. By increasing the capacity of the blow torch reservoir it may be made to run for a week without a stop if necessary. Air pressure may be pumped up in the blow torch reservoir by means of the regular tire pump.

A coil of small copper, brass or aluminum tubing will be required, and it should be so attached to the blow torch burner that the products of combustion shall pass through the tube. It will be necessary, therefore, that the diameter of the tube bear a certain relation to its length in order that it may not be so small that the hot products of combustion cannot be driven through the whole length of the tube without the torch "breaking" occasionally.

Carry the tube to and around the carburetor, pass it through the battery box and attach it to the water jacket in such manner that a circulation will be maintained therein and there will be no cold weather trouble for that car.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, NOVEMBER, 1915.

Missing Number.—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

CARELESS MAIL HANDLING.

Although he is held strictly accountable by the subscriber, a publisher is helpless and at the mercy of a power over which he has absolutely no control, when it comes to the correct delivery of his periodical to its destination through the mails. All he can do is to see that it is properly wrapped and addressed, and taken to the post office. There his authority and scrutiny ends.

Yet this ought to be enough, and it is enough in the case of first-class mail. Indeed, the loss of letters in transit is remarkably small and is a decided credit in this respect to the care and efficiency of the post-office department. It proves, however, that correct delivery by mail is possible, and that incorrect delivery is unnecessary.

This indifferent or careless handling of second-class mail can therefore be accounted for in no other way except that it is considered of little importance. But it goes without saying that it is just as important that a paper or magazine as a letter be delivered to the person to whom it is addressed. Nor is it necessary to state that in the majority of cases a magazine is of more value to those who have subscribed to it and paid for it than a letter. The value of the mail has absolutely nothing to do with its correct and safe delivery. All mail should be delivered correctly whether it is worth much or little. This the post-office department has agreed to do, and it can and should fulfill its agreement.

Yet complaints of subscribers failing to receive this magazine reach us by every mail, and the number of such complaints is increasing. The thing that makes it especially unfortunate, not to say exasperating, is that we are absolutely powerless to remedy the situation.

This explanation is made purely in the interest of such readers, and in the hope that if they can suggest a remedy that they will do so. In every instance where the Automobile Dealer and Repairer fails to reach a subscriber another copy will be gladly sent him upon request by a postal card, and in such cases we consider the favor ours and not theirs. We enter into an agreement to deliver the magazine to its subscribers and no trouble or expense will be spared to do it.

Yet it will easily be seen how powerless we are to do this when the fault is with the postal authorities.

SUBSCRIPTION SWINDLERS.

For a year or more there has been a gang of swindlers traveling around the country, chiefly in the West, but to some extent all over the country, soliciting subscriptions for this magazine and other journals and pocketing all the money they get without reporting to the publishers. These rascals are fluent talkers, and have some kind of a premuim for either getting the subscriber on the spot or a promise to have the publisher send him one. In making appointments of agents for soliciting subscriptions, the various publications have heretofore been too indifferent, so that the subscription fraud has been able, without much difficulty, to secure sample copies and in many cases, receipt books. Of course, the prospective subscriber is deceived by these evidences of the party's connection with the publishers and in many cases easily parts with his money.

Collecting money in this way and pocketing it constitutes, if not larceny, at least a breach of trust which would land the solicitor in jail, if he could be caught. Several of the publishers, including ourselves, are on the track of some of these rascals and there is hope of putting them where they belong. We do not wish to say that all solicitors of subscriptions are frauds, by any means; the most of them are men of integrity and are trying to earn an honest living.

It is a good plan to refuse to pay any money to a solicitor who either gives a premium of some sort to subscribers or who promise premiums to be sent by the publishers. Very few publishers are permitting solicitors to give premiums. This paper does not permit any solicitor to give a premium to a subscriber. If the Automobile Dealer and Repairer isn't worth a dollar a year it isn't worth anything.

THE QUESTION OF HORNS.

A correspondent of the New York Times thinks that all harsh, raucous-sounding signals shall be banished by law from automobiles. His contention is that they are often employed to practically order pedestrians out of the way when they have as much right to the streets or highways as the automobiles. Another indictment is the effect of these horns on the nerves of sensitive people. The Times in an editorial commenting on the communication referred to suggests that all signals, loud, mellow or soft, be prohibited by law and the car driver be compelled to proceed with such extreme caution as to reduce accidents to a minimum.

The Times errs in its contention that the sounding of a horn is always equivalent to a peremptory

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order to get out of the way. It is intended as a warning only, the same as the whistle of a locomotive is designed to warn people of the approach of a train and the whistle is far louder and more nerve-racking than the harshest of automobile signals.

With no means whatever of warning of their approach, automobile accidents would be far more numerous than they now are. How often has it been charged that a driver didn't sound his horn and by reason of his negligence somebody was hurt?

The everyday noises of street traffic in cities, are of such a character that a loud signal is necessary to overcome them. In the country a horn with a penetrating sound is indispensable at intersections of roads and at curves, to warn those approaching diagonally or from the opposite direction. Otherwise collisions would be inevitable.

These observations must not be understood as attempting to excuse reckless driving or injudicious horn sounding, of which there is far too much both in city and country.

WOMEN DRIVERS.

The assertion of a judge of one of the police courts of this city that women are unfit to drive automobiles raised something of a storm of protest, as might have been expected and as it deserved. Quite likely the judge did not exactly "speak before he thought" but he was just a bit hasty in speaking, even as was the psalmist who said in his haste that "all men are liars."

No better evidence is needed that women are fit to drive cars than that they are driving them successfully and in constantly increasing numbers. Indeed, a woman has just driven an automobile clear across the continent, and alone at that. But making the assertion as mildly and as inoffensively as possible, the truth impels us to admit that we never see an automobile coming with a woman driver than a feeling of apprehension arises as to whether we are to have the whole, a part or none of the road.

For it must be reluctantly admitted that the fair sex are often liable to act upon impulse rather than reason, and here is where their driving is often inferior to that of the average male. On the other hand, women are far less liable than men to attempt driving with a brain excited or addled by alcoholic liquors.

The proper driving of an automobile depends upon certain principles, some of which women are more likely and some less likely to have than men. They probably lack in the important qualities of nerve and judgment, but they are superior in quickness of perception.

Meantime, here in New York City many women are driving and as far as can be observed, with the average proficiency.

THE TWO-CYCLE MOTOR.

On another page, Mr. C. E. Duryea, the dean of automobile engineers, asserts that our reply to an inquiry in relation to two-cycle motors "was not fully considered," and that the reason this motor has not "come into its own is owing to prejudice."

But the two-cycle engine did come into its own several years ago and was found wanting. Where, for instance, is the two-cycle Elmore car? Where the two-cycle Knox car? What has become of any of the cars that once used two-cycle motors? Echo answers: "As extinct as the proverbial Dodo." And they were by no means abandoned from prejudice, but because they could not be made to give as good results as four-cycle motors.

After an automobile manufacturer at considerable expense, and based upon favorable conviction, has adopted a certain form of motor, he never discards it unless he is obliged to. If there is any prejudice or pre-judgment formed, it is all in its favor, and no change is likely to be made unless from necessity. Change is expensive.

Like the steam-driven automobile, the two-cycle motor for automobile propulsion has been weighed in the balance and found wanting. "The proof of the pudding is in the eating," and not in the theory. No one can rightly claim that either the steam car or the two-cycle motor has not had a fair show Quite likely most manufacturers who produced or used them now feel that they were given a better show than they deserved. But if this is not sufficient the following testimony should have additional weight:

"Probably the strongest points in favor of the two-cycle type are the lighter flywheel and the absence of valves and valve gear, making this type the most simple in construction and the lightest in weight for its developed power. Yet, for the larger power units, the four-cycle type will no doubt always maintain the standard for efficiency and durability of action."—Gas, Gasoline and Oil Engines, by Gardner D. Hiscox.

"When a two-cycle motor is running without moving the car it will almost always miss explosions. * * * The two-cycle motor has a very limited range of speed and will miss explosions when running very fast or very slow or with the throttle nearly closed. This missing will be impossible to avoid. No form of two-cycle engine is as economical of gasoline as a four-cycle engine."—Modern Motor Car, by H. P. Manly.

"It has been previously stated that the four-cycle motor is almost universally used, and to properly understand the reason for the preponderance of this type over the simpler two-cycle forms it is necessary to compare the actual results obtained from the two-stroke motor in ordinary practice with the advantages a purely theoretical consideration will give it. Trouble is also experienced with the cooling, lubrication, and carburetion groups, as most two-cycle motors have peculiarities which make proper oiling and gas supply difficult. They consume more fuel than the four-cycle engine of the same power and are not so economical as regards use of lubricating oil."—The Modern Gasoline Automobile, by Victor W. Page.

"It is not as efficient or as economical of fuel as the four-cycle engine."—Dyke's Automobile Encyclopedia.

The foregoing is merely a presentation of the evidence pro and con in relation to the two-cycle and the four-cycle type. The reader has heard the testimony. Let him form his own judgment.

CAR STEALING.

Although automobiles are being stolen right and left, little sympathy need be wasted upon the victims. In the days of the horse vehicle, the first thing the owner attended to on arriving at his destination was to hitch the horse.

When the owner of an automobile arrives at his destination, he often takes no precaution whatever

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to prevent the car from being driven away by some evil-disposed person. Yet the car can be made fast in less time than it requires to hitch the horse.

Automobile stealing has now reached a high state of efficiency. The organization consists of the original thief, the receiver of the goods, the disposer of them, and sundry subordinates, such as the makers of license tags, disguise painters, etc. Yet they can be quickly put out of business if car owners will simply take such measures for the protection of their property as are cheaply provided and easily applied.

REASONS FAVORING SLOW DRIVING.

According to a recent gasoline consumption speed test made by the Automobile Club of America in behalf of the Cadillac Motor Company, fast driving compared with slow burns up gasoline to a greater extent than is usually supposed. The actual figures were as follows:

Speed Miles Per Hour.	Miles Per Gallon.
14.5	20.6
24.5	18.3
33.9	16.3
43.5	13.6
52.9	10.8
62.8	8.8
69.51	7.41

Of course these figures are significant for comparison only. It really makes little difference whether the Cadillac car uses much or little fuel per mile; the main thing is that it uses much more when going at high speed than at low, and so much more that most drivers will be inclined to take the matter into account. The test reveals one more reason for slow driving when fast driving is unnecessary. It should be stated that although the use of lubricants did not show quite the same variation, yet even there the car that is driven rapidly uses much more oil than the one that is driven at a slow speed.

And if the two foregoing reasons for slower driving are not sufficient, two more of equal importance may be added: Fast driving compared with slow is still more expensive and destructive in the matter of tire wear, and the wear of tires is by no means a small item of expense in the running of an automobile. The other reason favoring slow driving, and the most important one of all, is that it adds much to the margin of safety.

Now if the four reasons given for moderate driving are not sufficient to affect car owners, nothing that could be said would have any effect upon them.

PRICES FOR PARTS.

Readers frequently complain at the high prices charged by manufacturers for automobile parts, and there seems to be a good reason for such complaints.

If any manufacturer of automobiles has a feeling of indifference towards those who have purchased his cars simply because the chance is remote that they will ever purchase another one, he is making a business mistake.

Car owners themselves have the power to sell more cars than either the manufacturers or their agents. It is true they may not exercise this power or influence to any great degree unless conditions and feelings are favorable. The car owner must have a feeling of obligation, not alone because he feels he received good value, for that is what he had reason to expect, but rather because of consideration received after having purchased his car, which of course is a favor rather than a right. Anything bestowed as a right is not specially conducive to gratitude, but that which is conferred from motives of good-will purely is bound to make a distinctly favorable impression.

It is a short-sighted policy for a car manufacturer to either charge exorbitant prices for parts or to in any way neglect the owners of his cars. More automobiles are sold by owners themselves recommending them to others than by any other means. And more sales are lost than by any other means by owners looking mysterious and wise but saying little when some one asks them how they like their car.

PRO AND CON OF WEIGHT.

In relation to the communication headed "Weight of Cars," elsewhere in this issue, it is true that with other things being equal, a light car is better than a heavy one, and possibly it may also be true that the weight of automobiles might be and should be reduced.

It should not be forgotten that manufacturers are constantly striving to reduce the weight of their cars, but that this is easier said than done. First, the factor of safety must be considered. On a smooth road and with an unvaried speed, quite likely a car might be constructed of less than half the ordinary weight, and yet it would bear the load without breaking down. But a test of this sort would be of absolutely no use whatever. When a car comes out of the factory, it must be able to stand a test, when loaded to its full capacity, of being driven over the worst of roads and upon the worst of grades. Not only must the margin of safety be sufficient to withstand this test, but it must be two or three times greater than such a test requires.

It is somewhat puzzling to the lay mind to know that in some cases heavy cars have been known to consume less fuel than lighter ones. Moreover, a reduction of weight of some parts of a car makes very little difference in the consumption of fuel, while if the weight of reciprocating parts, or the periphery of wheels—as for instance the tires or rims—be reduced, there is quite a pronounced reduction of the power needed to propel the car.

Of course the quality of the metals is important, and in this there is constant improvement being made. Not long ago malleable iron with a test of 25,000 pounds to the square inch was considered good iron, while to-day it will test from 30,000 to 33,000 pounds.

When our highways are all smooth and hard, automobiles may be built far lighter. It is the rough roads that cause undue strain, and none who has ridden in both light and heavy cars need be told how much easier the heavy cars ride on rough roads than light cars.

A GREAT SPEEDWAY.

The Sheepshead Bay Speedway in one of the suburbs of New York City is the most conspicuous monument thus far reared to the automobile and it is a decided credit to the enterprise and confidence of the men who projected it and brought it to its final completion.

It is by far the best and most expensive automobile race track in the world, and in itself is a sight worth going miles to see. No expense was spared in its construction, and its opening October 9, was an

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epoch-making event, witnessing as it did the overthrow of foreign speed supremacy. It was seen by 60,000 spectators who will all want to go again. The second race, Nov. 2, brought out 35,000 enthusiasts. Particulars of these two events have already been published in the daily papers. Sufficient now to say that they were not marred by a single accident of any sort.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Lights Were Not Lit.—Two men were badly cut and otherwise injured near Oakland, Wis., when they drove up behind a buggy, which they did not see until too late, as their headlights were not lighted. The buggy was entirely demolished and the horse so injured that it had to be killed.

Racing with a Train.—A man lost control of his car near Sugar City, Utah, while racing with a train. The machine turned over and the man struck on his head, breaking the bones at the base of the brain and cutting his face. There is a little hope of his recovery.

Dust Obscures Car.—Two people were killed and three injured in a head-on collision near Hillsdale, Mich. It appears that the driver has passed a horse and buggy which was followed by two automobiles, and the dust of the first car obstructed the view of the following machine, with a result that a collision occurred. One woman was killed instantly and a young man died shortly after the accident.

Excessive Speed.—A young man with five companions were joy riding in New York City and while going at a rate of thirty miles an hour the car left the road and crashed into a steel telegraph pole, killing the young man and injuring his companions.

While Cranking His Car.—A man dropped dead at Washington, D. C., while in the act of cranking his car. It is presumed that the overtaxing of his strength brought on the attack.

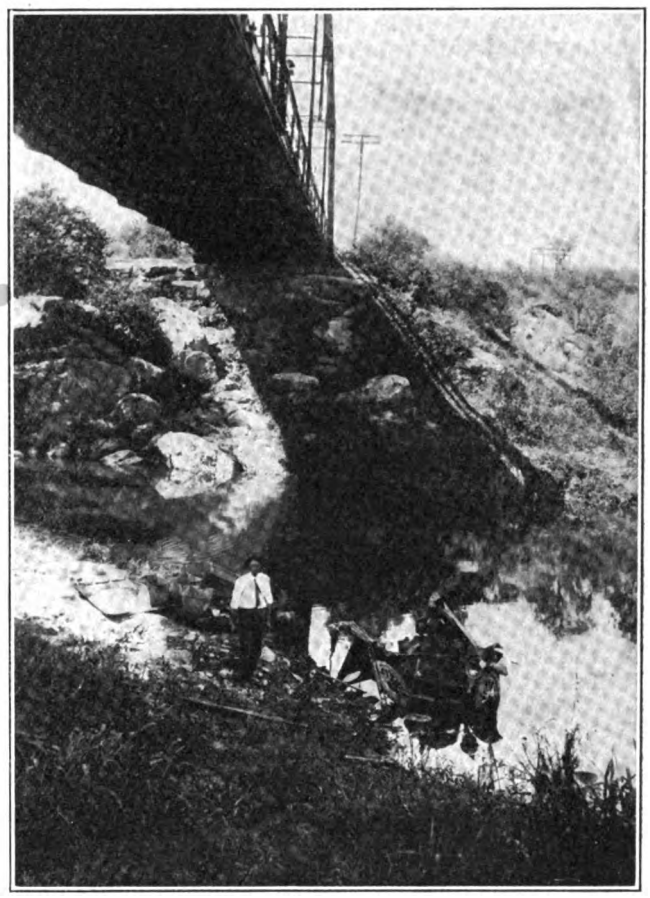
Accident at Bad Crossing.—Four children and a driver were killed and two injured near Lancaster, Pa., when a collision occurred between an automobile loaded with school children and a train. Owing to a deep cut where the highway crosses the track neither the engineer nor the driver were able to see each other until too late.

Steering Gear Wheel Swept from the Driver.—An accident occurred at Cincinnati, O., when an automobile collided with a loaded lumber wagon, and a piece of projecting timber swept away the steering gear wheel of the car and caused the machine to dash into the rear end of the lumber wagon. The driver was struck with glass from the shattered windshield, severing the jugular vein. His recovery is doubtful. Another occupant of the car suffered two broken ribs.

Assumed That the Train Would Stop.—A family of seven, mother, five children and an aunt, were instantly killed and the father seriously injured at Fraser, Mich., when the car in which they were riding was struck by an express train. They were approaching the tracks of the railroad yard and the driver, if he saw the on-coming train, had the impression that it would stop, although it was not scheduled to do so. He took the chance of crossing the tracks with the above result.

Lumber Blocks Way.—A child was knocked down and instantly killed at Chicago, Ill., when she stepped from behind lumber and a tool box which blocked the street, into the path of an automobile. It is stated that notice was served on the contractor in charge of the constructing of the building but so far the latter had failed to remove the things.

Plunged Into a River.—In San Angelo, Texas, a young man and a car plunged through the side railing of a bridge down into a river thirty feet below. Only presence of mind saved the driver. Realizing that his machine was jumping off the structure, he caught a piece of broken railing as the car shot off into space. The speed of the auto dragged him from his hold and he dropped into the water directly in front of the machine a second after it struck. Rocks



Pretty Well Demolished.

in the river inflicted wounds in his head, but he was out of the water standing on the bank, dripping wet, when the first persons who heard the crash arrived. In a statement the young man said: "The steering gear had been loose for several days. There was too much play for one thing and when you turned the wheel it would not wind up. This was what happened when I hit the bridge coming to town. I grabbed the bridge and did not fall with the car."

At a Sharp Turn.—At Conneaut, O., two men were killed and three injured. The party were testing a new machine which one of them had just purchased. They were going at high speed and did not observe a sharp turn, and the car struck the curb and turned over.

Railway Crossing Accident.—Two women and a little boy were instantly killed and another woman's feet were crushed so the amputation of one was nec-

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essary, in an accident at a railway crossing near Mosley, Mich. One of the women was driving and none of the occupants of the car seemed to note the approach of the train.

Did Not Heed Signal.—Two women and a man were killed at Gas City, Ind., by being struck by a locomotive and hurled many feet from the crossing. The chauffeur drove the car at high speed through the town and the watchman at the crossing signalled a warning but the driver of the car paid no heed. One woman's head was torn completely from her body, the other woman was crushed and the man's neck was broken. The chauffeur escaped with slight injuries.

Crossing Obscured.—A woman and her infant daughter were instantly killed at a railroad crossing near Arlington, Neb., and her husband and another woman severely injured, when they were struck by the engine of a freight train. As they approached the tracks the crossing was obscured by banks of earth, and the driver says that the warning bell was not ringing. It is stated that a number of serious accidents have occurred at this point.

Turned Corner Suddenly.—One little girl was instantly killed and another child knocked down and injured at Mt. Sterling, Ky., when a car suddenly appeared upon them around the corner without warning and before they could get out of the way they were struck.

Ran His Car Without Lights.—In running his car without lights, a man was killed and another man injured at Hartley, Ia. The car struck the iron railing of a bridge and pitched off the bridge twenty feet below into the bed of a creek.

Caused by Cramped Position of Driver.—Near Lawrenceburg, Ky., one man was instantly killed and three others injured when he lost control of the machine and was thrown through the windshield, striking the ground with such force that he was injured beyond recognition. As the car was a runabout and there were four occupants it is stated that the cramped position of the driver may have caused him to lose control of the car.

SOME LEGAL CASES.

Things Car Owners and Drivers Should Carefully Read and Remember.

Father's Liability for Son's Negligence.—The Texas Court of Civil Appeals holds that while an automobile is not a dangerous instrument, per se, when operated by a careful and competent driver, a powerful, heavy machine operated by an 85-pound boy, 11 years of age, along the streets of a populous town may become a menace to other persons in the street. A boy 11 years old, by permission of his father, purchased an automobile, which was kept in a garage. His father paid the bills and the boy had unlimited authority to call for the car at any time, day or night, and to use it, not only within the city limits, but in making excursions across the country to other towns; and his father and mother frequently accompanied him on such trips. The father arranged with the garage owner for the boy to have the car whenever he wanted it and paid all the bills and stated that whatever the boy did was right. While the boy was away at school for a few weeks, the car was cared for by the father and upon his return was delivered to him. While driving the car in a busy street in a city the boy ran down a woman who sued his father for her injuries. It was held that the boy in operating the car was the servant of the father, and therefore the latter was liable for the plaintiff's injuries.—Allen v. Bland, Texas Civil Appeals, 168 S. W. 35.

Automobile Collision.—In an action for injuries to the plaintiff's automobile in a collision with that of the defendant, which was being operated by the defendant's servant, it was held that the questions of the negligence or the wanton or willful negligence of the defendant's servant, and whether one having only one foot, as he did, could handle a car as efficiently as if he had two, and whether his operation of the car, and the defendant's putting him in charge was negligence, proximately producing the injury, were for the jury. A witness, merely because he was the secretary and sales agent of an automobile company, and had sold the defendant the car in question, was not thereby qualified as an expert on its mechanism or mechanical operation, so as to entitle him to give his opinions whether the car could be operated as safely by one crippled in one foot, as if he had the use of both. Blalack v. Blacksher, Alabama Court of Appeals, 66 So. 863.

Scope of Employment.—The owner of an automobile permitted his son to take the machine to give some friends a ride, on the condition that S. drive the car, as the son was not an expert driver. Owing to the negligence of S. the car was overturned, and one of the occupants, a guest of S., was seriously injured. She sued the owner of the car, on the theory that the relation of S. as to the defendant, on this occasion, was such as to render the defendant liable for the negligence of S. It was held that the owner was not liable, for, as to the plaintiff, S. was not the owner's servant.—Power v. Williamson, Alabama Supreme Court, 66 So. 585.

Theft Insurance.—An automobile was insured against loss or damage in excess of $25, occasioned by theft, robbery and pilferage. A boy took the car out of the garage where it was kept, for a joy ride, in the course of which he ran it into a fence, wrecked it and abandoned it. It was held that the owner of the car could not recover on the policy for damages caused by the wrongful taking of his machine by persons who intended to use it, but not to steal it, for an intention to steal is an essential to a conviction of robbery, theft or pilferage, and such words must be construed the same in an insurance policy as in ordinary cases.—Michigan Commercial Ins. Co. v. Mills, Indiana Appellate Court, 106 S. E. 725.

Owner's Liability.—A land company which was exploiting certain lands for sale at some distance from the city was in the habit of furnishing to prospective buyers an automobile and a driver to go to and from the property. It was held that the land company was legally responsible for injuries occurring through the negligence of the chauffeur of one of its automobiles while so engaged, if the chauffeur was found to be its servant.—Stovall v. Corey Highlands Land Co., Alabama Supreme Court, 66 So. 577.

Negligence in Moving Switch While Car is Being Cranked.—Action was brought by a chauffeur against his employer, the owner of an automobile, for injuries caused by a "back fire," which resulted in breaking his wrist. The plaintiff testified that just before he was injured the defendant directed him to crank the machine. He put the switch on

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the batteries and set the lever in a retarding position on the operating wheel and went to the front of the wheel and started to crank it up, when the defendant touched some of the levers on the front of the machine, the plaintiff being in the act of cranking, when the back fire occurred. There was evidence that when the switch was on the magneto there was more danger of a back fire than when it was on the batteries. It appeared that the only way in which a back fire could have occurred was by the switch having been placed on the magneto. It was held that if, without the knowledge of the plaintiff, the defendant changed the position of the levers, while the plaintiff was cranking the machine, and knew that the probable consequences would be to cause a back fire, his act might be regarded as negligent. If he was ignorant of the consequences, and changed the position of the levers without knowing what the effect would be, he would be equally culpable. To interfere with the mechanism of the machine under such circumstances could be found to be an act lacking in reasonable care and prudence. It was therefore held that the jury were warranted in finding that the defendant was negligent in moving the switch while the plaintiff was cranking the car, and that the plaintiff was free from contributory negligence.—Norris v. Allen, Massachusetts Supreme Court, 105 N. E., 364.

Master Not Liable When Servant Not Liable.—Action was brought against the owners of an automobile and their servant for damages for personal injuries resulting from a collision caused, it was alleged, by the negligent operation of the machine. A verdict was rendered releasing the servant, but holding the master. This was held, on appeal, to be equivalent to finding no cause of action, and could not support a judgment against the master; the master being liable only in case the servant was liable, and the award of damages against the master being controlled by the determination that the facts did not exist which justified an award.—Pangburn v. Buick Motor Co., 211 N. Y. 228, 105 N. E., 423.

Regulation of Garages.—A regulation adopted by the municipal explosives commission of New York City, pursuant to Laws 1911, c. 899, making it unlawful for anyone to store any motor vehicle containing volatile inflammable oil except in a building for which a garage permit shall have been issued, and providing that no garage permit shall be issued for any building within 50 feet of the nearest wall of a building occupied as a school or place of public amusement or assembly, or occupied as a tenement house or hotel, is held to be a valid exercise of the police power, and not to deprive one of his property without due process of law or the equal protection of the law so far as it relates to new establishments of the kinds forbidden. The main objection made to the regulation was that it is made applicable to a building that had been used as a garage and for the storage of gasoline, lubricating and other oils, prior to the time the enactment took effect; and it was stated that in the city of New York there were 75 garages, some of them valuable structures, which would come within the provisions of the ordinance if it were declared valid. The court considered th- this did not furnish a sufficient argument to condemn the enactment, and held that it was valid as applied to buildings so used at the time of the adoption thereof.—In re McIntosh, New York Court of Appeals, 105 N. E. 414.

Proof Must Show Negligence of Driver.—In an action for negligently running over the plaintiff's dog by the defendant's automobile, only one witness testified to the occurrence. It appeared that the accident occurred during the daytime. The witness saw the dog in the road, and that it was run over by the car, which did not slow up, but was going at a moderate rate of speed. He afterwards saw the dog lying in the road. So far as the case showed, both automobile and dog were lawfully in the road. There was no evidence of careless driving. It was held that the mere fact that the automobile ran over the dog was not sufficient to support an action for negligence, much less for a willful injury, and that the plaintiff's case was not proved.—O'Hara v. Gould, New Jersey Supreme Court, 87 Atl. 117.

Collision with Street Car.—In an action against a street railroad for injuries from a collision of its car with the plaintiff's automobile, the trial court directed a non-suit. On appeal this was held to be error, because the evidence did not show conclusively, as a matter of law, that contributory negligence on the part of the plaintiff was the proximate cause of the collision. It was in evidence that the defendant's car was being operated at a speed of upwards of 20 miles an hour, far in excess of the limit of speed permitted by ordinance at the place of collision. It appeared that if the car had been operated at lawful speed the plaintiff's auto could have turned off the track to a place of safety. So far as appeared, nothing was done to stop the car after the auto came in plain sight of the motorman. Under the evidence as it stood, the jury would have been warranted in finding that the defendant was guilty of negligence in running its car at a reckless rate of speed in violation of the ordinance; that the plaintiff was not negligent, or that, if he was, the defendant could have stopped its car and have avoided the collision after it became evident that the plaintiff was going upon the car track. The defendant, it was held, should have been called upon to produce its evidence, and the case should have been submitted to the jury.—Berghman v. Rhode Island Co., Rhode Island Supreme Court, 87 Alt. 314.

Double or Treble Damages.—A complaint stated facts sufficient for a recovery under Connecticut Pub. Acts, 1909, c. 211, Section 11, prohibiting reckless driving of motor vehicles on a public highway, and also under Pub. Acts. 1905, c. 216, as amended by Pub. Acts 1909, c. 268, allowing double or treble damage for injuries caused by violation of the laws of the road. Both causes of action were submitted to the jury. It was held that the court could not, in the absence of a special verdict, indicating upon which cause of action recovery was allowed, give judgment for double the amount of damage awarded by the verdict.—Dunbar v. Jones, Connecticut Supreme Court, 87 Atl. 787.

Evidence of Driver's Negligence.—In an action for injury to a child of four years of age, by being struck by the defendant's automobile in a public street, it was held that a non-suit was amply justified. There was an entire absence of testimony that the defendant was traveling at an excessive speed, that he did not have his car under suitable control, or that he failed to exercise due care in any respect or at any time. There was no testimony to indicate that the plaintiff had left the sidewalk, where he was just before the accident, until the moment before he was hit, or that there was anything in the situation

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which called for special prosecution on the defendant's part to avoid the accident which were not taken. On the contrary, the evidence indicated strongly that the plaintiff did not leave the walk, or come into a place of danger, until the defendant's car was so close to him that no reasonable efforts on its driver's part could have avoided running him down. The case was not one in which the plaintiff merely failed to present, as he was bound to do, evidence pointing to the defendant's negligence contributory to the injury; the evidence presented went far to disprove such negligence.—Hyde v. Hubinger, Connecticut Supreme Court, 87 Atl. 790.

Speed Regulation.—In proceedings for violating the Georgia statute regulating the speed of automobiles (Acts 1910, p. 92, Section 5), it was held that so much of the act regulating the use of automobiles as undertakes to make penal the operation of an automobile on the highways of the State. "at a rate of speed greater than is reasonable and proper, having regard to the traffic and use of such highway, or so as to endanger the life or limb of any person or the safety of any property," is too uncertain and indefinite in its terms to be capable of enforcement. The court of the accusation charging the accused with having operated an automobile "so as to endanger the life and limb of persons and the safety of property." was subject to special demurrer on the ground that it failed to show what person or what property was endangered by the running of the automobile.—Carter v. State, Georgia Court of Appeals, 78 S. E., 205.

State Regulation of Motor Vehicles.—Maryland Laws, 1910, chap. 207, provides that motor vehicles be registered, at a cost varying from $6 to $18, according to horsepower, that drivers obtain a license at a cost of $2, and that non-residents, in order to have limited use of the highways without cost, must have complied with a similar law in their respective States, and must have secured a local identifying tag or marker. The United States Supreme Court holds that these requirements are not so arbitrary or unreasonable as to constitute, when applied to vehicles moving in interstate commerce, a direct and material burden upon such commerce, and are therefore valid until displaced by federal legislation covering the subject.—Hendrick v. Maryland, 35 Sup. Court, 140.

Recovery for Injury to Rented Car.—In an action for injuries to the plaintiff's automobile, it appeared that the plaintiff was compelled to run his car across a depression on the side of the road in order to pass the defendant's team, which had been driven into the highway from a lane, and stopped diagonally across the way, leaving no space to the rear of the wagon through which the plaintiff's car could pass, and leaving the space in front so slight as to compel the plaintiff to run into the depression in passing. It was held that the defendant's negligence and the plaintiff's contributory negligence, if any, were questions for the jury, which found in favor of the plaintiff. The plaintiff was operating the car under an agreement with the owner for a division of profits and that the plaintiff would return the car in as good condition as when he took it, necessary wear excepted. It was held under this agreement the plaintiff could recover for the damages to the car, although not its owner.—Manion v. Loomis Sanatorium, 147 N. Y. Supp. 761.

CARBURETOR RUDIMENTS.

Principles of the Vaporizer That Makes Fuel for Automobiles.

A car driver should know something of the theory and construction of his carburetor. The beginner finds many difficulties in his way, as he probably reads the maker's catalogue and description of what is really a somewhat intricate device, without first understanding the theory of its operation. Makers' descriptions seem to be intended for experienced people. It is the object, therefore, by describing an elementary form of carburetor to enable those who wish to pursue the subject further to understand the more complicated constructions now in use, and the general principles underlying the action of all carburetors.

The function of the carburetor is to convert the liquid gasoline into a gas, to mix that gas with air, and to deliver the required quantity of mixture to the engine. A liquid will not burn, and therefore before the gasoline can be used in the engine it must be changed into gas. In the earliest carburetors the air was passed over the surface of the gasoline, some of which was thus evaporated and taken up by the

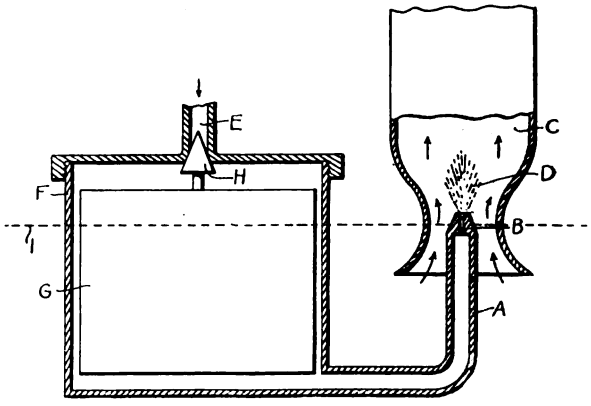


Fig. 1.

air. This principle was not found generally satisfactory.

An alternative to the simple surface carburetor is to have a number of wicks dipping in gasoline and to draw the air through these so that in passing it takes up some of the gasoline from the wicks by evaporation. It is necessary to heat the air before it passes through the wicks, and, after it has been carbureted by the addition of the gasoline vapor, the correct mixture must be obtained by the addition of more air. The mixture then passes through a throttle valve to the engine. As this system is so simple it is unnecessary to illustrate it.

In the spray carburetor the essential feature is the spraying nozzle or jet. Most people have handled a scent spray, in which there is a vertical tube dipping into the scent bottle and provided with a small hole at the upper end. Near this upper end is an air tube through which air is blown forcibly by means of a bellows device. This air passes over the top of the vertical tube, and by its movement causes some liquid to flow up the tube and to pass out through the small hole at the top. By the speed of the air passing, and on account of the small size of the hole, the scent issues in a thin stream and is broken up into thousands of tiny globules which rapidly disappear, showing that they are turned from the liquid globular form into vapor. This scent spray idea

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although hardly recognizable is the principle upon which all spray carburetors operate.

Construction of the Spray Type.

The simplest form of spray carburetor is shown in Fig. 1. At the right-hand side is shown a vertical jet tube, A, containing gasoline and terminating at its upper end in a hole of small bore, B. Around this is a pipe, C, which is constructed in the neighborhood of the jet, and which leads to the inlet valve of the engine. At each suction stroke of the engine air is sucked through the pipe, as shown by the arrows, and as the pipe is restricted the air passes the top of the jet at high speed; for this reason, and also because of the suction effect generated, the gasoline is caused to flow out and is broken up into a fine spray (as in the scent squirt), D. The smaller the hole in the jet the less gasoline will issue in relation to the air passing, and conversely the less the pipe is restricted the more air there will be, so that by adjusting the relative sizes of the jet outlet and the restriction in the neighborhood of the jet, the correct mixture is roughly obtained. More delicate adjustment than this is required, however, as will be explained later. The most powerful explosion is obtained when the gasoline vapor is mixed with a certain definite quantity of air. If there be too little or too much gasoline vapor, the power to the engine will fall off, and in the latter case the gasoline consumption will also be heavy. It is, therefore, extremely important that the right proportions of gasoline to air should be maintained under all conditions, and it is on account of the delicate adjustment required to accomplish this that carburetors are somewhat complicated.

The Float Chamber.

If the level of the gasoline in the reservoir from which it is drawn were above the top of the jet orifice, gasoline would flow from the latter when the

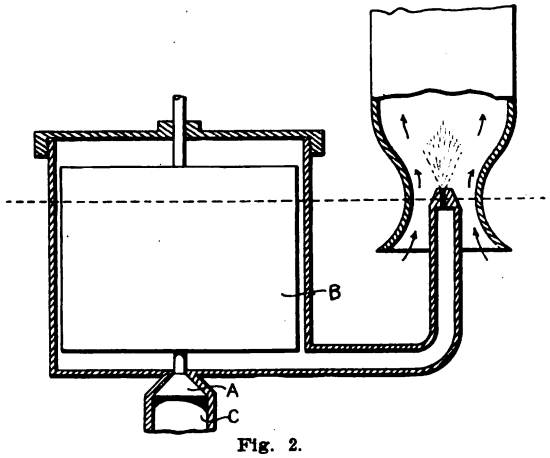


Fig. 2.

engine was stopped. Therefore some device must be employed to keep the gasoline at the required height in the jet. To do this a float feed mechanism is used, and this is contained in a float chamber alongside the jet nozzle. In the crude form shown in Fig. 1, the gasoline is admitted to the top, E, of the float chamber, F, containing a cork or hollow metal float, G, to the top of which is attached a conical plug or "needle," as it is termed, H. As the gasoline flows into the chamber the float rises until a certain height of liquid is obtained, when the needle (which, of course rises with the float) closes the gasoline inlet. When the gasoline level falls in consequence of some passing out of the jet nozzle the float falls and more gasoline enters, so that the gasoline level is automatically kept at the correct height, which is shown by the dotted line, I.

As stated, the float feed mechanism described is of a crude type which is rarely used. Another form is shown in Fig. 2. Here the needle, A, which again takes the form of a plug, is fitted to a rod attached to the float, B, and the gasoline enters from below at C. When the required gasoline level has been reached the float has risen to such an extent that the needle blocks the entry to the float chamber.

The most usual float feed mechanism is shown in

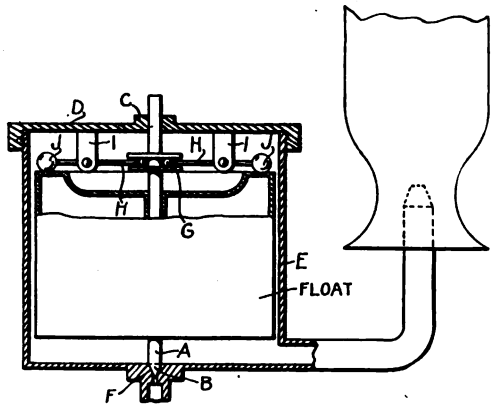


Fig. 3.

Fig. 3, where the mechanism is shown as in use. The float in this case is formed with a passage through the center, and is generally made hollow and of metal. Through the central passage passes a rod, A, the lower end of which is pointed somewhat resembling a needle, B, as in fact it is termed. The upper end of the needle passes through a guide, C, in the lid, D, of the float chamber, E, and the lower pointed end engages a coned seat, F, past which the gasoline must flow in order to enter the carburetor. Attached to the needle is a reel, G, and between collars on this reel lie the ends of a pair of levers, H. These levers rock on pivots, I, attached to the lid, D, of the float chamber, and at the ends opposite to the reel the levers are provided with weights, J, which tend to lift the needle off its seating. These weighted ends rest upon the edge of the float. Thus, when the gasoline is turned on the float rises, and the weighted ends of the levers are gradually raised and their inner ends lowered, pushing down the needle valve until it closes the gasoline inlet to the float chamber. As the gasoline is used the level falls and the float drops, so that the weighted ends of the levers lift the needle valve and more gasoline is admitted.

In nearly all cases the upper end of the needle projects above the lid of the float chamber, as shown in Fig. 3, but in some instances this upper end is closed in by a cap, and if this cap be unscrewed the upper end of the needle can be seen. When the engine is running this needle should, of course, be down. If the gasoline tap be turned off and the engine run, the needle will gradually rise, due to the gasoline in the carburetor being slowly used up, causing the float to fall. It is as well to bear this in mind, as the position of the needle can be taken as an indication, which is often useful if the engine stops, as to whether the float chamber is full or not. On looking at the needle one can tell whether the stoppage is due to running short of gasoline or to some restriction in the jet.

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Choke Tubes.

Reverting to the crude carburetor shown in Fig. 1, it will be noticed in that diagram that the lower part of the spraying chamber is restricted in the neighborhood of the jet nozzle. If a sectional drawing of a carburetor can be examined it will be seen that the passage round the jet is narrower than the space above it, but in some cases, instead of the wall of the spraying chamber being narrowed, a separate tapered tube, termed a choke tube, is used. By using a larger or smaller choke tube the carburetor can be adjusted to suit different engines. In some carburetors a choke tube of this type is not used.

Assuming that the crude carburetor shown in Fig. 1 is fitted to an engine which is running satisfactorily at 500 revolutions per minute, if the engine is to run faster, the air in consequence will travel faster past the jet nozzle and more gasoline will flow out of the jet. For a number of reasons, which it is unnecessary to discuss here, it happens that more will flow out than is required. That is to say, the faster the engine runs the richer becomes the mixture. Correspondingly if the engine run slower the

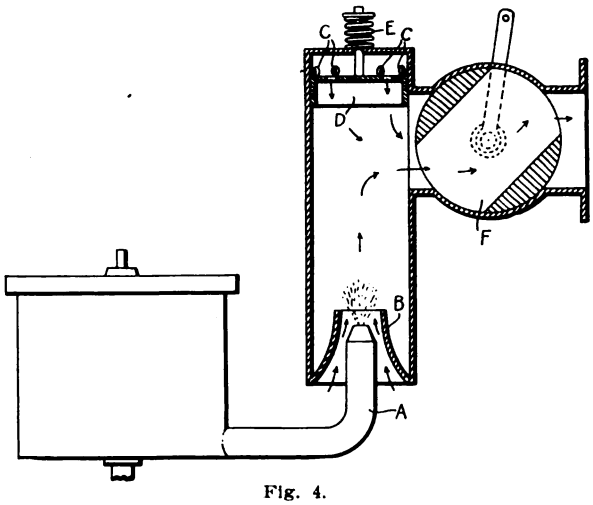


Fig. 4.

delivery of gasoline from the jet falls off and the mixture becomes weak. As it is necessary to keep the same proportion of gasoline to air at all speeds, it is clear that a simple form of carburetor like this will not be satisfactory under all conditions, and that to make it satisfactory one must supply more air or reduce the gasoline supply in order to correct the mixture as the engine runs faster.

Automatic Adjustments.

A simple form of automatic carburetor which does the former is shown in Fig. 4. Here there is a jet, A, surrounded by a choke tube, B, the size of which and the jet outlet are so arranged that the engine receives a proper mixture at low speed. When the engine speeds up this mixture becomes too rich, and must be diluted with pure air, for which purpose an extra air inlet is used. At the top of the carburetor is a number of holes, C, for the admission of air. These holes are normally shut off by a piston, D, which, at low speeds, is supported in position by a spring, E, so that no air then enters by these holes, but as the engine runs faster the suction becomes powerful enough to draw the piston downwards to a varying extent, uncovering the air ports and admitting extra air to dilute the rich mixture. As the engine slows down the piston automatically rises and shuts off these extra air inlets, so that the mixture is then prevented from becoming too weak. On the right hand side is a throttle valve, F, which acts merely as a tap whereby the quantity of gas passing from the carburetor to the engine may be varied.

Heating the Air.

The evaporation of a liquid causes a fall in temperature, as one soon appreciates if one stands in a wind with wet clothes on. To evaporate a liquid heat must be taken up from the surrounding objects, and consequently a carburetor becomes a refrigerating plant on a small scale, and even in summer the outside of some carburetors under certain conditions becomes coated with frost, due to the low temperature inside causing the moisture in the air around the carburetor to freeze. In cold weather the air passing through the carburetor may deposit frozen moisture to such an extent that the spraying chamber may become choked with ice and the carburetor "frozen up." (There is a widespread misunderstanding about this, it being often supposed that it is the gasoline which freezes, but this is not the case.) To prevent this freezing, and because the carburetor will not work well at low temperatures, it is essential to heat either the incoming air or the carburetor itself. For this reason the air is drawn from the neighborhood of the exhaust pipe, or some other point from which it can obtain heat, or the carburetor is fitted with a hot water or hot air jacket through which hot water or exhaust gas is passed.

It must be pointed out that there is a big difference between the simple construction described and the actual types of carburetors most widely used, and the beginner will probably find much difficulty in finding any resemblance between his carburetor and that dealt with, beyond the float mechanism.

RUNNING FORD CARS.

An Englishman's Advice as to Their Care and Management.

From "Vagrant" in the London Autocar.—In venturing to make suggestions for the benefit of fellow Ford owners, I feel that I am in rather a curious position, for there must be many motorists in this country who have covered on the car in question far greater mileages than stand to my credit, though my own experience extends to 22,000 miles covered in just two years and a half.

From the point of view of mileage alone some other Ford owners undoubtedly have the advantage of me, but I rather doubt whether any of them has had more opportunities than I have enjoyed for considering the Ford not alone upon its own merits but in comparison with other cars.

I have owned motorcycles, a steam car and various different makes of well-known gasoline cars during the past fifteen years, and, as I have always been my own mechanic I have obtained a fair insight into the capabilities and limitations of each one of them. I knew precisely what they would do and what was beyond their powers, and I have the same knowledge in connection with the Ford I own to-day.

This comprehensive experience, therefore, may help me to be of some material assistance not only to motorists who have owned no other car than a Ford, but also to those who, owning or having owned another make, may contemplate the purchase of a

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Ford, not realizing in the least in what important respects that car differs from others.

Fuel Consumption.

To run the car economically is, I suppose, one of the principal aims of most motorists, be the vehicle in question a Ford or anything else; and, whatever the make may be, there are, of course, certain principles to be taken into account and ideals to be striven for which are common to all cases. For example, we all wish to cut down gasoline consumption, but with the majority of carburetors this is not altogether an easy matter. One can change jets, choke tubes, the gasoline level, and other details of the kind, but, as a rule, the alteration takes time, and, although the result in a given set of circumstances may constitute an improvement, it by no means follows that the revised setting will give satisfaction throughout a day's running.

Now a Ford is fitted with a Holley carburetor, in connection with which there is only one adjustment, namely, the size of the spraying jet. Obviously, for economical running, the amount of gasoline passing the jet should be as little as will give the amount of power required at the moment; but, if we cut down the gasoline to suit the needs of the engine when the car is running easily—say down a gentle slope or before a following wind—we shall not have full power, if we require it, for hill-climbing. With the Holley carburetor, with very little trouble one can obtain the desired result whether the work of the engine happens at the moment to be light or heavy.

The jet aperture has passing down into it a needle, the spindle of which is threaded so that when the button on the top of the spindle is turned clockwise the needle is forced down into the jet aperture until, eventually, it closes it altogether, and when turned counter-clockwise the needle is raised, enlarging the jet aperture to a less or greater amount as desired. By means of a long rod, terminating at its upper end in a brass-headed button, the control of the carburetor needle is brought up to the driver's side of the dashboard, and upon the correct manipulation of this button a great deal depends.

If I remember rightly the Ford Company used, at one time, to set the needle so as to give the maximum engine power, and then were in the habit of advising Ford owners to leave that setting alone. In my opinion this advice was unfortunate, for the engine is quite a heavy drinker when pulling hard, whereas it may be described as practically a teetotaller when the work to which it is put is light.

The cardinal rule for saving gasoline on the Ford car is to run with the button on the dash screwed clockwise as far as possible without losing power. The only objection to running always on the weakest mixture that will serve is that the requirements alter in the course of a day's run almost from minute to minute, and to achieve the very best results possible for each change of condition requires a corresponding movement of the brass-headed button, which on the standard Ford is placed in an awkward position on the dash. At least two devices have been introduced recently for simplifying the manipulation of the button, the object of both of them being to bring the control right up to the steering column just below the steering wheel. I have one of them fitted to my own Ford, and am more than pleased with it. By careful manipulation of the button I have obtained, with a four-five-seated car, 42 miles to the gallon—a mileage secured, I have no doubt, by some other Ford owners, but very greatly in excess of the average recorded.

To Obtain an Easy Start.

While on the subject of carburetor adjustment, it may be well if I say a word or two about the best method of obtaining an easy start with the Ford engine. Now the Ford, for some reason or other, has the reputation of being a bad starter, especially when cold, but my own experience is that it is one of the easiest engines to start, so long as one knows how to set about the matter.

The problem of easy starting with the Ford is really affected not only by carburetion, but by the setting of the vibrators on the four ignition induction coils. See, first of all, that each vibrator blade is adjusted as lightly as possible. When the engine is running, slack back the vibrator adjusting screw of each coil in turn until that particular cylinder ceases to fire; then tighten the screw until the cylinder cuts in again, and, finally, tighten again about one-eighth of a turn. When this setting has been obtained the conditions, so far as ignition is concerned, are satisfactory for easy starting.

Now as to carburetion. Note the position of the mark—generally a V-shaped nick—on the jet adjusting button on the dash when the engine appears to be developing its maximum power on the level. Let us say that the mark on the button in these conditions points due north, or towards the front of the car. For starting from cold, first turn the button counter-clockwise half a revolution until the mark points due south. Open the throttle to about the notch which gives twenty miles an hour speed on the flat. Retard the spark either completely or to within two or three notches of the lever's backward travel. Do not switch on, but go to the starting handle, and, by means of the wire controlling the butterfly throttle in the main air intake pipe, shut off the main air supply. With the wire drawn out turn the engine four half revolutions; in other words, pull up on the starting handle four times. Then let go the wire in your left hand, switch on the current, and give one smart pull up on the starting handle.

The engine should fire immediately. If it does not, give two or three more upward pulls on the starting handle without touching the air throttle wire. If everything be in order, the engine will certainly start at either the first or the second pull after the ignition is switched on.

When the engine has begun to fire, close the throttle a few notches, and gradually turn the carburetor regulating button clockwise until the mark is due north once more. Should the engine be unintentionally stopped when it is thoroughly warm, do not, when trying to restart, pull out the air throttle wire, for if difficulty be experienced in obtaining an explosion it will be due, in all probability, to an over-rich mixture and not to a mixture that is too weak. Also, when restarting the hot engine do not turn the carburetor regulating button counter-clockwise: it may even be necessary to rotate the button clockwise for about five-eighths of a revolution until the jet is completely closed, and then to turn the engine over half a dozen times by means of the starting handle to get rid of the over-rich mixture. After this has been done the due north position of the regulating button should be adopted again.

Incidentally, when starting the Ford from cold be

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sure that the side brake is hard on. If possible, put a chock of some kind under one of the wheels, to discourage any tendency for the car to run forward when the engine starts.

Economical Running.

To revert to the subject of economical running generally, the annual bills can be reduced materially if attention be paid to husbanding tires, and, incidentally, all the mechanical units of the chassis. In the case of the Ford the chief point to bear in mind is that excessive speed, especially when long continued, is almost certain to lead to serious trouble. We all know that high speed on any car is bad for tires, and, naturally, this is so when the Ford is in question; therefore I will not labor that point, but will confine myself to a few words on its effect upon the chassis.

It must be remembered from the start, and all the time, that the Ford is not a racing car; that its designer does not advocate high speed being maintained on it; and that optimistic agents who talk glibly of an average speed of thirty miles an hour over a long day's run with the Ford are, in reality, doing the car a thoroughly bad turn by endowing it with capabilities it does not possess. If one drive a Ford at an average speed of twenty miles an hour it will last for years, but averaging thirty would certainly ruin it in less than three months.

I need hardly say that it is impolitic to avail oneself to the full of the Ford's remarkable power of acceleration. A big engine and a very light load naturally make for exceptional acceleration, but if the engine be habitually asked to do its utmost in this respect the tire wear will be considerable and the transmission will become prematurely aged.

Changing Gear.

Many people are apt to think that with epicyclic gearing a smooth change of speed must necessarily be obtained. This is by no means the case with the Ford gears. To secure a smooth change with this car it is necessary, after speeding up to, say, seven miles an hour on the low gear, to close the throttle as the foot comes back into the top speed position, the ideal being reached when the speed of the engine immediately before and immediately after the top gear clutch engages is unchanged. If the throttle be closed too much, there will be a jerk as the road wheels and transmission begin to drive the engine; if it be not closed enough there will also be a jerk, this time because the engine speed will be suddenly checked when the clutch plates grip. A little practice, coupled with common sense, should ensure a smooth change.

Working Together.

Upon his recent return from a trip through the West, Alfred Reeves, general manager of the National Automobile Chamber of Commerce, announced the formation of the Automobile Service Managers Association of Michigan, with headquarters in Detroit, and to have as members the service department men of the motor car concerns in Michigan, Northern Ohio and Western Ontario.

The purposes of the association are to promote personal acquaintance among the representatives of the service and repair parts departments of motor vehicle manufacturing companies; to consider the best methods of conducting the work of service and repairs; to promote the adoption of the most liberal policy of helpfulness to purchasers of motor vehicles, and to generally improve and facilitate cooperation among manufacturers, dealers and owners, with a view toward supplying the maximum of service to the mutual advantage of all.

Meetings will be held every month, at which papers on the problems of service will be read and discussed, with lectures and moving pictures of men and machines in factories and their operations.

The Indianapolis service managers have already been organized, and associations will be formed in Chicago and probably in Cleveland.

ANTI-FREEZING.

Now Guard Against Damage to the Radiator of Your Car.

BY C. P. SHATTUCK, M. E.

Automobilists, especially the motorist making his initial investment, will find upon consulting the instruction book accompanying the car a paragraph cautioning him to guard against freezing of the water of the cooling system. Generally instructions are given for the preparation and use of solutions to lower the freezing point of the water, but as the car is usually purchased in warm weather, the instruction book is likely to be mislaid or the suggestions for the care of the cooling system in cold weather forgotten.

It is reasonable to assume that the temperature will drop well below the freezing point this month and the motorist who would avoid the heavy expense of replacing cracked cylinders, water connections and pumps with new, and who does not desire to incur the cost of radiator repairing, will do either one of two things, namely, draw off the water from the circulating system when the car is not in use, or employ an anti-freezing solution.

Opinion varies as to the best solution to employ, some car makers recommending alcohol while others favor a solution with calcium chloride as the base. Others favor glycerine and some approve of alcohol and glycerine. Some manufacturers disapprove of the use of anti-freezing solutions because of their action upon the components of the cooling system. It is held that alkaline solutions are productive of an electrical action wherever two dissimilar metals are utilized, such as the brass tubing of a radiator and the solder used at the joints; the iron water jackets and the brass or aluminum plates, etc. While electrolytic action is to be expected when two metals of different potentials are used together in any alkaline solution, the injury resulting from such action will be minor as the solution is employed but a few months.

In selecting an anti-freezing solution the motorist must be governed by conditions of locality and the car. Where extreme changes occur; that is, in sections where the weather is mild for a few days then follows a sudden change to temperatures well below the freezing point, it is advisable to employ a solution that does not boil readily in mild weather. This is particularly true if the car be operated in heavy traffic or the motor is run idle for any great length of time. Under such conditions the freezing point will rise because of the evaporation that takes place. Another factor to be considered is the motor and its cooling system. Some motors will not heat

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in warm weather under the most severe conditions of service while the water in others will boil readily. This is true of cars that have seen considerable service.

Of the solutions that can be prepared by the motorist no one combines all of the desirable features, so in selecting the solution it should be borne in mind that it should have no corrosive action, nor should its use prove deleterious on the components of the cooling system. It must be easily dissolved or combined with water, must be reasonably cheap and not subject to rapid waste by evaporation. It should not deposit sediment or foreign elements, its boiling point should be as high, if not higher than that of water, and it should not congeal at temperatures ordinarily met with where it is used.

The calcium chloride solution is favored by many car manufacturers and is easily prepared. One should be careful to obtain the chemically pure material, not the commercial form. The relative value of the solution is given in an accompanying table.

Alcohol, denatured, is perhaps, more extensively employed as it is easily obtained, combines readily with water and is not as expensive as the glycerine solution. One of the disadvantages of the alcohol solution is that it boils more readily than water and there is a loss by evaporation, particularly if the solution be prepared for freezing points in the neighborhood of zero Fahrenheit, and is used where the thermometer frequently registers above the freezing point, 32 degrees. The odor given off by the solution when heated is disagreeable to some. If the alcohol solution be employed care must be exercised. It should be tested from time to time to ascertain the loss of alcohol, or in other words the solution must be maintained at the desired point. There is an instrument or thermometer marketed called the pyrometer which will register accurately the freezing point of the solution. Another disadvantage of the alcohol solution is that it is not adaptable to radiators having a tendency to leak.

The glycerine, or alcohol and glycerine solution is favored by many because it does not heat as readily as alcohol and the glycerine preparation will not boil as easily as water. It is more expensive than calcium chloride or alcohol and has a tendency to attack the rubber hose of the circulating system. Glycerine creeps, its analogy being similar to that of the creeping of the electrolyte of a storage battery. The glycerine solution, even when combined with alcohol and water, is more practical than the calcium chloride or alcohol in motors heating easily and in radiators that are not perfectly tight.

The accompanying table show the the various combinations and their freezing points Fahrenheit, and the capacity of the cooling system can be ascertained from the maker or by drawing off the water and measuring it. Before introducing any solution, any existing leaks should be remedied else the cost of maintaining the solution will be expensive. The radiator should be thoroughly cleaned by using a soda solution or a marketed preparation. If the circulation system is badly affected with what is termed "fur" or scale, caused by the use of hard water, it can be cleaned by the use of washing soda, followed by hydrochloric acid. Employ a 25 per cent solution of the commercial grade, which should do the work in about 15 or 20 minutes. The system should be washed out thoroughly after using both solutions.

Calcium Chloride.

2 pounds	1 gallon water	Freezing point	18° F.
3 pounds	1 gallon water	Freezing point	1.5° F.
4 pounds	1 gallon water	Freezing point	—17° F.
5 pounds	1 gallon water	Freezing point	—39° F.

Alcohol.

Per cent.	Per cent.		
Alcohol 5	Water 95	Freezing point	25° F.
Alcohol 15	Water 85	Freezing point	11° F.
Alcohol 20	Water 80	Freezing point	5° F.
Alcohol 30	Water 70	Freezing point	—5° F.
Alcohol 35	Water 65	Freezing point	—16° F.

Glycerine.

Per cent.	Per cent.		
Glycerine 10	Water 90	Freezing point	28° F
Glycerine 30	Water 70	Freezing point	15° F.
Glycerine 40	Water 60	Freezing point	5°
Glycerine 48	Water 52	Freezing point	0° F.
Glycerine 54	Water 46	Freezing point	—5° F.
Glycerine 58	Water 42	Freezing point	—10° F.

Alcohol-Glycerine.

(Equal proportions.)

Per cent.	Per cent.		
Alcohol-Glycerine 15	Water 85	Freezing point	20° F.
Alcohol-Glycerine 20	Water 80	Freezing point	15° F.
Alcohol-Glycerine 25	Water 75	Freezing point	8° F.
Alcohol-Glycerine 27	Water 73	Freezing point	5° F.
Alcohol-Glycerine 29	Water 71	Freezing point	0° F.
Alcohol-Glycerine 30	Water 70	Freezing point	—5° F.
Alcohol-Glycerine 32	Water 68	Freezing point	—15° F.
Alcohol-Glycerine 40	Water 60	Freezing point	—23° F.

In addition to the anti-freezing solutions described there are marketed preparations which have a low freezing point and which do not boil below 210 degrees Fahrenheit, the boiling point of water. In selecting any solution for service in a radiator that has been repaired by a chemical preparation, it is well to ascertain from the maker of the last named the effect the anti-freezing mixture will have upon the preparation.

Those who do not care to employ an anti-freezing solution or whose radiators leak slightly will insure against the bursting effect of congealed water by draining the circulation system. This is practical with the majority of cars but not with some older types, the petcocks of which are not all located at the lowest point in the system, preventing a complete drainage. A careful inspection will determine this point and will prevent damage.

If through carelessness the car has been exposed to freezing temperatures it is advisable to ascertain whether or not the water is frozen before attempting to start the car, particularly if the machine be equipped with a motor starter. It is much better to remove the radiator cap and examine the water or open a petcock to see if the water flows than to shear off the driving mechanism of the pump. By assuming that the car will freeze if not properly cared for will insure the motorist against large repair bills occasioned by Jack Frost.

A Sweeping Claim.

From a Motorist, North Carolina.—I see in the September issue a statement about the Ford's pulling qualities. Mr. Boucher is the man that is not "motor wise," for when a Ford is running good and pulling good, it will pull any hill his six-cylinder car will pull, whether in Arizona or Virginia, or anywhere else for that matter, for I have tried about as many as he ever has, I suppose.

The Atwater-Kent System.

From John A. Brown, Rhode Island.—Please tell No. 1670, in your last issue, to avoid changing his Ford ignition. But if he must, he will find that the Atwater-Kent system meets every requirement.

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SPIRAL BEVEL GEARS.

They Run Quiet, Have Good Wearing Qualities and Are Efficient.

A. L. Stewart before the New York Society of Automobile Engineers.—Several different names have been applied to the type of gear under discussion. It has been variously called "spiral bevel," "worm bevel," "helical bevel," "screw bevel," "spiral type bevel," and so on. Probably the last term ("spiral type bevel") more nearly describes the gear than any of the others. So far as I know, all gears of this type which are being made are approximations to a true spiral curve. There is no particular virtue in a spiral curve, but it will be seen that the term "spiral bevel" is not strictly correct. The term "worm bevel" suggests a sliding contact and does not seem to apply to the rolling action of bevel gears, although they have curved teeth which, if developed in a plane, would be a straight line. The shape of tooth which is actually being produced, however, is a curve when developed in a plane, and is close to a true spiral, so that "spiral type" aptly applies. It is interesting to note that spiral type gears are more appropriately named than so-called gears of spur type. The tooth of a spur spiral is a true helix and does not even approximate a spiral curve.

The essential feature of a spiral bevel gear is that the tooth is curved instead of straight; the curve, if continued, would intersect the cone center of the gear. This at once distinguishes the spiral from the skew bevel gear, the tooth elements being straight but not intersecting the cone center in the case of the latter. The tooth elements of a skew bevel are all tangent to a circle about the cone center, the diameter of this circle determining the amount of skew of the teeth.

Method of Cutting.

The method of cutting with which I am most familiar is that of the Gleason spiral type bevel gear generator. In this machine a face mill cutter is used. The impression has existed in some quarters that the cutter blades are formed to the shape of a tooth space, but this is not the case, each blade being ground to rack form. The cutter and the work are rolled together with a generating motion producing true octoid teeth or, as we commonly call them, involute teeth. The diameter of the cutter is 12 inches, so that the curve of the tooth is a circular arc on a 6-inch radius. In a large number of cases that have been laid out covering the full range of automobile gears of different pitches, diameters, face lengths and spiral angles, it has been found that this curve closely approximates in every case a true spiral. This is not considered to be either an advantage or a disadvantage; the point is mentioned as showing how the 12-inch diameter was chosen.

In cutting, one side of a tooth is finished at a time. On account of the large number of blades in action—ten cutting inside and ten outside—the machine is a rapid producer. The same cutter is used for both sides of the tooth and for both pinion and gear. One cutter will finish all pitches between 2½ and 7½ diametral as far as the tooth thickness is concerned, but different cutters are required for a change in angle of spiral. In practice it is found that four finishing cutters cover the usual range of automobile gears and pinions. The cutter can be set above or below the cone center of the gear to give right- or left-hand spiral. It can also be adjusted horizontally, the horizontal and vertical adjustments together allowing for cutting gears of different cone distances and angles of spiral.

Advantages.

In speaking of the advantage of spiral type bevel gears we immediately think of quietness, and this, of course, is the point which has led to their great popularity among automobile and axle designers, manufacturers and users. When all that could possibly be called over-enthusiastic praise has been lain aside, the fact remains that spiral type bevel gears are extremely quiet. It is easy to make them so in manufacture and to maintain them so in use and to a very great extent they have lessened the troubles of the axle man. The overlapping of the teeth, which is largely the cause of this quietness, is familiar in helical gears of spur type, and has long been used where high speed and quietness are required. In comparing spiral type bevel and helical spur gears, however, it must be remembered that spurs with axes not parallel have a sliding action and enter the worm and worm-wheel class. This is not true of spiral type bevels, and the comparison should be made only with helical spurs on parallel shafts, where the action is as purely a rolling action as in the case of straight-tooth spur gears. Line contact, not point contact is provided, the line slanting across the tooth face from the point at one end of the face, across the pitch line at the center and down to the flank at the other end.

Another marked advantage of the spiral type bevels is the range of endwise adjustment of the pinion that is possible without reducing materially the amount of bearing, or introducing noise. This is perhaps the most striking feature of these gears when tried out on the testing machine. An average of a large number of different combinations and pitches that have been tried showed that they would pass inspection with the pinion anywhere within a total range of .015 in., i.e., .007-in. or .008-in. each way from the flush position. A similar test of straight-tooth gears showed an average adjustment of only .008-in., or .004-in. each way. Beyond this adjustment the straight-tooth gears immediately became decidedly noisy, while the spiral type remained quiet through a much wider range than the .015-in., but showed a gradual change in the amount and position of the bearing.

This range of adjustment should be considered in connection with another feature, which I believe is peculiar to the Gleason method of cutting. Because of the fact that the same cutter is used for both sides of the tooth, the concave side, cut with the outside of the cutter, is on a slightly greater radius than the convex side, which is cut with the inside of the cutter. This produces a bearing heavy at the center of the face, and fading away slightly toward either end. If the gear and pinion housings were absolutely rigid, this peculiarity of the bearing would have no special advantage. But such a condition could not exist without the use of housing far heavier than would be tolerated, and the fact is that almost any axle will show displacement of the driving gear and pinion with relation to each other where the load is heavy. This weave of parts tends to throw the bearings toward one end or the other of the tooth. A bearing originally heavy in the center, allows for such displacement, without throwing the

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load to a point bearing at either end of the tooth. This action is demonstrated in practice by examining gears that have been run with a light load, say on a testing machine, and then put in service in the axle. The first test will show the tooth surface polished at the center of the face, and at the second examination the tooth surface will be polished over the entire length. It has frequently been said that straight-tooth gears would be quiet enough if they could be set in absolutely perfect alignment and maintained so under all conditions of service, and it is known that straight-tooth bevels that run almost without a sound on a testing machine are frequently rejected in the axle test. In view of this any allowable adjustment or displacement of spiral type bevels is of very great importance.

The possibility of using higher ratios in spiral type bevel gears is an advantage which has been quickly recognized. In straight-tooth gears ratios of 4½ to 1 have been about at the dividing line between quiet and noisy gears in automobile drives, and for the high ratios there has been little chance of using a bevel gear drive. We have heard of occasional instances of straight-tooth gears being used for higher reductions, but usually in such cases considerable difficulty has been encountered. We know at present of several 5 and 6 to 1 ratios of spiral type bevel gears giving satisfactory service. In one 6 to 1 ratio the pinion has 11 teeth. In another case a 10-tooth pinion running with a 49-tooth gear has proved an entirely successful drive, while tests of a 9-tooth pinion in a 7.3 to 1 combination have also been quite satisfactory. I am of the opinion that the limit has not been reached yet. The question comes down to one of strength of the pinion rather than quietness, for with the continuous contact which spiral type bevels give, there seems to be no reason why an 8-tooth pinion will not run quietly in ratios up to 8 to 1. The only reason for using so few teeth in the pinion is to keep down the diameter of the gear. In this case the pinion must, of course, be made solid on the shaft.

Strength and Wear.

Perhaps the most satisfactory way to consider the strength and wear of spiral type bevels is by comparison with straight-tooth gears. For the same power transmitted, and other things being equal, the load on spiral teeth is greater than on straight teeth, because the spiral tooth must carry the additional thrust-load. This thrust-load varies with different angles of spiral, but assuming an angle of spiral of 30°, the total load on the tooth is about 15 per cent. greater than the corresponding tooth load for straight-tooth gears. To offset this extra load the spiral type gear has more teeth in contact at all times than the straight-tooth gear. Assuming that the spiral lead is such as to give an overlap equal at least to once the circular pitch, there will always be one more tooth in contact. While the contact of the extra tooth will not be full-length, still it will be more than enough to make up for a 15 per cent. increase in load. That is to say, spiral teeth, while they have a greater load to carry, have that load so distributed as to put less strain on each tooth. We have known of very severe tests of an electric car spiral type drive in which a nine-tooth six-pitch pinion running with a sixty-six-tooth gear with a face length of one and one-quarter inches, has stood up under repeated reversals of the motor when running at high speed. The total load, including three passengers, was about 4,000 pounds. The pinion was made of 5 per cent. nickel steel case-hardened and was, of course, solid with the shaft.

Referring again to the comparison of spiral type bevel gears and helical spur gears with parallel axes, it will be seen that inasmuch as the spiral type bevels have no more sliding action than straight-tooth bevels or spurs, there will be no more tendency to wear from the nature of the action. This can be seen from another point of view, by considering a spiral type tooth as made up from a straight tooth which has been cut into a number of sections normal to the tooth, the sections or laminae then being offset with respect to each other, or stepped, so as to conform to the spiral curve. Each section would then roll with the corresponding section of the mating tooth with the rolling action of straight-tooth gears. If the number of sections is increased the tooth approaches a spiral type tooth with a smooth curve, but the increase of sections does not introduce any more sliding action. A spiral type tooth may be considered as made up of an infinite number of such sections each infinitely thin, but the action will still be the same. Thus if there is no increase of sliding action, the only condition which will tend to increase the wear is the increased tooth load. The length of tooth measured along the spiral is, however, increased in the same proportion as the load itself, so that the unit pressure is the same as for straight teeth. It will thus be seen that spiral type teeth will show up at least as well as straight teeth as far as strength and wear are concerned.

Efficiency.

The efficiency of spiral type gears has been the subject of some discussion, but as soon as we look into this matter we find that spirals take their place in the high efficiency class alongside of straight-tooth bevels. Considering the action of these gears, we have already seen that there is no more sliding motion in the case of straight-tooth bevels. Consequently, there would be no loss of efficiency from this cause, as compared with straight teeth. One other feature which might cause a loss of power is the end-thrust of the pinion. It will be seen readily that if bearings provided to take this thrust have much friction loss, there will be just that much less power to apply to turning the wheels, and this loss would have to be charged up to the use of spiral bevels. That such loss might be considerable with bad bearings is apparent when we remember that the end-thrust of the pinion will in some cases be more than half as great as the transmitted tooth-load. The high efficiency of good bearings will, however, hold this loss down so low that in practical use it would be difficult to determine the amount of it. So much for the theory of efficiency. In practice, judging from all reports that have come from actual use, the change from straight-tooth to spiral type bevels can be made without any loss of power. As a general statement I would say that with proper mounting there will be no difference in efficiency between the two types of bevel gears.

As compared with the worm drive, the advantage as to efficiency is with spiral type bevels. It has been reported by a number of users that the efficiency of worm-drive axles is best at high speeds, and that there is considerable loss on the pick-up. As most worm drives are used on electric cars or

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trucks, they are confined largely to town use, where there is sure to be a great deal of accelerating and retarding, working a considerable part of the time at a speed which gives a lower efficiency. A recent test of two electric cars the same in other respects, but one having a worm-drive axle and the other a spiral-type-bevel axle, gave results from which the engineers estimated that the worm-driven car would run 72 miles on a charge, while the bevel-driven car would run 95 miles. Great care was taken in this test to have the conditions exactly the same for the two cars. A 2 per cent. difference of efficiency in the two motors was reported by the manufacturers, but allowing for this the spiral-type-bevel axle would still show a mileage more than 25 per cent. greater than the worm axle. A coasting test was made of the same two cars, coming to a standstill at a certain point on a hill and allowing the cars to start under gravity, and run freely until they stopped. The bevel-driven car ran one and three-tenths times as far as the worm-driven car and at higher average speed.

Direction of Spiral and Thrust.

The direction or hand of spiral which it is best to use, and the thrust caused by spiral teeth are two points so closely related that they can be discussed best together. In speaking of direction of spiral it is usual to name the direction of the pair from that of the pinion, although it must be remembered that the hand of spiral of the gear is always the opposite of that of the pinion. For instance, if the pinion is cut with right-hand spiral and the mating gear with left-hand, the pair is called right-hand, and vice versa. The direction of spiral of the pinion is named the same as if it were a screw. As far as quietness is concerned, we are unable to discover any difference between right and left-hand spirals, from either theory or practice. With right-hand spiral the small end of the pinion rolls into contact first on forward drive, but it seems to make no difference which end is the first to engage. Large numbers of pairs have been produced with both directions of lead, and the results of quietness have been the same. In regard to efficiency, also, no difference could be found, except under special conditions of mounting.

The question of the amount and the direction of thrust is the most important factor in deciding the direction of spiral to be used. In speaking of thrust we recognize that the use of gears with spiral instead of straight teeth changes the loads on nearly all of the bearings of the differential assembly. We confine ourselves here to end-thrust of the pinion, because it is impossible to go into a complete analysis of all the bearing loads, and it is the pinion thrust that changes most with the introduction of spiral teeth and which requires the designer's attention most. Straight-tooth pinions are not without thrust. This thrust is, however, slight in amount with the usual driving gear ratios, is always in the same direction, and varies with the pressure angle and the pitch angle. It is one component of the total thrust of spiral bevel pinions. The thrust due to the curve of the tooth is much larger than that of straight-tooth pinions in usual automobile bevel-driving combinations, it varies in amount with the angle of spiral, and changes in direction with a change of the direction of spiral or a reversing of the drive. With a spiral angle of 30° the amount of spiral thrust alone is 64 per cent. of the transmitted tooth load. With 20° it is 40 per cent. With 25° it is 51 per cent. and with 35° 78 per cent. With a right-hand spiral this is a pull into the gear on forward drive, and a thrust back away from the gear on the reverse. With a left-hand spiral it is back out from the gear on the drive, and into the gear on the reverse. Combine with this the usual thrust of straight tooth pinions and we have as average results for ratios between 3 to 1 and 7 to 1 the following:

Angle of Spiral.....	20°	25°	30°	35°
Right-hand — forward	—.29	—.44	—.56	—.69
Right-hand — reverse	.41	.59	.72	.85
Left-hand — forward	.41	.59	.72	.85
Left-hand — reverse	—.29	—.44	—.56	—.69

The decimals represent the thrust as a percentage of the transmitted tooth load. Positive values indicate thrust away from the gear; negative values indicate pull into the gear. The percentages given are to be used in connection with the tooth load, figured on the full pitch radius of the pinion at the large end. This is in order to facilitate computations in which these constants are used. For a tooth load figured on the mean pitch radius these constants would be reduced by one-eighth of their value. The load being that much greater, the final value of thrust would be the same.

From this it will be seen that for a 30° spiral angle, for instance, and a right-hand spiral the thrust for forward drive is 56 per cent. of the transmitted load, and tends to screw the pinion into the gear. For reverse drive it is 72 per cent., and thrusts the pinion back from the gear. With a left-hand spiral the thrust on forward drive is the larger figure and away from the gear; on reverse it is the smaller figure and into the gear. Here is where most designers decide the question of direction of spiral. If the bearing arrangement and general assembly of the pinion are such that there is little chance of end-movement, right-hand spiral can be used, making the thrust load under driving conditions less. If there is a chance that continued in-pull will cause play in the bearings, or if the bearings are not so well adapted for taking thrust in this direction, left-hand spiral will be chosen. Thus right-hand spiral favors the bearings for amount of load under forward drive, while left-hand puts on a heavier thrust load under forward drive. I have known of a right-hand spiral being chosen purely with reference to the amount of the load. The bearings selected would not stand the additional load of left-hand under constant use. Left-hand is frequently chose because bearings for taking an in-pull have usually been of less capacity than those taking an out-thrust, and left-hand spiral consequently involves less change in design. Whichever direction is chosen, arrangements must be made for taking the thrust in the opposite direction when backing up, though this is for comparatively little time and the loads are not so severe.

Other considerations affecting the choice of direction of spiral are lubrication, the question whether an in-pull is likely to loosen the pinion from its taper seat, and the possibility of a pinion having enough end-play to wedge into the gear and start cutting.

Amount of Spiral.

Theoretically, the amount or angle of spiral should be such as to give a lead equal to the circular pitch within the length of face. In practice the best results are obtained with somewhat more than this, and we recommend a lead of one and a quarter t

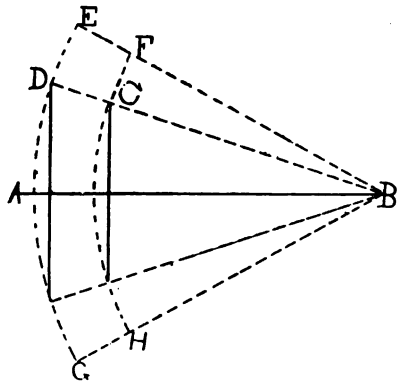
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one and a half times the circular pitch. Tests made on automobile drives have shown that a lead of less than once the circular pitch, while giving fairly good results and reducing the thrust slightly, is only a compromise, and that it is much better to make provision for the slight extra thrust, and gain the advantage in quietness which a greater angle insures. Usually information as to the amount of spiral is wanted in terms of the angle. For four, four and a half and five diametral pitch and the usual face width, an angle in the neighborhood of 30 degrees will give the desired spiral lead. For a finer pitch or an extra long face, a smaller angle is sometimes satisfactory.

To sum up the case briefly for spiral type bevel gears, I find that they have the advantages of extreme quietness, large range of adjustment, accommodation to distortion of the housings, adaptability to high ratios, high efficiency and good wearing qualities. The only serious disadvantage is the thrust. We believe, however, that spiral type bevels have come to stay, and that designers will quickly learn to make any necessary changes in mounting in order to avail themselves of the many benefits which this type of drive affords.

Fitting New Clutch Leather.

From S. P. C., Rhode Island.—Noting in a recent issue that one of your readers was troubled with a faulty clutch of the cone type I am supplying a



sketch for making a pattern for a new leather which will cure his trouble. The plan is simple and easily followed. It is more reliable than attempting to use the old leather for a pattern.

Obtain a large sheet of fairly stiff paper and lay out the clutch to exact size. The faces must be at right angles. Draw a line through the center of the hub and parallel with it. This line is shown at A-B in the sketch. Use this point as a center and the distances from B to C and B to D as radii, and scribe the circles E G and F H. It is important that the distance from E to G equal the largest circumference of the cone so that the ends will come together true. It is best to cut the strip a trifle longer to allow for fitting.

Use good oak bark tanned sole leather or belting. Before fitting soak it in oil to make it pliable. Some will disagree with the writer and advocate water, but when water is used the leather shrinks and is apt to pull away from the rivets. In attaching leather, clamp one end to the cone, drill and countersink for rivets. Then pull the leather to the next set of holes. Repeat from one point of attachment. This will result in a tight fit. Drill but one set of holes at a time. After fitting the leather it should be trued up in a lather which can be done by any machinist at a slight cost. Unless familiar with the use of glass or sandpaper in scraping a leather facing, the novice had best let well enough alone and rely upon the machinist.

Employees' Clubs.

Addressing the entire office force and factory department heads of the Chalmers Motor Company recently, Hugh Chalmers advocated the founding of two clubs for the young men and women employees of the company.

"Prepare for the job ahead of you, because it is our idea to make promotions wherever possible from our own ranks," said Mr. Chalmers. "And by all means, think. It is far more necessary to run this plant by brain-power than by horse-power. Anyone can purchase electric current from the Edison Company, but if a central market for brains exists, we have yet to find it.

"To-day, the trouble with the average young man is that he expects to advance in the world through right of succession or because the boss likes him, or for some other mysterious reason. We lack the developed men, the men who have built up their abilities step by step, and are ready for increased responsibilities when called upon. We have reason to be thankful that the only real aristocracy in this country is one of brains and decency. And there is still plenty of demand for men of brains and initiative for the big jobs in every business.

"Our trouble, nowadays, is not in securing skilled labor, but in getting the men to fill the $4,000, $5,000 and $6,000 jobs.

"To the young women who earn a living in any department of our plant I want to emphasize the fortunate conditions under which you work. Caste has no place in the Chalmers organization and that applies with equal force to both men and women employees. If there is an appellation I despise, it is comprised in the two words 'working girl.' We owe the utmost respect and honor to every woman who earns her own livelihood."

That Carburetor Controller.

In the September issue there was published a short article in relation to a home-made carburetor control with an illustration. It has since appeared that this device is similar or identical to a patented carburetor control, made by Grace & Company, 3205 West Washington Street, Los Angeles, Cal. It supplies clean hot air to the fuel, acts as a decarbonizer and primer, provides a reliable air brake for the car, and the manufacturers are so confident it will do what is claimed for it that purchasers can have ten days in which to make a thorough test of the device on their engines and if it does not do as stated they may return it and the money will be promptly refunded. The price is $10.

The owner who is using vibrator coils will find that any excessive current consumption is due to excessive tension of the vibrator springs. The spring adjustment should be loosened until the motor begins to miss and then slowly tightened again until regular firing is resumed.

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WHICH FORM OF COOLING?

An English Comparison of the Pump and Thermo-Syphon Systems.

Henry Sturmby in Motor, London.—Quite a considerable controversy has been carried on again lately over this ever-verdant question, but the disputants—as usual—do not appear to have "got any forrader." This is one of those questions in which the old adage applies, "He that's convinced against his will, is of the same opinion still," and as to just what are the real reasons for their respective contentions on opposite sides of the fence, well, "it all depends." It depends, in short, upon the ability with which the manufacturers of the cars used by the several disputants have carried out their work, for each participant in the wordy fray claims to speak from experience, in which, no doubt, he is right. It is like the old story of the men who argued and got to hot words about the color of the chamelion. Both were correct, so far as their observation went, but the conditions were different, and "circumstances alter cases."

So far as the question under consideration is concerned, both systems are good and perfectly satisfactory if intelligently carried out; but ever since my pioneer John o' Groats-Land's End drive, in 1898, when the only thing which "hung me up" on the road—and that three times—was the failure of the circulation pump to act, I have had more than a sneaking regard for the thermo-syphon system. In the words of a certain well-known advertisement, "It's so simple," when carried out properly, and that I know, for I have in my time built some hundreds of cars which not only had no pump, but were likewise minus a fan, in spite of the fact that the cars were geared, in some cases, as low as 7 to 1, and even lower on top gear; hence, whilst the engines were running fast, there was no rapid pace to force great quantities of fresh air over the radiators. Some of these cars worked perfectly satisfactorily on five and seven-mile hills, over grades running up to 1 in 6, and that, too, almost under the equator.

After that, no one can tell me that thermo-syphon cars cannot be built to work satisfactorily under all conditions and motoring, but they must be "built for the job" and not merely "altered over" makeshifts. A thermo-syphon car which is built for and will work perfectly satisfactorily upon British roads, in our English climate, will not be equally satisfactory if used over mountain roads in the tropics, although, if the car has been designed to work under the latter conditions, it can be depended upon to do good work and give no trouble in less severe circumstances; as a matter of fact, the same applies to both systems, for, unless a forced circulation car has been designed for the needful efficiency, it will fail when the conditions are beyond the normal, although giving perfect satisfaction otherwise.

The secret of success in thermo-syphon design is not merely the correct relative position of the engine to the radiator, which appeared to be the principal point in the recent argument. Whilst that has its importance, of course, as a factor towards success or otherwise, of far more importance are the two factors of area of radiating surface and cross area and freedom from longitudinal angularity of the water passages. If we keep always in mind the broad fact upon which the thermo-syphon system is based, viz., that hot water rises and cold water descends when forming part of the contents of a receptacle containing water at varying temperatures, we shall have no difficulty in arriving at a correct understanding of the way a circulatory system should be designed. In the first place, we have two containers, i. e., the radiator and engine water jacket, with tubular connections between them. To commence with, the water in both vessels is cold. Then the engine is started, and the heat absorbed by the cylinder walls is passed on to the water which surrounds them. We now have the water in one of the containers warmer than the rest of the fluid in the system, and the warmer portion of the water now wants to exercise its natural bent, i. e., to rise. If, then, the water jacket—in other words, the top of our engine—is the highest point in the system, it will be seen that the hot water, being already as high up in the system as it can go, cannot go any higher, and any movement of the water particles must take place downwards into the cold water below, or, still downwards, from the top of the engine to the lower radiator, which would be all against its natural inclination, and the result would be that very little movement would take place, and the water which was in immediate contact with the cylinder walls would just go on getting hotter and hotter till it boiled. Hence it follows that the top of our engine must be below the top of the radiator. Further, seeing that the object of our endeavor is to take away the water from around the engine directly it gets warm and before it gets hot, it follows that there will be little force in the upward flow; hence its path of movement must be made easy for it. If the water could rise vertically into an upper receptacle immediately over the engine, through a passage as large as the area of the water jacket itself, the slightest difference in temperature would cause movement, and rapid and practically even heating of the whole body of water would take place, just as it does in a kettle on the fire. This, then, is our ideal condition, and it consequently follows that our water passages must be as large as circumstances will permit. If we cannot get an overhead tank to flow into, we must get it high enough to give as upward a flow as possible to the water. It will readily be perceived, when these conditions are pointed out, that narrow ports, water passages and tortuous channels will check and hinder the flow of water under so light a pressure as the merely warmed water exerts, and anything which will check the flow of the current will keep the water longer in the jacket and the temperature will rise quicker.

It will also take little perception to follow that there must always be water in the highest part of the system. There being so little force behind the flow, the water cannot be forced upwards over an intervening space or division, so that the net result of all our efforts must be to allow the hot water quickly to rise to the highest point in the system.

But the effect of the radiator is rapidly to remove heat from the water, with the result (if we suppose the radiator is filled with hot water in the first place) that, as the heat is removed from the water by the radiator, it will tend to fall as it becomes colder. We must not forget that our upward and downward systems are interconnected, and if the hot water rises, it must have something else to take its place, otherwise it could not rise. It follows that the water in the bottom tank of the radiator is

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colder, it will naturally flow into the bottom of the water jacket, to take the place of the hot water which is ascending; whilst, at the same time, the water from the upper tank, as it comes more and more into contact with the radiating surface provided for it, will, by becoming colder and heavier, as well as by being robbed of its supporting water, fall steadily to the bottom tank, and, in its turn, pass into the water jacket and recommence the cycle of operations. As we have to depend upon the natural flow of the water for circulation to take place, as the rate of that flow cannot be hurried, and as, moreover, the cooling of the water will depend upon the area of the radiating surface with which it is brought in contact, it follows (as I have already said) that the flow must be even and unrestricted, and if heavy service is required, i. e., if the engine is to be worked fast and hard, the area of the radiating surface must be large enough to deal with any volume of water and any amount of heat which the engine can put into it. If, therefore, it is found in practice that overheating of the engine or water takes place, it is proof in itself that either the passages are restricted and the free flow of the water held back, or else insufficient radiating surface has been provided for the severest conditions under which the engine will be worked.

A Broken Piston Ring.

The engine of a car became rather uncertain in starting, and its owner suspected and verified in turn the ignition, the carburetor, and the valves. The compression of each cylinder was tested in turn by feeling the resistance it offered to the rotation of the starting handle, and one cylinder proved to be almost compressionless; the engine would not start from a pull-up if the starting handle claw was so engaged that the weak cylinder was either the first or second resistance to be overcome. The exploded charges blew past the broken ring into the crankcase, and sent puffs of smoke out through the gauze cover of the crankcase breather. This usually occurs when faulty piston rings have perceptibly reduced the compression in a cylinder. In the case under notice, the pistons had but one ring each, and a piece of about ¼-in. in length had absolutely vanished from the ring of the erring cylinder, the two remaining pieces still lying in the groove. Such a puff of smoke from the crankcase breather is plainly determinative, and shows that the rings, and not the valves, are to blame.

The automatic spark advance not only does the work accurately but it does not forget. If a driver gives proper attention to steering the car, varying the throttle, applying the brakes and watching the road ahead, he will not have much time left to manipulate the spark lever or talk to passengers.

Painting an automobile so that it will look neat and workmanlike is an expert's job. You can easily improve the appearance by carefully washing the surface with warm water containing a little ammonia, and then giving it a coat of thin varnish.

Unusually rapid wear in the differential or transmission case often is due to grit in the grease. Carefully wipe the gritty dirt off the grease gun before inserting it.

BATTERY CONDITION.

How to Ascertain it and How to Care for the Electrolyte.

The frequent and careful inspection of the individual cells in a battery is necessary in order to detect any irregularity in their behavior. Many defects which ultimately develop are of slow but sure process, and inspection will not only reveal them in their early stages, but will prevent their becoming serious and a source of trouble and expense at a later period. In some batteries, for example, the separators used to keep the positive and negative elements from coming into contact with each other, and so short-circuiting, are not as efficient as they might be, with the result that small pieces of foreign matter—straw, dirt, displaced active material, etc. —occasionally bridge across the plates. Such "bridge" in course of time becomes coated over with sediment in the shape of small particles of reduced lead, or lead peroxide, and an electrical connection is thus established between the plates inside the cell. Internal discharging will now result and continue while the battery is at rest, the plates being unequally acted upon and a tendency to buckle established. Inspection of the cell would have revealed this condition, and the instant removal of the obstruction prevented the trouble from becoming serious. Short-circuiting of this description is avoided in the better batteries by the use of efficient separators, the plates being so packed that the cell becomes semi-solid, and, in this manner, rendered immune from short-circuit, and the effects of vibration.

Causes of failure and trouble are usually to be traced to quite simple occurrences, and it is only by inspection that such can be detected. Bad connections are a prolific source of trouble, while corroded terminals and faulty lid fittings lead to much inconvenience and expense. Other causes of trouble that may be mentioned, and, incidentally, avoided by inspection, are slipping separators, loss of electrolyte, irregular charging and discharging, broken and leaky containing boxes, and gradual sulphating.

It is necessary then for the motorist systematically to inspect his battery, and attention to the following points may render the detection of faults a comparatively easy matter.

A good idea of the state of a battery may be obtained by merely observing the color of the plates, and, in fact, there is really no better condition test. When a lead cell is first put in action, the negatives are a yellowish gray and the positives a dark brown, sometimes spotted with a whitish or reddish gray substance. If the first charge be continued for a sufficient period, the whitish material—the objectionable sulphate deposit—disappears, and the positives should then be dark red, chocolate or plum color, turning to a nearly black, wet slate color when fully charged.

After a small discharge, they will regain their former appearance. Any peculiarity in color, such as the appearance of a white deposit or a reddish scale, indicates want of attention, since the cell has been exhausted. Such cells should be brought back into condition by prolonged charging at a slow rate on a charging board.

When the cells are fully charged, the negative plates should assume a light metallic gray color, and, since the ideal condition to aim at is always to keep

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the battery fully charged, the negatives should be of the color indicated and the positives a dark chocolate or plum color. The negatives, it should be noted, are always considerably lighter in color than the positives, and this hint may be of service in ascertaining the polarity if doubt should arise on this point.

It is quite possible to become an expert in regard to the color of the plates, for, by constant observation before and after a run, taken in conjunction with the voltmeter reading, the motorist will soon learn to appreciate whether the plates are of a good or bad color, and also to ascertain the amount of charge remaining in the battery.

Careful attention must be paid to the electrolyte, or the solution of sulphuric acid and water, which covers the plates. This solution is a mixture of two parts of specially pure sulphuric acid with about five parts of pure water, and 30 per cent. acid may be taken as the standard strength for ordinary purposes. Since the density of the acid varies with the condition of the battery, the state of the latter, as regards charge, may be ascertained by noting the density readings with a hydrometer. It is practically impossible to do this when the car is in motion, but some makers fit hydrometers to one of the cells of the lighting set at least, and then the density may be noted before and after a run and the necessary charging time calculated in this manner. For those who employ a battery only for lighting purposes, and also for the benefit of motorists making use of a charging board to keep their cells in condition, the following hints may be of service. When the cells are in good order, the density of the acid in each should be almost the same, and in a fully charged cell should be about 1.22. Above 1.2 indicates a battery more than half charged, while below 1.2 but above 1.18 indicates less than half charged. A reading below 1.18 means that the battery is exhausted and should be recharged immediately.

What is called a discharge indicator enables the driver to determine whether the cells require more or less charging during the run. The indicator consists of a tube containing four colored glass beads which rise when the acid attains various densities. Thus four beads up indicates too high a density and distilled water must be gently added and the cell agitated until only three are up. Three beads up mean that the cell is fully charged; two up that it is about two-thirds charged; one up about one-third charge running, while no beads up is a sign that the cell is exhausted and requires immediate recharging.

Exhausted Batteries.

For all ordinary lighting purposes it is very important to note that an exhausted battery is the result of lack of charge or waste of current, and if, after being fully charged, the cell is soon run down again, there is a fault somewhere, and the system must be examined. Should the electrolyte be spilled only acid of the same density as that in the cell at the time of refilling must be used. Do not add strong acid to an exhausted battery. It is best always to consult an experienced battery man before adding acid, but, if this cannot be done, use a hydrometer to obtain a mixture of the correct density. To replace loss due to evaporation, add pure distilled water at regular intervals, and always maintain the solution above the top of the plates. It is essential that pure or distilled water only be added and tap and boiler water must never be employed.

A clean non-metallic vessel is necessary for storing and handling water, and metallic funnels other than lead—enameled or otherwise—must not be used for electrolyte. Always replace and screw up the filling plugs after adding water to avoid loss of solution during the subsequent run, and examine a cell that requires an excessive water replacement. The cell will be found to be leaking, and, since a slow leak will cause loss of electrolyte and consequent sulphating, the cell should be repaired and replaced without delay. In cold weather add water just before running or charging to ensure mixing of the water and avoidance of freezing, and always wipe up spilled solution with cotton waste damped with ammonia water.

The Test Lamp.

A very convenient piece of apparatus for ascertaining the pressure, and, incidentally, the condition of a cell, is a small 2 volt lamp. By noting the brightness of the lamp as it is placed across each cell in turn an estimate of its condition may be found. A good voltmeter is also very desirable, and it will be found that the pressure of a cell rises to 2.4-2.6 volts near completion of the charge. When the voltmeter registers 15 volts for a 12 volt set, for example, the battery is fully charged. The discharging pressure when the lights are on will remain fairly constant at 2 volts per cell; that is, with a fully charged battery supplying the lamps with current and the car at rest, the pressure should be 12 volts for the six cell set.

It is of the utmost importance that the battery should never be discharged below 1.8 volts per cell or permanent sulphating will undoubtedly occur.

STARTING A STARTER.

Not Always Possible, But Usually This Is Due to Neglect.

The development of the self-starting device and its general adoption by auto makers and drivers have brought a new source of trouble to garage and repairmen. A self-starter that will not start either itself or the car is a vexation and the present short days with cool mornings has produced many. Of course the greater part are due to misuse, carelessness or ignorance, and a lot of drivers are learning how to start their self-starters when they will not start themselves.

Some of the trouble, it is true, is due to the fact that many thousands of the earlier types of the self-starter have been in use long enough to need repair parts and a general overhauling, but so much has come from simple "don't know" that the West Side Y. M. C. A. of New York City has put in a course on "Self-Starters," which is being largely patronized by garage and repairmen, as well as individual drivers.

"The self-starter is responsible for a lot of other troubles," said Mr. H. C. Brokaw, director of the school. "For instance, a car may be running along smoothly when the lights flash up and then go out. Mr. 'I Don't Know' starts in at the generator or the battery to trace each wire to locate the trouble. The trouble was that the lights had burned out. There was a loose connection at the battery or between the battery and generator and the entire current generated was sent over the light circuit, which quickly burned out the lamp filaments. Mr. 'Know

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It' looks for the loose wire, puts in new bulbs and goes on without fear of the traffic cop.

"You see cars running every night with only part of the lights in order. Some have one headlight, some none and others have not even the tail light. Mr. 'Know It' understands that this means there is a wire disconnected, a burned out fuse or a short circuit. He has been taught methods of testing for each of the troubles and in a few minutes has the car all right.

"The average owner knows mighty little about his car and its mechanism. He listens to the salesman of a self-starter and lighting system, or of the car having it, and absorbs just enough of it to rise up later and trouble him. Many think the storage battery, for instance, is big enough to stand up under any conditions. They do a lot of starting and little running—which is when the battery is charged—and they do their running all at night, when all the lighting circuit is drawing upon the battery, and then wonder why the battery falls down. The conditions noted prevent the generator from recharging and sooner or later there is a discharged battery. He condemns the battery and starter system at once. The fact is there should be something else than the battery discharged.

"The ease of starting the car by the new method is a drawback in case of trouble. If a man had to get out and crank his car he'd be pretty likely to find out the cause of trouble before he had cranked it many times. With the self-starter, he sits still and generally cusses a lot before he decides to investigate.

"Students who come to us from garages tell us that self-starter troubles are the bane of the average garage. Some will not touch this class of repairs, but pass it on to the specialist.

"Troubles of self-starter systems, which suggest the remedy needed, may be summed up as: First, neglect of ordinary care. It isn't kept clean. Second, short circuit or open circuit, and lastly, worn, broken, or burned out parts, which would be discovered by a general overhauling at intervals. More and more chauffeurs and garage mechanics are being required to have this information."

Double Clutching.

Drivers of cars fitted with the quadrant or "straight through" type of gear change no doubt have found that the operation of changing from a high gear to a lower one is usually accompanied by a good deal of grating, which is caused by the two gear wheels that are required to mesh not running at the same speed. To enable the change to a lower gear to be made without noise, it is necessary to perform an intermediate operation of speeding up the clutch shaft to the number of revolutions required to drive the car at its existing speed when the lower gear is engaged. This is usually accomplished by the method known as "double clutching," which many people think can only be done on a car fitted with a gate change. It can, however, be performed just as well on a car having a quadrant or straight through change, for it will be found that if the lever be placed midway between any of the notches in the quadrant a free or neutral position will be obtained.

The process of "double-clutching" on a car with a gear change of this description resolves itself into the following operations: Press the clutch out and place the lever between the notch it has just left and the one next to it, with which it is to engage; then let in the clutch and accelerate the engine slightly, disengage the clutch and move the gear lever without hesitation, into the next notch, thus engaging the next lower gear. After a little practice, it will be found quite easy to change the gear silently in this way. It should be kept in mind that the clutch pedal should not be depressed so much as to bring the clutch stop into action when changing down to a lower gear or noise will certainly occur. The movements should not be performed hurriedly, but, on the other hand, rather more time should be taken in effecting the gear change than would be taken if the ordinary method of changing were being employed.

Difficult Oiling.

The manufacturer and the experienced motorist will blame ignorant owners for their neglect to fill grease cups and to oil up generally. Yet some of the blame should go to the manufacturers who continue to turn out cars that have grease cups or oil holes all over them, every one of which needs periodical attention separately, and many of which can only be got at with very considerable difficulty, and a great deal of dirt and discomfort; in fact, the only way in which many cars can be at all easily dealt with so far as the greasing of the universal joints is concerned, the oiling of the brake gear, the replacement of the speedometer belt or oiling of the speedometer spindle, is by means of a pit, though every manufacturer has for many years been assuring us that the modern car need have no pit. This proud assertion is literally true, because if a person does not mind crawling under a car and rolling about in very contorted positions, varying the performance by climbing into the car and diving through floor boards he may indeed dispense with a pit.

Faulty Valve Cap Joints.

It would surprise many motorists to find the great loss of compression due to faulty valve cap joints. To test for leaks apply soapsuds as being cleaner than oil, and the difficulty in making them fairly gas tight must be experienced to be appreciated. After following the usual course, thoroughly cleaning the seating, etc., apply a fairly liberal dose of gold size on both sides of the copper and asbestos washer, but even this often fails to remedy the trouble. Perhaps someone can give a better "tip."

Do not forget that copper attempted to be ground in a carborundum wheel always clogs. You can avoid this by rubbing a little tallow on the copper. This will not interfere with the cutting of the wheel.

Some mix one ounce of picric acid or ether to five gallons of gasoline for use as a priming fuel only. It gives a more forceful explosion than gasoline alone, but should not be used after the engine has started.

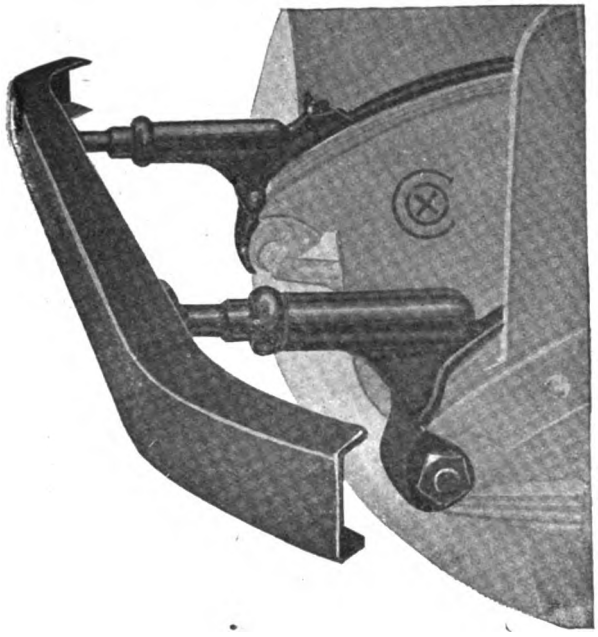
Valve trouble is produced when carbon forms around the edge of the valve, forming a hard crust that prevents the valve sitting tight.

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NEW AND INTERESTING THINGS IN MOTORDOM

A New Bumper.

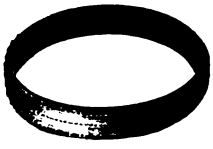
The Cox Brass Mfg. Co. of Albany, N. Y., offers a new specially designed bumper for the 1916 Cadillac. This car differs from other models and makes in several ways and requires a special type bumper. As shown in the illustration, the bumper is attached by the brackets that go over the nose of the springs. No additional holes need be drilled. The two bolts that hold the splasher and mud guard to the frame are replaced by two longer ones supplied by the Cox Company. These anchor frame, mud guard, splasher and bracket securely. Where the bracket goes over the nose of the frame it is held by a special lock nut which fastens on the regular shackle bolt which is supplied. The bumpers are made in the channel, diamond and round types. Each type is furnished in either nickel or black enamel and retail prices range from $10 to $6.50.



A Special Bumper for Cadillac Cars.

A No-stretch Ford Fan Belt.

A Ford fan belt that will appeal strongly to all users of Ford automobiles has recently been put on the market by the Leather Tire Goods Company of Niagara Falls, N. Y. This belt consists of a ply of strong non-stretching fabric, having a ply of leather sewed on the face of it where it comes in contact with the pulleys. The leather is treated by a special process that makes it always hug the pulleys perfectly, and, since the fabric prevents stretching, the belt seldom or never requires adjustment. On account of the high speed at which Ford fans run, there is unusual strain on the belt, and a belt like this, which will not stretch or slip, is especially valuable. The price of the belt is 40 cents each, and they will be sent postpaid by the makers to any part of the United States or Canada on receipt of price, or three belts will be sent for $1.



Ford Fan Belt.

New Delivery Body for Ford Cars.

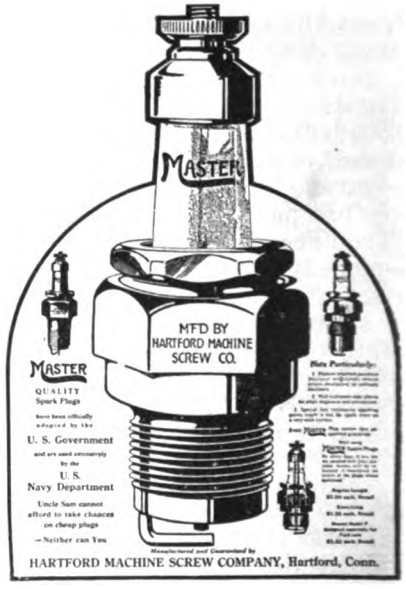
A new delivery body especially designed for Ford cars has been brought out by "Angier's," Streator, Ill. This is an open type body with flare-boards and box seat, and it fits any Ford chassis. It has a length over all of 103 inches, an extreme width of 43 inches, height of seat 16 inches, size floorboards front of seat 22x33 inches, height of body 8 inches, over flareboards 14 inches, loading space 65½x33 inches. This body is of excellent quality. It is made of carefully selected lumber and built on oak sills. It comes knocked down, but can be put together by any one in an hour. It is finished in one coat of prime, and weighs about 180 pounds. These bodies are sold only to jobbers and dealers, and they are not sold at retail under any circumstances. Contracts must cover at least 10 bodies to have any order filled, as the prices are based on a large output. Dealers' price will be about $18.50 each, with a liberal cash discount, and jobbers are urged to write for prices in lots of 25, as these prices will be gladly quoted on application. Nearly all dealers have some demand for delivery bodies for Ford cars, and this affords an excellent opportunity for a good profit on this line of goods.

An Unusually Complete Catalogue.

We acknowledge receipt of the new catalogue for 1916 which has recently been brought out by the Gemco Manufacturing Company of Milwaukee, Wis. This catalogue contains a surprisingly large list of accessories for all cars, and an especially comprehensive list of accessories particularly made for the Ford car. We understand that this catalogue will be sent to any dealer or car owner free of charge on application, and no doubt many of our readers will want to send for it. It is a profusely illustrated book of 64 pages, and will be very valuable for reference to any car owner or dealer.

A Neat Display Stand.

The Hartford Machine Screw Company, Hartford, Conn., is offering to dealers handling their Master Spark Plugs a very attractive display stand. Particularly noticeable is the Mammoth plug, which can be seen for a long distance. The stand is 20 inches high, in three colors, with a brilliant red background, and the plugs in silver and blue. This stand should make an attractive piece of advertising matter for any dealer and is most certain to attract the attention of a prospective purchaser of spark plugs when he enters a dealer's store. The stand is so arranged that it may be set on a counter or can be hung up in a conspicuous place or used in connection with a window display. It calls attention to the fact that Master Plugs have been adopted by the United States government and are used extensively in the United States Navy department and also points out the principle features of excellence of the Master Spark Plugs, such as massive imported porcelain insulator, ample room for expansion and contraction, low resistance sparking points and the unqualified Master guarantee. It is a very unique and effective piece of advertising matter and dealers interested should apply for their stand at once, as the supply is readily being depleted. Master spark plugs have enjoyed a larger popularity in 1915 than ever before, and it is rumored that an announcement of great interest to the trade is to be made in connection with the 1916 models.



For Spark Plug Display.

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Fire Fly Light.

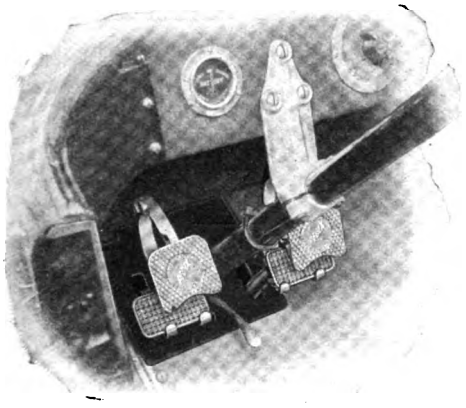
This is a most convenient automobile trouble finder's light. It consists of one dry battery and two incandescent lights with mirror reflector. The handle projects from a fibrous disc with a switch by which one light may be flashed separately or two together. It is not a spot light, but a light that will light up a



whole room light enough to read by. The U clip on the bottom of the illustration is to screw to the floor back of the driver so that he can pull the lantern from the U clip to measure the gasoline or read sign boards. The light is marketed by Geo. K. Burleigh, Penacook, N. H., at $2 each.

A New Pedal Extension.

The American Car Accessories Company has brought out a new pedal extension called the Pedex, which can be



A New Extension Pedal.

attached to the permanent pedals of any car and adjusted to fit any reach. By the use of this device two or more persons of different height can drive the same car, and the foot of the driver will always be in the most convenient and comfortable position. The Pedex only costs $5 a pair f. o. b. New York, and in sending your inquiry and orders for this article address American Car Accessories Company, Department E, 30 Church Street, New York City.

Peerless Goggles.

Max G. Cohn & Co., Inc., 19 Madison Avenue, New York, is offering a line of goggles under the name of Peerless, and a special feature is the use of an adjustable, non-breakable temple piece, made of Zylonite. This substance is flexible and allows of the temple being made into any shape merely by bending. The eye-pieces of the goggles are two inches in diameter.

Thermite Anti-Freeze.

This is an anti-freeze solution, which is said by the maker, the Northwestern Chemical Co., Marietta, Ohio, to freeze at seventy degrees below zero. When mixed with the same volume of water, the resultant solution is said to freeze at sixteen degrees below zero. Evaporation is said to be slight, and the maker claims the cooling system is not injured by its use.

The Powell Appliances.

The William Powell Company of Cincinnati, Ohio, make a large number of appliances for commercial vehicles and gasoline and oil engines. Their reputation for quality is always maintained by superior manufacturing facilities and an exacting and vigorous system of shop inspection, which enables them to fill every requirement. The Powell service anticipates every need of the consumer. The Powell methods insure the quality and uniformity of their products.

Heating the Garage in Winter.

The Scientific Heater Company, Power Avenue, Cleveland, Ohio, has perfected a heater that will appeal to the motorist owning or leasing an unheated building. One of its qualities is that it requires no alteration of the garage building, such as installing boilers, etc., the fuel utilized being artificial or natural gas. Owing to the fact that there is more or less gasoline vapor present in the garage it is not practical to utilize any heating arrangement having an exposed or naked flame, as it is well known that the fumes of the fuel, being heavier than air, are present in clouds of vapor near the floor. The Scientific design embodies the same safety principles as the miner's lamp. It heats by the principle of air circulation; that is, it causes the air in the garage to circulate through the heater, up one side of the building, down the other, across the floor and again through the heater. The manufacturers state that the system is easily installed, the only expense being that of piping to the city mains. Exhaustive meter tests have proven that it is possible to operate the Scientific system at a cost of a few cents a day. The accompanying illustration depicts the single type of heater, No. 700 size. This model will heat the ordinary two-machine garage comfortably during zero weather. The heater is built in three sizes for heating garages, 18x20 feet up to 26x36 feet. In public garages as many heaters can be installed as is necessary to cover the radiation. The 1916 model Scientific incorporates a great many new features over past seasons. Important among these is a self-lighter which eliminates the dangerous use of matches inside of the garage. It will undoubtedly be a great factor in decreasing gas bills. Another improvement is the double perforated metal screen. This is the safety screen and is of a more substantial construction than that used in the past. A brush located between the two screens makes it possible to clean the heater easily. The heater's construction is of the most rigid design and incorporates only the highest grade materials and workmanship. It is absolutely fool proof. The company has issued a number of attractive pieces of literature covering the heater which they



Scientific Safety Garage Heater.

state they will be glad to mail to any interested motorists. Their booklet, "Winter Motoring," is especially thorough in the way in which it treats upon garage heating. For a copy, address as above.

Disco Increases Capitalization.

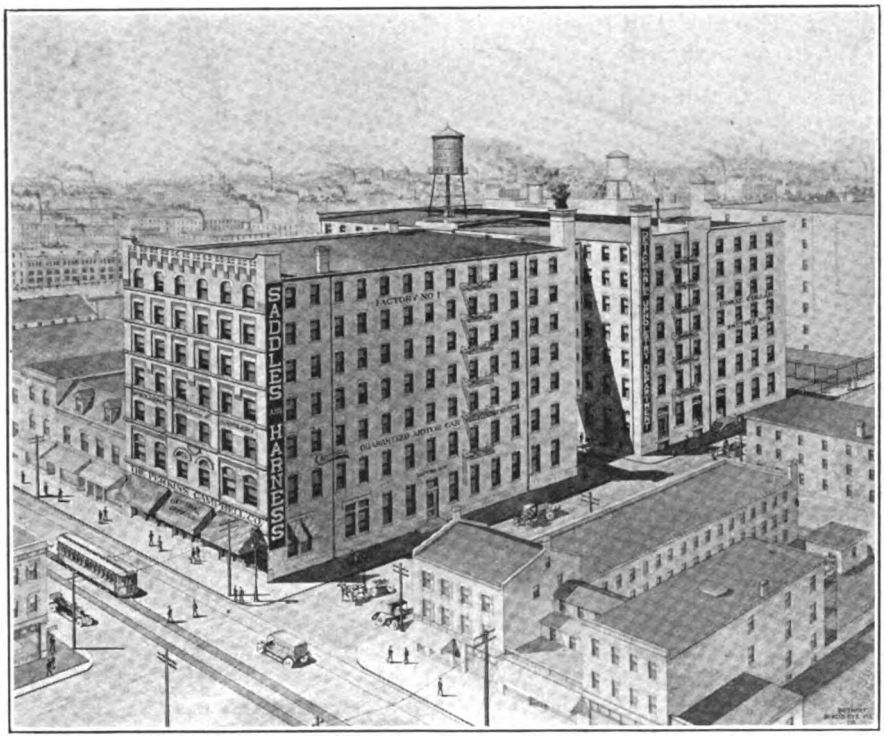
The Disco Electric Starter Company, Detroit, has increased its capital stock from $60,000 to $100,000, the extra $40,000 being subscribed by the present stockholders. It is said that still another increase is to be made to enable the company to build a larger factory and install the special machinery necessary for a large production.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

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A Large Manufacturing Plant.

A large majority of our readers are already familiar with the line of detachable upholstery for automobiles which has been placed upon the market by the Perkins-Campbell Company, 628 Broadway, Cincinnati, Ohio. Some may not realize, however, that all the large variety of goods marketed by this house



Perkins-Campbell Factory.

is made in their own factory in Cincinnati, and we therefore take pleasure in showing in connection with this article an excellent picture of their big plant which is busy up to its full capacity in the manufacture of automobile upholstery and other similar goods. Readers are urged to write direct to this manufacturer for sample and prices, also catalogue of other high-grade guaranteed motor car accessories. This literature will be found very interesting and it ought to be in the hands of every car owner and dealer.

The Carburetor With a Thousand Jets.

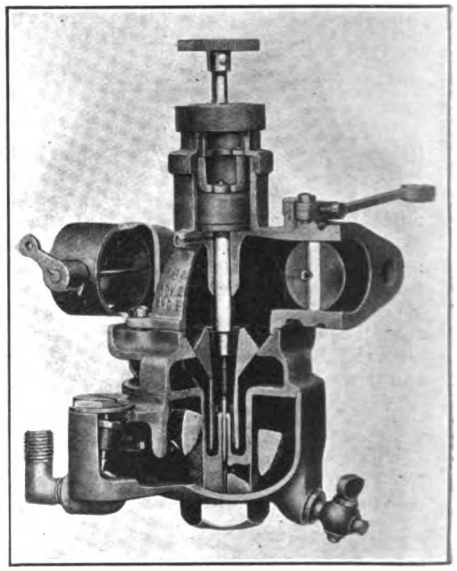
The Diamond Carburetor Co., Inc., of Colgate and Mercer Streets, Jersey City, N. J., has for the past nine months been putting out a carburetor which is specially designed for Ford cars. It runs the car smoothly and economically and can be attached to the Ford motor in about a half hour without extra manifold or fittings, and in which all the parts furnished with the Ford car, including the hot air pipe, dash adjustment, air shutter wire, throttle connection, etc., may be used without alterations. The Diamond carburetor for Ford cars illustrated herewith is but one of a line of carburetors which this company is bringing out for quantity built cars, so designed that they can be easily and quickly attached in the place of the present standard equipment. It is of the metering-pin type in which the air valve carries a fuel metering valve. It is called "The Carburetor of a Thousand Jets" because for every infinitesimal rise of the air valve there is a change in the opening of the fuel valve which has been worked out to be correct for the corresponding air opening. There is one moving part which controls the primary air, the auxiliary air and the fuel nozzle. The primary air is variable and admitted through the center of the valve past the nozzle, and the auxiliary air around the outside of the valve. The valve has considerable movement and the metering pin is of considerable length with the self-aligning point. The bearing part of the moving member is in an upper air-dash chamber. It is suspended as it were from the top and the bearing is not exposed to dust and abrasive matter passing through the carburetor. The air-dash plunger is made of solid graphite and self-lubricating.

There is but one adjustment which affects all speeds alike, once adjusted for high speed it is correct for low speed. The proper ratio of fuel and air has been worked out in the taper of the air and fuel valves. The adjustment affects the mixture throughout its entire range. The adjustment can be made from the dash or steering wheel by which the carburetor is adjusted while the engine is running without interfering with its operation. The carburetor can therefore be instantly adapted to any condition of temperature or power requirements. When the motor is cold the mixture may be enriched, and as the engine warms up the mixture should be cut down as much as possible. This company claims between 20 and 35 miles to the gallon on Ford cars.

The Ford type of this instrument has proven unusually pleasing in its performance, the acceleration is always smooth and the operation of the car is velvety. With the high gear clutch engaged the motor operates easily and for considerable distances when throttled down to a speed of five miles per hour, invariably accelerating without perceptible loading, missing or bucking. Owing to the automatic operation of the single part, this effect is secured independent of the rate of throttle movement, so that the instrument exhibits the attractive property of causing the engine to pick up gradually and smoothly, even when the throttle is suddenly wrenched wide open.

There are over six hundred of these instruments in operation on Ford cars since April of this year, when deliveries first commenced. Arrangements have been made with distributors in the following cities and states: New York, Chicago, Boston, Newark, N. J., Worcester, Mass.; New Haven, Conn.; Providence and the state of Rhode Island. The list price of the Ford model is $12.50. The other one-inch Diamond carburetor models which are suitable for the Overland, Oakland, Baby Olds, Buick and Maxwell cars list for $15.00. These models are made with top outlets, both in straight and cross flanges.

Ernest Charles Cox, president and general manager of the Diamond Carburetor Co., Inc., since its organization,



New Carburetor for Ford Cars.

has long been associated with the automobile industry in various capacities, devoting considerable time to the carburetor business. The instrument in its various forms is the invention of Carl F. Schulz, who is the company's engineer.

Ford Buys Saxon Stock.

Harry W. Ford, president of the Saxon Motor Company, has purchased all the stock which Hugh Chalmers, president of the Chalmers Motor Company, held in the Saxon company. The deal involves a cash transaction of half a million dollars and makes Mr. Ford the largest individual stockholder in the Saxon company.

"A Sure Start."

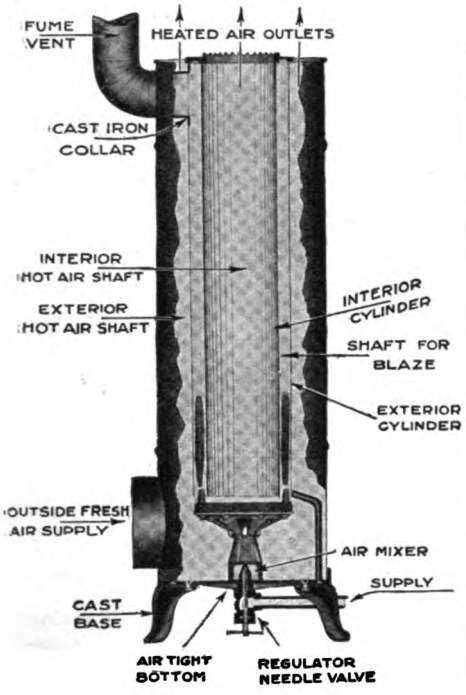
Under the above title the Electric Storage Battery Company of Philadelphia, Pa., has put out a booklet which is a discussion in most unusual form of the subject of starting batteries and springs, and the method of caring for the battery.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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The Reo Garage Heater.

Many of our readers know what it is to have trouble with their cars in the extreme cold weather. Great damage is often done by the freezing and bursting of radiators, and the cracking of water jackets due to freezing. Sometimes there

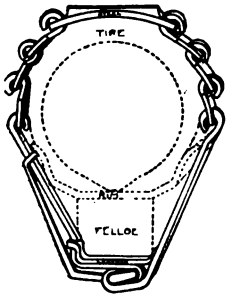


A Fine Garage Heater.

is ice in the batteries which also makes trouble, and also gumming of the oil in the working parts. All these troubles may be remedied by installing a good gas heater in your garage, and we illustrate herewith an excellent type of heater which is manufactured by the Edwards Manufacturing Company, 423-473 Eggleston Avenue, Cincinnati, Ohio. Now is the time to purchase heaters, and no doubt many of our readers will be glad to correspond with this company and get their prices. This is an excellent article for the dealer to handle at this season of the year.

Anti-Skid Mud Chain and Blowout Clasp

Illustrated herewith is a sketch of an anti-skid clasp which by a cam arrangement is clasped around the tire tight so that it presses into the rubber and sticks tight to it. Can be put on with one hand in a jiffey. Don't need to get off in the



Anti-Skid Tire Clasp.

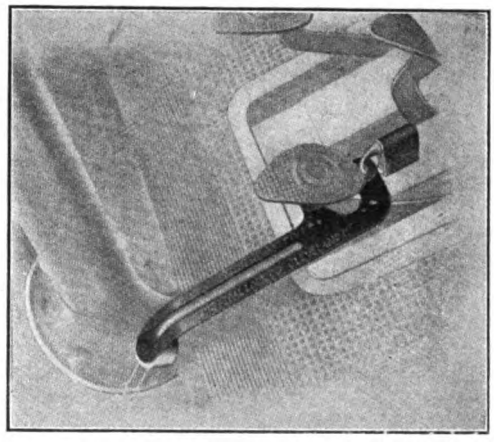
mud; just stand on the runboard. Place the chain over the tire, hooking the cam, and press the lever down; this tightens it on and locks it. Intended for use in mudholes. For instance, if the hind wheel is in the mud and slips around, one or more of these can be put on in a minute. These can also be put on over a swell or blowout in a tire and will push it down tight and hold any old blowout. One of these will generally take a wheel out of a slippery place, but for continuous running over a muddy road six at equal intervals are advisable to keep the car from slipping sidewise. Did your hind wheels ever slip around in the mud and your car stand still, and did you hunt up some boards and pull grass and shovel dirt and try to jack your car up to get chains on? These chains go on without raising the wheel, and quicker than you can say d——.

It is made from flat steel ⅛ of an inch thick, the tread plate being two inches wide and the links 1¼ inches wide. The cam is on one end and a hook on the other end which the cam hooks into when placed together. A piece of leather is placed on the steel band where it comes in contact with the felloe to keep from marring the varnish. The tread plate is corrugated to keep from slipping and has a surface of four or five square inches pressing flat against the tire and cannot roll like a common twisted chain and will not chatter the hind axle when running on pavement. The hooks on the sides will hold the wheel from slipping as soon as they sink in the mud—it cuts the rut wider instead of sinking the wheel deeper. To take them off, just jerk the little lever and off they come.

This device is manufactured by the Kimball Tire Case Company, Council Bluffs, Iowa, to whom all correspondence should be addressed.

Pedal Lock for Ford Cars.

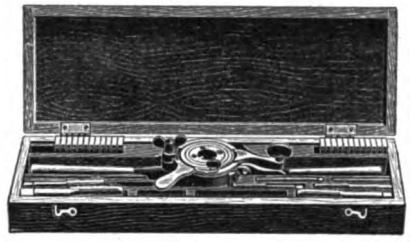
We illustrate herewith a pedal lock for Ford cars which is manufactured by the Commercial Manufacturing Company, Commercial building, Cleveland, Ohio. By regrettable error in our October issue an article was published relating to this lock and the wrong illustration was used, so that our readers would gain a very incorrect idea as to the appearance and method of this device. We are glad to make full correction at this time. The device is an excellent one and ought to appeal to a great many of our readers who own Ford cars or deal in them. This is a positive lock which makes it impossible for anyone to start the car, and the same manufacturers also make the locks for larger cars, such as the Overland, Studebaker, Oakland, Jackson, Cole and various others, but, of course, the Ford lock will fit no other make of cars. Correspondence is invited both from car owners and dealers. For full particulars write direct to the manufacturers.



A New Pedal Lock.

Automobile Screw Plates.

Screw-plates which thread eleven A. L. A. M. standard sizes of bolts and adjust perfectly for re-threading worn bolts to any size desired are made by the Oster Manufacturing Company, Cleveland, Ohio. A feature of these screw-plates is their simplicity of operation. The dies can be quickly adjusted for a tight or loose fitting nut or for any



Screw Plate Case.

variation, by one movement of the cam-handle. After the thread is cut the dies are instantly opened. There is no backing off over the finished threads. To change the dies it is necessary merely to release the clamps and throw the cam the full limit of travel, then remove and replace. A simple movement of the cam causes the self-centering guides to grip the bolt and hold it fast; one set of guides adjusts for all sizes the tool threads. Two cuts may be taken when the operator chooses to do so. The superior accuracy and lasting qualities of this screw-plate together with the ready adaptability described above recommend it to automobile men as specially suited to the precise and rapid operations necessary in a garage. Catalogue No. 20 describing these screw-plates may be secured free by writing The Oster Manufacturing Company, 2102 East 61st Street, Cleveland, Ohio.

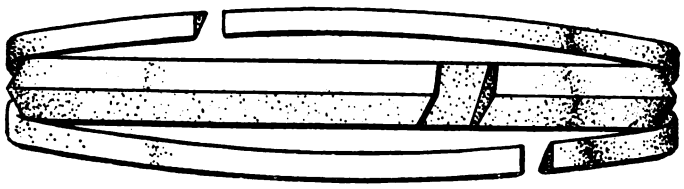
Extension for Chalmers Plant.

Contracts have been let for a four-story addition to the plant of the Chalmers Motor Company, Detroit. It will be 60 by 200 feet, and will provide 50,000 additional square feet of floor space. It will contain an extension of the machine shop and stock room.

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The R. & M. Conform Piston Ring.

The manufacturers of this piston ring make the point that it is mechanically right, and therefore will give 100 per cent. efficiency. It is claimed that it will also give more power to the motor with less gas. It is a scientific fact that piston rings give the best satisfaction which permit the least loss of compression and which give the least loss of power from friction, and the manufacturers state that this piston ring is guaranteed to do this; also to cut the



An Efficient Piston Ring.

cost of maintenance by reducing gasoline and oil consumption, and greatly eliminating carbonization and spark plug troubles. The illustration will give a clear idea of the construction of this ring. When the rings are compressed in the cylinder, the joints are concealed. Jobbers and dealers are wanted to handle this piston ring in every city. Whether you are a car owner or a dealer you are invited to write for prices and full particulars direct to the distributors, the Superior Auto Parts Company, 938 Fort Wayne Avenue, Indianapolis, Ind.

Gould Storage Batteries on Standard Cars.

The Gould storage batteries are used as standard equipment on a great many automobiles and, among others, this battery has been adopted as regular equipment by the Standard Steel Car Company of Pittsburgh, Pa., and agents for the Standard car are urged to write to the Gould Storage Battery Company, 30 East 42nd Street, New York, for list of service stations where these batteries are re-charged. Dealers in automobile accessories, garage owners and electrical dealers should also get full particulars as to the agency plan which is followed in marketing these batteries.

A Vigilance Committee on Advertising.

Many of our readers are undoubtedly familiar with the Advertising Men's League of New York City, which has its headquarters at No. 200 Fifth Avenue, New York City. The Vigilance Committee of this league has organized a movement the object of which is to raise the standard of practice in all advertising, and to prevent fraudulent advertising, so far as possible. At the regular meeting of the New York Trade Press Association held in New York City October 22, 1915, the following resolutions were unanimously adopted:

Whereas, the Trade Press Association has for one of its purposes the systematic promotion of honest advertising and the discouragement of dishonest advertising, and

Whereas we believe the organization and plan of the Vigilance Committee of the Advertising Men's League of New York, known as the Advertising Protective Bureau, will raise the standard of practice in all advertising and minimize the practice of fraudulent advertising;

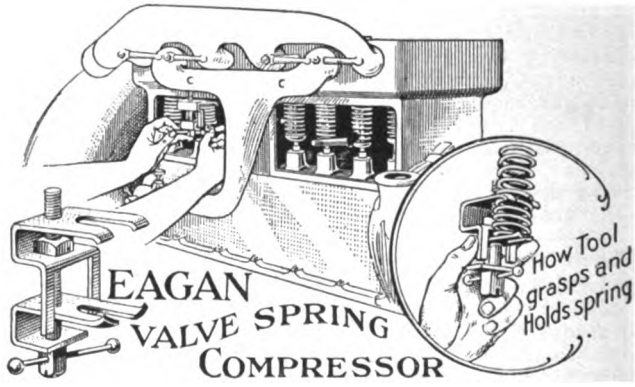
Be it resolved that the Trade Press Association endorses the objects and purposes of the Advertising Protective Bureau and its members do hereby agree to individually give the bureau their unqualified support and active co-operation, and

Be it resolved that the secretary be instructed to advise the Advertising Protective Bureau accordingly.

All publishers and reputable advertisers should share the opinion of the New York Trade Press Association, that the work of this Vigilance Committee ought to be warmly supported, not only by publishers, but by advertisers throughout the greater city.

Eagan Valve Spring Compressor.

This is a simple device as illustrated herewith which is especially intended for removing the springs from Ford valves or any other small car. With this tool any handy person can remove valves for grinding without being obliged to remove manifold, exhaust or carburetor. It is not a cheap cast-iron affair, but is made out of the best sheet steel, properly hardened and absolutely guaranteed, as it is practically indestructible. The method of working is clearly shown in the accompanying illustration. Dealers or car owners who may be interested should write for full information to Fred Gabriel's Auto Supply Company, general distributors, 1165 Bedford Avenue, Brooklyn, N. Y.



Movement to Protect Accessory Dealers.

An interesting announcement is the one just made by Mr. E. H. Schwab on behalf of the Silvex Company, manufacturers of the Bethlehem five-point spark plugs. "This concern," stated Mr. Schwab, "has decided to take immediate and drastic action in regard to the cutting of prices on the Bethlehem spark plug by the so-called mail-order and cut-price houses with a view of giving to the legitimate jobber and dealer in automobile accessories the protection to which they are entitled. Having created a tremendous demand for Bethlehem plugs by an insistent and expensive compaign of advertising, the Silvex Company is in a position to understand the havoc raised by these cut-price houses in so far as the business of the legitimate dealer is concerned."

Mr. Schwab has stated on numerous occasions that it is his belief that a manufacturer of automobile supplies is in no position to expect the co-operation and support of the legitimate jobber and dealer, when, at the same time, he sells either directly or indirectly to a cut-price house wth the full knowledge of the fact that such house will inevitably cut prices in order to secure business on the product.

An idea of the importance of this announcement can be obtained when one knows that Mr. Schwab has stated that the adoption of this policy means the voluntary surrendering of a business of more than 100,000 Bethlehem plugs per year, which can be secured without difficulty from cut-price houses. "The Silvex Company," further states Mr. Schwab, "invites suggestions from all legitimate dealers as to further stands that may be taken to give them complete protection."

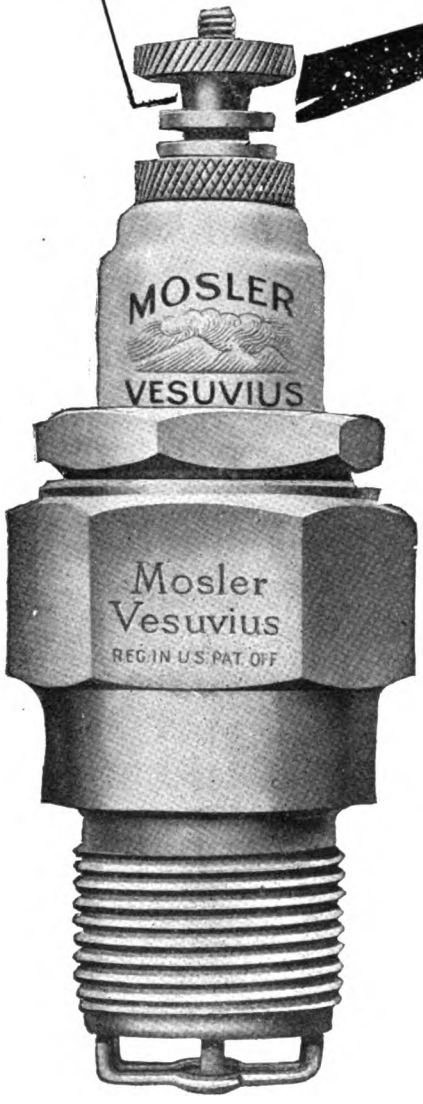
Unico Bodies for Ford Cars.

These are manufactured in limousine and coupe top styles by the Unit Construction Co., 125 South 31st Street, Philadelphia, Pa., at a price of $75 and upwards. These tops are of the best body construction with wood frame, metal panels, glass sash, minimum steel and hardwood, and maximum glass. Strength is combined with light weight. The tops are also finished in the best manner, as they have a seven coat exterior coach finish, and the interior has a full upholstered lining. Materials of the highest quality is used in every detail of these tops. The adjustable windows are set in rubber. The tops are also provided with electric dome lights, and sedan doors, with all necessary fixtures complete for quick attachment. A most liberal proposition is made to agents and dealers, and these tops should not be confounded with the many cheap articles of this character on the market. Exclusive agencies will be placed in every town, county, and city, east of the Mississippi River, and dealers who wish to secure agencies should act quickly, as territory is being closed daily. Write, wire, or call on this company at the address named for complete information and details.

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Trade Discounts





A New Schedule of Trade Prices on the

MOSLER VESUVIUS PLUG

has been fixed.

It means greater and better profits for the dealer. The plug itself has been simplified and improved.

It has the same indestructible "Vitite" (stone) insulation that made it famous.

It has the same knife-edge sparking points that give extra power.

It is made any size—any thread so that it fits any motor.

It has no equal for power and speed—and—
It is guaranteed for the life of the motor.
The price remains the same,

$1.00

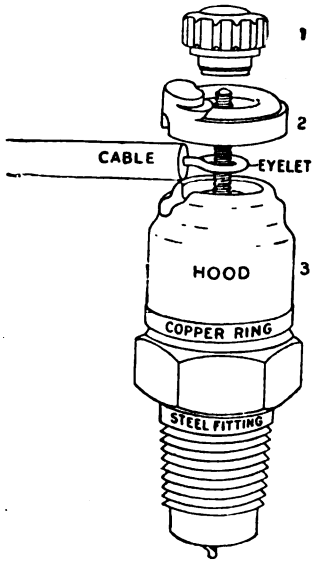
Get your discount schedule today. It is fixed—the same to dealers the world over. Get it—because it opens the way to greater profits.

A. R. MOSLER & COMPANY
NEW YORK, N. Y.

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The Herz Ford Pro-mo-tor.

This is a new spark plug especially designed for the Ford car. The illustration will give an excellent idea of the novel features which have been incorporated in this spark plug. The plug is completely protected against leakage, moisture, dirt or slush by the hood and the new patented terminal. The hood is made of stone and completely encloses and protects the inner insulation. It has



Plan View.

a copper rim on the open end which makes it almost unbreakable. The upper end is formed so as to provide for the entry of the cable. A peculiarly shaped rubber cap fits over the top of the hood, and with the insulated top nut forms the cable connection. The claims made for this plug are that it is absolutely self-cleaning, soot-proof, waterproof, dust-proof and shock-proof. The workmanship and material are of such exceptionally high character that only the large quantity of production makes it possible to produce such value at the price, which is only $1 postpaid, or at all dealers. It is manufactured by Herz & Co., 245 West 55th Street, New York, and correspondence is invited from dealers, repairmen, garage owners or car owners.

The Lion Trailer.

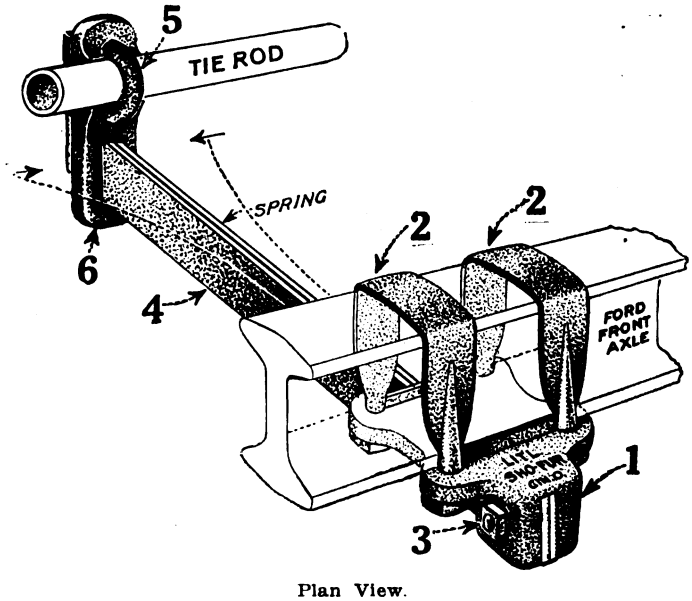
The attention of motorists throughout the country has been directed recently in the strongest way to the idea of attaching trailers to pleasure cars and by this means getting all the advantage of delivery wagon use from an ordinary car. The Lion Economy Trailer has been manufactured for this purpose, and it can be attached or detached to any car in an instant. It is a great convenience for farmers, dairy men, grocers, carpenters, merchants, hotels, contractors and many others, and it is claimed that the weight of material carried in this way consumes less power and gasoline than to carry the same load on the car. Distributors, dealers and agents for the Lion Trailer are wanted throughout the country, and exclusive territory contracts are now being made as rapidly as possible. The Lion Trailer offers a new, broad and profitable field for live representatives everywhere and dealers or any others who are interested in an agency for this article should write at once, mentioning the territory wanted. Address all inquiries to the Lion Buggy Company, Department A. R., Cincinnati, Ohio.

The New York Automobile Show.

According to present indications the coming automobile show in Grand Central Palace, New York City, will be the greatest of its kind ever held. The show will open on New Year's eve, December 31, 1915, and continue until January 8, 1916. It will be, as usual, under the auspices of the National Automobile Chamber of Commerce, Inc., and S. A. Miles, as in years past, will act as manager, which in itself is a sufficient assurance that the show will be skillfully and successfully conducted. The Chicago show, under the same management, will be held at the Coliseum and First Regiment Armory, from January 22nd to 29th, 1916, inclusive.

The Litl Sho-Fur.

This is the trademark name for a new device which has been brought out by the White Mfg. Co., 713-715 Main Street, Cincinnati, Ohio, and which is illustrated herewith. This device may be attached to any Model T Ford car without any machine work or even the boring of a hole. A pair of pliers or wrench to tighten the nuts is all that is necessary to apply it, and anyone can put it on a car in ten minutes. It attaches to the front axle of the car by means of two strap bolts. The two-leaf spring of specially tempered spring steel passes through the eye clamped on the tie rod. When the tie rod which connects the front wheels is moved to either side the



Plan View.

spring tends to return, center, or bring the rod back to its normal position. This is a safety device which will appeal to every driver of a Ford car. In turning corners, it straightens the car up without effort after the turn. It also helps to steer the car all the time, and holds the car in a straight line on the road when going at high speed. It does away with the wobble of the steering wheel, which sometimes causes a dangerous side sway even at moderate speed. It also prevents skidding to a large degree, and takes away the rattle of steering connections, tie rod, ball and socket joints, etc. It absorbs road shocks which would otherwise be carried to the driver's wrists, and prevents that tired feeling that comes after long drives. We understand that this device is moderate in price, and any of our readers who may be interested should write for prices and full particulars to the manufacturers at the above address.

The Cleveland Spring Cranker.

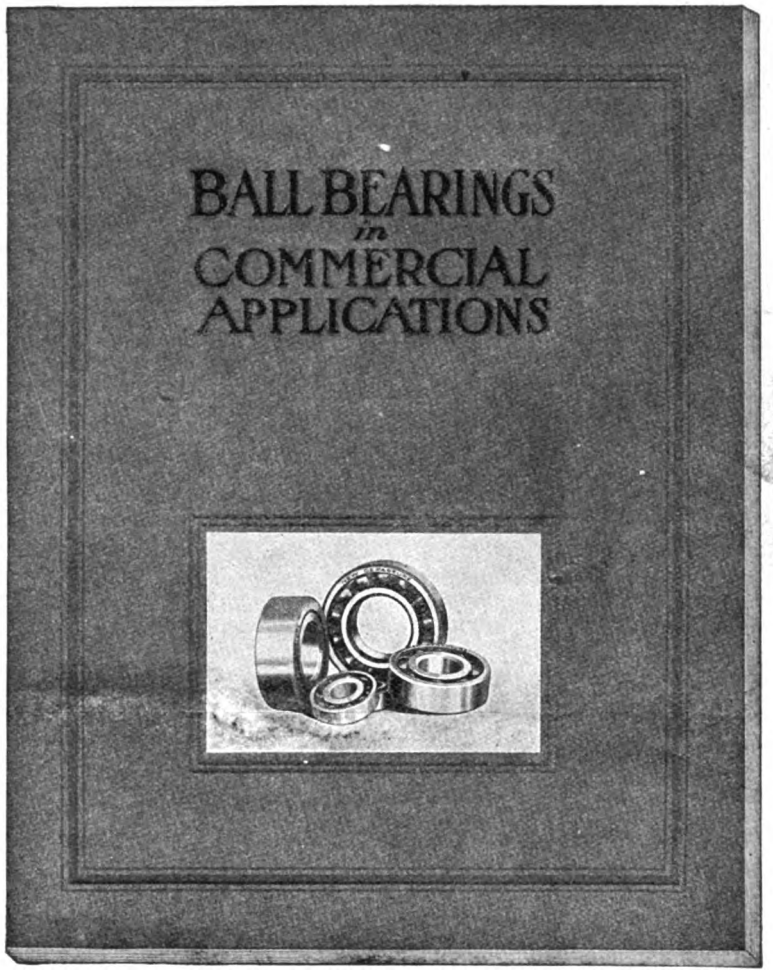
This is a new device especially made for starting Ford cars from the seat. It is designed and manufactured for Ford cars, and sold to Ford owners through the dealers, under the manufacturer's guarantee for one year. The device is simple and inexpensive, yet it does the work perfectly, and any reader who may be interested should write for full particulars direct to the manufacturers, the Forest City Electric Company of Cleveland, Ohio.

Cigars on Trial.

Every lover of a good cigar should turn to the advertisement of Herbert D. Shivers, 21st and Market Streets, Philadelphia, Pa., on another page and read his remarkable offer. He will send you fifty of Shivers' Panatelas on approval and pay the express charges without the payment of any money on your part. You can smoke ten of these cigars to see whether you like them or not and return the other forty at Mr. Shivers' expense if you don't like them, and no questions asked. If you do like them, you send him the price of the box of cigars. Of course, it goes without saying that Mr. Shivers, who has been making cigars for a quarter of a century or more, could not afford to make an offer of this sort unless he felt sure of the quality of his goods. It is coming along towards the holidays when a box of good cigars to a friend is always an acceptable present. When you order the fifty Panetalas referred to, ask for Mr. Shivers' booklet which will give you further particulars about the great variety of other cigars which he carries; some sold in boxes of 25. State the brand that suits you best, mild, medium or strong.

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NEW DEPARTURE BALL BEARINGS
American Made for American Trade



THE most enlightening book ever written on this subject.

It covers thoroughly the use of Ball Bearings in Automobile Trucks, Motors, Tractors, etc., and shows conclusively the economic advantages to be derived from the elimination of friction through the substitution of Ball Bearings for those of other types.

This book, now on the press, will be mailed free to Manufacturers, Purchasing Agents and bonafide users of the apparatus mentioned if asked for on your letter head.

THE NEW DEPARTURE MANUFACTURING COMPANY

Distributors in Trade Centers Throughout the United States

BRISTOL, CONNECTICUT, U. S. A.
Conrad Patent Licensee

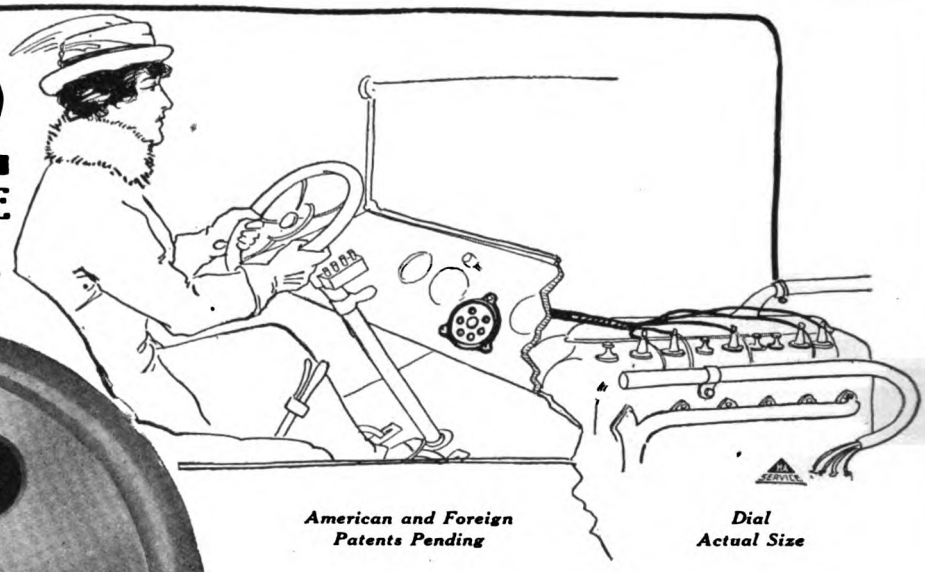
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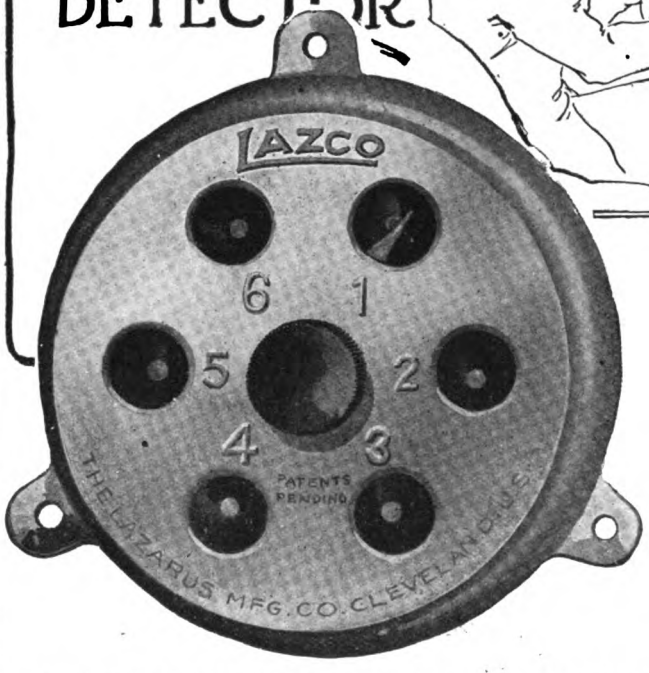
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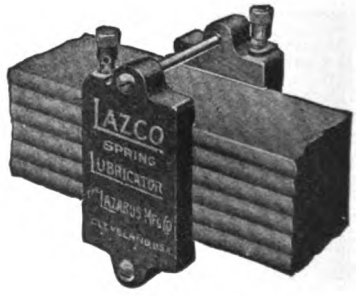
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Garage Repair Sets.

Wiley & Russell Mfg. Co., Greenfield, Mass., make a repair set of taps, dies and reamers, especially for Ford cars. This assortment of taps, dies and reamers has been selected to meet the demand from garages and repair shops, and is based on their experience in handling repairs on Ford cars. The tools are

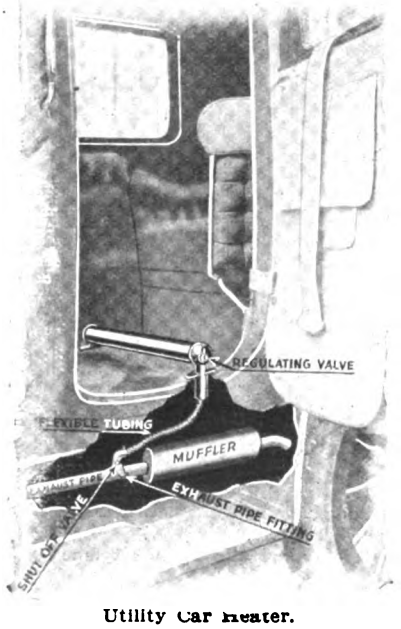


Made by the Wiley & Russell Mfg. Co., Greenfield, Mass.

of the celebrated Lightning quality which has been in the front rank for nearly 45 years. The price of this set of tools is low considering its quality.

A New Car Heater.

The Utility Car Heater, made by the Hill Pump Valve Company, Chicago, Ill., keeps the car heated at comfortable



Utility Car Heater.

temperature in coldest weather without costing a cent for maintenance. The Utility Heater is a radiator and footrest combined and it utilizes the hot gases from the engine exhaust. The gases, instead of being wasted, pass through the heater when it is in operation and escape into the air beneath the car. The temperature is kept at the desired point by means of a regulating valve inside the car. It gives off no obnoxious odors or gases, and cannot burn anything, and can be permanently installed in half an hour. Garages and accessory dealers can make money pushing the sale of this heater at this time of the year, because if the heater is used it will make it possible for cars to be used all winter, thus giving them an opportunity of furnishing other supplies.

A New Book on Springs.

A book prepared to answer hundreds of inquiries regarding one point or another about automobile springs has been brought out by the Detroit Steel Products Co., of Detroit, Mich. This book is entitled "The Springs on Your Car." It is written by an engineer who has the gift of making himself understood by the layman, and we understand that it will be sent free of charge to parties who are really interested in this important subject.

Detroit Double Service Tires.

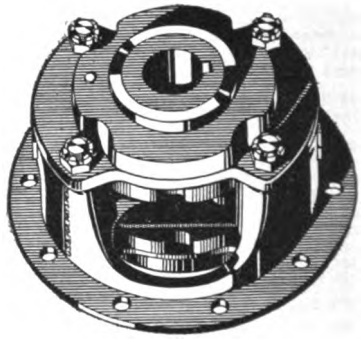
This is a tire which the manufacturers state is absolutely puncture proof. There is a double thickness of rubber and of fabric to protect the tread, and these tires are not made by merely stitching a fairly good casing over a hopelessly worn tire. Both casings are good and they are joined by a special process of vulcanizing, reinforcing, and heavy lock stitch sewing, making what the manufacturers characterize as a "peach of a tire," puncture proof, strong, oversize, and very durable. Readers are urged to write for prices and full descriptive matter to the Detroit Double Service Tire Co., 950 Woodward Avenue, Detroit, Mich.

Socket Wrench Sets.

The Packer Auto Specialty Company, People's Gas Building, Chicago, will shortly place upon the market a very complete line of socket wrench sets. This line will comprise the following sets: No. 6, in canvas case with glove button fastener flaps; No. 6A, in fibre case with flaps; No. 11, No. 22, No. 33, No. 39, No. 11a, special for Ford cars. In each of the above instances the number of the set designates the number of sockets contained therein. The No. 39 set will be most complete, having a complete assortment of socket wrenches, handle, long extension bars, five "S" wrenches, 8-inch drop forge Stillson wrench, combination screw drivers, short extension bars, cotter pin extractor, and other miscellaneous tools, making it what will be known as the "Universal Set, No. 39." A general catalogue featuring all of the above will be furnished upon application. This line was previously handled by the Fulton-McCutchan Company, who recently went into the hands of the receivers.

The Bailey Gearless Differential.

This article, which is illustrated herewith, ought to be interesting to a great many of our readers. The manufacturers claim that by the use of this device the motorist can laugh at snowy, sleety, slushy, slippery roads and drive any car in safety during the worst weather in winter. Thousands of car owners have installed it and thousands more will do so in the next few months. Ford, Overland and Chevrolet replacements in this differential are now ready for the market, and every Bailey gearless differential is sold on a guaranty of satisfaction or money back in thirty days. If you have this device installed on your car it is claimed that skidding, slipping and sidesway are absolutely eliminated. A positive drive is delivered to both rear wheels, and the power is only delivered to the wheel having traction. If you want your car to pull through roads which would ordinarily be



A New Differential.

impassable, it may be well to look up this invention, and dealers are especially urged to write to the manufacturers for their complete plan of co-operation. Address all inquiries to the Gearless Differential Company, 866 Woodward Avenue, Detroit, Mich.

Meco Engines for Garages.

There is nothing so handy for power in a garage as a good gas or gasoline engine, and the Meco engines made by the Manufacturers' Engine Company, 1879 Crystal Avenue, Kansas City, Mo., are especially recommended for this business. These engines are of a high quality through and through; they are of the center-firing, valve-in-head type, with automobile style ignition, also safety spark shift for easy and safe starting, without cranking. The best of materials and workmanship are used in all these engines with up-to-date fuel-saving design. They are simple to operate and durable under the hardest wear, giving even speed and continuous power. They are not only adapted for power in the garage, but many dealers and garage owners who read this publication can successfully act as agents for this engine, which is offered to dealers at an excellent profit. Readers who are interested should write direct to the manufacturers for full particulars.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

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Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

OVERHAULING

Time is here and we are here to help you do it as cheaply as possible.

SPECIAL BARGAINS.

MITCHELL 4-cyl. motor, 30-35 h.p.	$100.00
VAN 22 motor, 20-22 h.p.	75.00
RAMBLER, 35 h.p. (overhead valve)	60.00
MUNCIE transmission with multiple disc clutch and levers	65.00
CROXTON Keeton transmission with levers	75.00
WESTON Mott semi-floating rear axle, complete	45.00
ELMORE front axle, 30 inch centers, complete	14.00
KRIT, left or right hand, steering gear	9.00
HARTFORD cone clutch, 15¾ inches, with joint	22.00
MICHIGAN, 40 frames, 145½ inches long by 30 by 33 inches wide	10.00
PRESSED steel step brackets, each	.45
STAD body (upholstered), will fit Ford	50.00
GOLDBERG mufflers, 16½x5½x1¾ cutout	2.00
LEATHER cushions (single for front) each	3.50
LEATHER cushions (double for rear) each	6.50
KRIT gasoline tanks, 8x13x29 inches	2.50
DISCO 12 volt starting motor	15.00
SCHEBLER model L carburetors, 1½ or 2 inches	12.00
RAYMOND brake bands, 10x2 inches each	1.00
34x4 inch wheels with Baker demountable rims, set	20.00

GUARANTEED RADIATORS.

PLAIN to fit Ford car	17.00
"V" SHAPE to fit Ford car (brass)	21.00
BUICK model 10 (give year)	20.00
HUPMOBILE 32	32.50
"V" SHAPED or plain radiator for any car. Write for special prices.	

FORD SPECIALS.

1916 cowl dash Ford touring car bodies (new) with top, side curtains, slip cover, windshield, rear fenders, fender irons, floor boards and mats	95.00
SPEEDSTER outfit complete, including "V" shape radiator	65.00

WRITE for specifications on these parts if in doubt as to whether or not you can use them, or send us specifications and we will help you make a selection. This is only a partial list of our complete stock.

Send for our No. D920 Catalog.

AUTO PARTS COMPANY

737-39 W. Jackson Blvd. Dept. D. Chicago, Ill.

Chatfield Indestructible Tubes

WILL (not) LAST FOREVER

but come mighty near it and don't cost much more than any other good tube. Write us for full particulars.

IT WILL PAY YOU WELL.

CHATFIELD TIRE COMPANY, 312 W. 52nd St., New York City

WE ARE PIONEERS

With Specialties For FORD CARS

OUR PRICES ARE RIGHT.

OUR MERCHANDISE IS THE BEST.

Buy from us and you buy right. Our Catalog yours by asking for it.

General Automobile Supply Co.

1671-1673 Broadway NEW YORK

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete

$25.00 Models

Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00.
Odometers reset to zero, 25c.

All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.

51 West 63rd Street New York, N. Y.

AUTO DEALERS, AND REPAIR AND GARAGE MEN

New Catalog and Lists ready Now.

Send for copy. Wholesale only.

Special prices on Piston Rings, Brake Lining, Grease Cups, etc. Send us your list of wants for special quotations.

WESTCHESTER ACCESSORIES COMPANY

1777 Broadway, New York City

Fore Doors for Open Front Cars

Prices right. A postal will bring particulars. ECONOMY SERVICE CO., 2714 Boulevard Place, Indianapolis, Ind.

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

Auto Accessories

SNAPS

D. W. F., Rheinland, New Departure, Hyatt, and other standard makes annular bearings, all sizes 40 per cent. off list: Timken bearings and cups all sizes 20 per cent. off list:

Rayfield 1¼ in. and 1½ in. carburetors	$15.00
Stromberg carburetors G 1¼" double jet	11.00
Schebler Model R 1¼" carburetors	12.50
Schebler Model L 1¼" carburetors	8.00
Marvel, Holley or Kingston carburetors 1½"	3.00
Prestolite tanks, Model B, filled	11.50
Stewart Speedometer, Model B, $50 list	12.50
Same with clock and electric light comb. list $85.00	20.50
Magnetos Bosch 6-cylinder DU 6 H.T.	50.00
Elsemann H.T. 6-cylinder E.M.I.R. 6	42.50
K.W. High Tension 6-cylinder	20.00
Comb. Tool Box & Running Board 60"	2.50
Rambler Motor 4-cylinder, all models	135.00

Other parts and accessories at equally low figures.

AUTOMOBILE APPLIANCE CO.

1436-38 Michigan Avenue

CHICAGO - ILLINOIS

STOCK TAKING—SUPPLY BARGAINS

Desirous of cleaning up a few job lots we have on hand, therefore will offer them at specially reduced prices.

Call and look over our stock. We have the most complete "Automobile Plant" for retail business in the world. Everything from a cotter pin to a complete car.

A few of our specials are: One-man tops (all years), $25; windshield, $8; self-starter, $6.50; shock absorbers, $3.85 (set); tool boxes, 75 cents and up; speedometers (Stewart), $6.45; sloping hoods, $6; lamp sets, $4.25 up; demountable rim sets (painted or natural wood), $12.50; new runabout bodies, $35; carburetors, $5 up; Remy complete dual system magnetos, $25; Splitdorf, $17.25; bearings, $1 up (bring in old one and we will dublicate at a great saving); electro horns, $1.60. Rims, all kinds and sizes at a big reduction. Electric lamps, $5.50 pair; windshields, $9; spark plug pumps, $3.75; Prestolite tanks, $7; Pyrene fire extinguishers, $5.50; lap robes, $1.85; gloves, $1; spark plugs, 15 cents; wrenches, 8 cents up; clocks, 90 cents; mirrors, 60 cents; storage batteries, $7; fur coats, $15; tops, $15; sweaters, $2; trunks, $5; dashboards, $1; runabout or racing seats, $8.40-$16; wheels, $1; bodies, $35; transmission, $20-$45; axles, $10.

TIMES SQUARE AUTOMOBILE CO.

World's Largest Dealers

Broadway & 56th St., N. Y. 1210 Michigan Ave., Chicago

ONE MAN TOPS—$20, $25

Fit Fords and others. Top enveloped, $1.

20th CENTURY COMPANY, 1694 Broadway cor. 53d St., N. Y.

BUY WRITE—Get Our New Catalog before placing your orders.

NEW YORK & BROOKLYN AUTO SUPPLY CO.

1717-1719 Broadway Established 1905 New York

ALL TYPES OF BEARINGS

The New Departure Service Station

THE GWILLIAM COMPANY

ENGINEERS

Specialists in Bearings

NEW YORK, 253 West 58th Street, (at Broadway)
PHILADELPHIA, 1314 Arch Street.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

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Tires

OWNERS
CUT YOUR TIRE BILLS
BY USING
Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

For all other sizes write for prices.

Be sure to state the bead, whether Q. D., Straight bead or Clincher.

M. LIBEN & CO.
27A East 110th St. NEW YORK CITY
Branch: 205 W. 48th St., New York City

Double Tread Tires
AT 75% SAVING
GUARANTEED 3500 MILES

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.00	$8.75
30x3	$5.00	$5.25	36x4	8.00	9.00
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
32x4	7.00	8.00	36x4½	9.00	10.00
33x4	7.50	8.25	37x4½	9.00	10.00
34x4	7.50	8.25	37x5	10.00	11.00

These Tires are absolutely Puncture Proof.
Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
243a West 56th Street NEW YORK

TIRES TIRES TIRES
Automobile Dealers Take Notice.
We now offer for sale our Henschel Special tires in a sizes and types. Write for our special dealers' proposition
HENSCHEL TIRE & RUBBER COMPANY
1675 Broadway, New York City

OLD TIRES RECLAIMED
Making Them Practically Puncture Proof

Why not get 2,000 additional miles out of your old casings, in place of throwing them away? Others are doing it. Why not you? Reclaiming prices sent on request.

COWANS BROTHERS
150 West 55th St. New York
Branch: 815 North Broad St., Philadelphia

Tires

TIRES TIRES
NEW TIRES GUARANTEED 3500 MILES
40% off Standard list price

We also carry a large stock of
Double Tread Tires
GUARANTEED 3500 Miles
AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
NEW YORK CITY
The Home of Double-Tread Tires

DOUBLE TREAD YOUR OWN TIRES. You can do it yourself with the Ruff Wire Outfit. Make two old tires into one and get this additional service at a cost of less than 50 cents per tire. Dealers, Repair and Garagemen, make money Double Treading Tires for your customers. Complete outfit and stock, enough for 4 large tires, $2.50. Address, Tire Trading Co., 50 William St., Newark, N. J.

SAVE YOUR OLD TIRES
AND HAVE THEM
Reclaimed for $2.00 to $4.00
ACCORDING TO SIZE.

SQUARE DEAL TIRE EXCHANGE
247 West 49th Street NEW YORK CITY
Write for catalogue on Double Tread Tires.

TIRES
Every Tire User is aware of the great savings by using Double Tread Tires; providing he buys the right kind of Double Tread Tires of the right kind of people. Buy of us and you know that you get the right kind at the following prices.

30 x 3	$4.50	34 x 4½	$9.00
30 x 3½	5.50	35 x 4½	9.50
32 x 3½	6.50	36 x 4½	9.50
34 x 4	8.00	37 x 4½	10.50
36 x 4	9.00	37 x 5	11.00

One dollar extra for non-skid.

A deposit of 10% is required on all C.O.D. orders. You can save C.O.D. charge by sending a money order. Please specify in order whether Q. D., Clincher or Straight Side desired.

For rebuilding the old tires the price is 40% from above list.

R. K. TIRE CO.
1401 Ridge Avenue PHILADELPHIA, PA.

Tires

SAVE 75%
ON YOUR
TIRE BILLS
BY USING OUR
DOUBLE TREAD TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

For retreading your old tires we charge you 40% off above prices. *10% Deposit.*

ALL TIRES GUARANTEED

These are our prices for double tread tires in stock, net.

These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

We also carry a complete line of new inner tubes prices as follows:
30x3.....$2.00 30x3½.....$2.25 34x4.....$3.25
Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

SAVE YOUR OLD TIRES
Send us **2 OLD TIRES**, one with a good bead and the other with a good tread, and **WE WILL COMBINE** them by our **DOUBLE TREAD SYSTEM** into a **SOUND ONE** for a cost from $2 to $4, according to size.

If you have **ONLY ONE** tire in this shape, we can **Furnish** you with the **Other** one at a cost from $4 to $9.

If you have **NO OLD TIRES** to have remade, you can **Order Ready Remade** ones, that we carry in stock from $4 to $12.

POSNER & BLOCK
1211A Bedford Ave. BROOKLYN, N. Y.

Miscellaneous

PISTONS! RINGS! PINS!
LIGHT CAST IRON PISTONS
Standard or Oversize.
LEAKLESS or COMMON RINGS
Standard or Oversize.
PISTON PINS
Carbonized Ground, Standard or Oversize.
For any make motor. We make them by 1000 with automatic machines, therefore the price. Large stock always on hand.
McCADDEN MACHINE WORKS, St. Cloud, Minn.

CYLINDERS REBORED
Best quality piston and rings fitted, any make and size. $3.00 and up.
KENNEY COLWELL CO., NORFOLK, NEBR.

PAINT YOUR OWN CAR
FOR $4.00. Write for interestiug booklet and color card. We can save you money.
ECONOMY SERVICE COMPANY
2714 Boulevard Place Indianapolis, Indiana

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Miscellaneous

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

CYLINDER GRINDING
NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order. Prompt and reasonable.
NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

"Beats-All" TAR and STAIN REMOVER
The only product of its kind. Removes dullness, stains and tar from cars and renews surfaces. The great demand brings overwhelming sales. Write for samples.
ATTRACTIVE AGENCY PROPOSITION.
FORDHAM CHEMICAL CO., 1021 E. 178th Street, New York City

INCORPORATE your business. Avoid partnerships. Protect private personal property from business ventures. Stock companies incorporated. Fees small, blanks and information free. Philip Y. Lawrence, former Assistant Secretary State, Huron, South Dakota.

CYLINDERS REBORED & REGROUND
Fitted with light weight pistons and Trump Multiple Piston Rings. $6 to $15 per cylinder. Fords a specialty. Reground, new pistons, Trump Multiple Piston Rings, bushings and wrist pins, $32.00, plain rings, $20.00.
TRUMP MANUFACTURING CO., CROWN POINT, INDIANA

Gears and Parts

GEARS AND SHAFTS
Piston Pins
"Manufacturers for the Trade"
SERVICE GEAR & MACHINE CO.
READING, PENNA.

WE CARRY IN STOCK
STODDARD-DAYTON PARTS
DAYTON AUTO REPAIR COMPANY
353 West 52nd St., New York City

MARION AMERICAN PREMIER
We furnish all gears for these machines at a discount of one-third off of regular prices. Every order filled same day received.
We guarantee absolute accuracy.
Write for price list and further particulars.
STANDARD MOTOR PARTS COMPANY
587 Franklin Street DETROIT, MICH.

K-R-I-T
OWNERS
We have sole possession of all patterns, engineering records, etc., from which Krit cars were made. We, alone, can furnish prompt, accurate and dependable service on Krit repairs. Address all mail the same as always, to the Krit Motor Car Co., Detroit, Mich.

ALL KINDS AUTOMOBILE PARTS bought and sold. Write us what you want or have to sell. Motor Parts Listing Company, Listing Dept., Detroit, Mich.

Spark Plugs

FORD OWNERS—Easier starting guaranteed by using LIGHTNING Spark Plugs; something new; nickel plated. Made of finest material. Guaranteed one year. Regular price $1.00. Special introductory offer 50 cents each by return mail postpaid. Send dealer's name. Automobile Equipment Co., Plug Dept., Martinsburg, West Virginia.

Piston Rings

We have the largest
CYLINDER GRINDING
organization in the East.

We carry the largest stock of
PISTONS
of various makes and sizes obtainable.

We make the best
PISTON RINGS
that mechanical ingenuity can design.

That is why we are recognized as the standard for Quality and Service.

Houpert Machine Company
355 West 52nd Street New York, N. Y.
Telephone, Columbus 6730

WE SPECIALIZE IN CYLINDER GRINDing, pistons and rings. First class equipment, 20 years' experience make low prices possible. Ford and Metz cylinders reground, new pistons and rings, $20. Bridgeport Piston Ring Co., 346 Connecticut Ave, Bridgeport, Conn.

PISTON RINGS—Simplex Leak Proof for Ford cars, 50 cents each. Dealers, or Peerless Piston Ring Co., 91 Lafayette St., Newark, N. J.

Magneto Parts

MAGNETO PARTS
We manufacture parts for all types of
Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos
Liberal discount to the trade.
Illustrated Catalogue on request.
MAGNETO PARTS CO., Inc.
1790 Broadway New York City, N. Y
If interested in agency write for particulars.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Welding

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WELDING PLANTS--$25 to $250
LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.
Write at once to Manager Dept. B.
BERMO WELDING APPARATUS CO. OMAHA, NEBR.

For Sale

FOR SALE.—25 Lincoln milling machines; $35 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

FOUR LINCOLN MILLING MACHINES $50.00 each. Send for photo. Lucas & Son, No. 3 Fox St., Bridgeport, Conn.

10 NEW CROME NICKEL STEEL AUTO Frames, $10 each. Send for sketch. Lucas & Son, Bridgeport, Conn.

FOR SALE—Up-to-date garage equipment; good reasons for selling. Write for particulars. Click Bros., Cardington, Ohio.

FOR SALE—Gentlemen's Fur-Lined Overcoats, manufacturers' samples. Black broadcloth outside, lined throughout with mink dyed marmot, a beautiful fur, like mink, large handsome Persian lamb collar, all sizes, price $29.50, would retail for $60. Sent for examination, you take no risk, examine before paying. Write to-day, stating size, and enclose 50 cents for express charges only and coat will be sent at once. E. Hart, Department D, 518 W. 134th St., New York.

BEST FORD WHEELS AT LOWEST PRICES—Oiled or painted wood wheels with detachable rims for Ford cars at far less than manufacturers' prices. Get full particulars of these remarkable values immediately. Address B. J. Potter, Okemos, Mich.

FOR SALE—White Steamer, Model 00, in fine shape, $300. Steam engine and all parts for Model 0 Steamer. Wm. H. Thorne, Megiddo Mission, Rochester, N. Y.

FOR SALE—Splendid garage and accessory business with agency two popular cars, six counties, Western Montana. Address P. O. Box 1394, Missoula, Mont.

Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

If You Have An Idea PATENT IT
Patented Ideas Make Money. We Show You How. Send for Free Book.
Williamson & Williamson
1325D Arch St., Philadelphia, Pa.

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book "INVENTIONS —PATENTING AND PROMOTING," free. Lancaster and Allwine, 212 Ouray Building, Washington, D. C.

Help Wanted

SALESMEN to demonstrate and sell automobile specialties. Man with car preferred. Liberal commissions. Sales manager, 650 Woodward, Detroit, Mich.

WANTED—Salesman calling upon garages and automobile dealers to sell the best specialty known. Quick sales—liberal commission. Sample outfits free. Can be carried in vest pocket. State territory and lines now handled. References. Riess Mfg. Co., 1688 Broadway, New York.

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Radiators and Lamps

Telephone 6597 Bryant M. Drimmer, Pres.
German-American Auto Radiators & Lamp Co.
Radiators, Mud-Guards, Tanks and Fancy Brass and Copper work. New and Repaired. Also Nickel Plating. Glasses and Wind Shields a Specialty. Open Day, Night and Sundays. **258 W. 47th St., New York City**

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.
HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH: 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATOR BARGAINS

Ford, Model T, Honeycomb, V-shaped	$22.50
Buick 16 and 17, Tubular	30.00
Buick 16 and 17, Honeycomb	33.50
Buick 10, Tubular	20.00
Buick 10, Honeycomb	22.50
Hudson 20, 32 and 33	28.50
Chalmers 30	30.00
Cutting Models A and B40 or T35	30.00
Colby Model 40 and 50, Honeycomb	30.00
Rambler radiators, all models	26.00

Write for prices on other makes.
AUTOMOBILE APPLIANCE CO.
1436-38 Michigan Avenue CHICAGO, ILLINOIS

RADIATORS OF QUALITY

WRIGHT HAS IT IN STOCK.
Abbott-Detroit, 30-1910-11; Ames, Buick, 16-29-39; Cadillac, 1909-10-11; Chalmers, F30-1909, 30-1912; Cino, Courier, 1910; Flanders 20, Ford T, Henry 40, Hudson 33, Hudson 54. Hupmobile, 20-1910-11; Hupmobile 32, Imperial 30-1910; Little Four, Marion 30-1911; Michigan F, 1911; Moline 30-1910; Nyberg, 1912; Oakland 40-1910, Oakland 30-1912; Oldsmobile Special, 1910; Overland 51-56-1911; Premier 4-40-1910; R. C. H., 1912; Regal 20-30, Richmond K, Studebaker Garford 40-1910; Studebaker 1913; 25-H.P., Velie 30, 1909; Warren-Detroit 30, 1910, and many others. New Radiators built to specifications in two days. Fully guaranteed.
WRIGHT RADIATOR & HOOD MFG. CO.
1253-55 S. Michigan Ave., Chicago.

Starting & Lighting Systems

Starting and Lighting Systems
of all makes repaired.
All repair work done under our guarantee.
IGNITION SPECIALTIES COMPANY
798 Seventh Avenue New York City
SIMMS-HUFF SERVICE STATION

BRUSHES

Metallic and Carbon Brushes
for every make of
Starting and Lighting System
Magnetos and Generators Repaired
CARLILE & DOUGHTY
846 No. Broad Street PHILADELPHIA, PA.

Starting and Lighting Systems
Gray & Davis, Auto-Lite, North-East
Repairs and PARTS in Stock
P. J. DURHAM CO., 244 W. 49th St., N.Y. City
AUTHORIZED SERVICE STATION

Metal Spinning

METAL SPINNING
OF ALL KINDS
Parts for Auto Lamps made to order. Auto Lamps repaired and made as good as new. Experimental work a specialty. No job too small, or we will figure on large contracts for the trade. Send sample or blue prints and specifications for estimates.
COLLINS & COMPANY
150½ ELM STREET AMESBURY, MASS.

Magnetos and Batteries

MAGNETO SALES CO.
Official Bosch Service Station. Expert repairing guaranteed. All types of magnetos and coils bought and sold.
1779 Broadway - New York City

MAGNETOS
Of all makes repaired and guaranteed.
IGNITION SPECIALTIES COMPANY
798 Seventh Avenue New York City
Official Service Station for
SIMMS, WILLARD, BERLING

Hecht's Magneto Exchange, Inc.
Dealers in Magnetos of all Makes.
Lighting Systems and Self Starters.
We have always on hand a large assortment of high and low tension magnetos, BOSCH, SPLITDORF, REMY, EISEMANN, and all other standard makes, at 50% off list.
Expert Repairing of All Makes.
Express your Magneto to us. Same will be repaired and returned same day received.
Distributors and Service Station for
MICHIGAN and NATIONAL MAGNETOS
— Also —
ESTERLINE GENERATORS and NORMA BALL BEARINGS
230 West 49th Street NEW YORK CITY

Auto Lists

1915 Automobile Registrations
NEW YORK STATE OR ANY OTHER,
supplied on sheets or cards. Addressing, folding and mailing to auto owners. Special lists promptly compiled such as Ford, Overland or Electric owners, dealers, chauffeurs, etc.
List Ten States, 1915 Complete, $20.00
Write for Details
NAT'L TRADE LIST & ADDRESSING COMPANY
ALBANY, N. Y.

MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. Motor List Co. of America, 1111 Locust St., Des Moines, Iowa.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Bodies

JANDORF AUTO COMPANY
Largest dealers in Tires and Tubes. Bargains.
1764 BROADWAY NEW YORK

Ball and Roller Bearings.

Many garages and repair shops are finding considerable difficulty in obtaining supplies of ball and roller bearings owing to the great war in Europe, and many of these will be interested to learn that a particularly large stock of bearings of almost every description is carried at the present time by the Gwilliam Company, Broadway and 58th St., New York City, N. Y. Their stock includes Annular Ball Bearings, Ball Thrust Bearings, Ball Thrust Step Bearings, Journal Roller Bearings, Pressed Steel Bearings, Roller Thrust Bearings, Taper Roller Bearings, Thrust Bearing Retainers, also brass, bronze and steel balls. Correspondence is invited from any of our readers, as this company may be in a position to deliver goods which cannot be found elsewhere under the present peculiar conditions of the trade.

Acme Cylinder Grinder.

The Acme Grinder Company, Minneapolis, Minn., is offering the Acme cylinder grinder, which consists of a base which is bolted to the face plate of the lathe, the cross slide to which the spindle is securely fastened, and the rotating sleeve which carries the grinding wheel. The construction is claimed to permit the wheel to rotate in a perfect circle, the diameter of which is regulated by means of a cross feed screw.

New Ignition Lock.

The Novelty Distributing Agency, South Dearborn Street, Chicago, is marketing a keyless lock for protecting the ignition system. The lock is circular in appearance and is fitted with sixteen buttons and in order to open the lock it is necessary to press a certain number of buttons at the same time. If other buttons are pressed while the combination is worked, the lock will not open.

Luminous Match Box.

The Pioneer Portrait & Picture Frame Co., 1249 West 63rd Street, Chicago, has brought out a match box, which, when in a dark room, will give off sufficient light, because of a certain preparation with which it is coated, to allow of the person entering finding the box. This article can be used to advantage in private garages which do not use electric light with a switch in a convenient place. The box may be placed anywhere in the garage and upon entering the owner can see the box without much difficulty.

Radio Heater.

The Milwaukee Auto Specialty Company, Milwaukee, Wis., is manufacturing a heater which uses exhaust gas. This heater is connected in series with the exhaust pipe and when desired a portion of the exhaust gas passes through the heater and after giving up most of its heat passes out into the air. The Radio, as it is called, may be mounted flush on the floor-boards.

Ideal Fuel Saver.

More power and better fuel economy are said to be obtained by the use of the Ideal gasoline saver, manufactured by the Ideal Mfg. Co., 1525 Main Street, Anderson, Ind. This attachment is in the form of a fuel preheater which employs the heat around the exhaust pipe for warming the ingoing gasoline. The fuel line is tapped and a pipe directed to the heater which is clamped to the exhaust pipe, as shown herewith. The fuel after becoming heated passes to the carbureter. The price is $3.50.

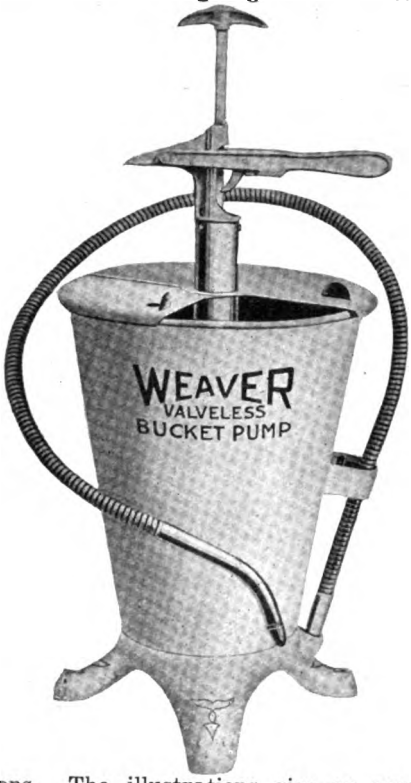
Ask Gasoline Price Investigation.

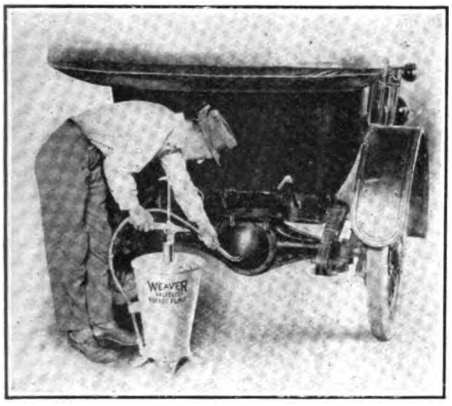
Request has been made of the federal trade commission to institute an investigation of charges that illegal practices prevail in the marketing of gasoline. Price fluctuations have been brought to the attention of the commission which, it is declared, are not explained by the difference in freight rates between the cities where the varying prices exist.

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The Weaver Valveless Bucket-Pump.

This is a very handy device for handling lubricants in garages and oil stations. The illustrations give an excellent idea of the appearance of this article.





Pump in Use.

The bucket is of ample capacity and is very substantially built to withstand the abuse which articles of this kind are likely to receive in the shop. The bucket is also equipped with a flexible steel hose which is of great advantage as ordinary rubber hose is soon affected by the action of the grease, while the metal hose is absolutely immune to anything of this kind. Another point is the "Three-Way" feature which makes it possible for the grease and oil to be drawn out of the car and discharged into another receptacle without disturbing the grease contained in the bucket. The ample diameter of the cylinder or barrel and also of the hose enable this bucket to successfully handle anything from light oils to soft greases. Garage owners or others who may be interested should write for further particulars and prices direct to the manufacturers, the Weaver Manufacturing Co., 2167-2179 South Ninth Street, Springfield, Illinois.



Pump in Use.

More Space for Firestone Plant.

Contracts have been placed by the Firestone Tire & Rubber Co., Akron, O., for additional floor space amounting to 110,000 square feet, nearly three acres. This amount is in addition to the five wings begun last spring and which are now nearing completion. A total of 10 acres of floor space has been added this year. This will allow an expansion in the tire output from 7,500 tires daily to 12,000 per day, an increase of 60 per cent.

Overland Tire Locks.

New Era Spring & Specialty Co., 864-878 Woodward Avenue, Detroit, Mich., the sole agents for the W. W. Sly Manufacturing Company, have had such a success in the marketing of Overland tire locks that they are now furnishing a form of this same lock that is made in the reverse position with small holes drilled so that the same can be riveted to the carrier furnished as standard equipment upon the Buick, Dodge, Maxwell, Oakland and other cars. The new form of lock is riveted to the lower part of the rim tire holder equipment which comes on these cars. The tire merely rests on this rim, being securely locked so that same cannot be taken off unless the rivets are broken, which can be made so this is practically impossible. The lock is furnished in the reverse position of the Overland tire lock and with the holes drilled without extra charge. The list prices are $1.50 for the single and $1.75 for the double.

Will Regrind Your Cylinders.

The Allen and Curtiss Co., Mishawaka., Ind., make a specialty of regrinding cylinders for the trade or individual motorists. Their scale of prices is as follows: 1 Cylinder, $12.50; 2 Cylinders, $17.50; 4 Cylinders, $25, and these prices include new pistons and rings. The work is absolutely guaranteed, and this company has facilities to do it promptly. Correspondence from our readers in regard to this work is solicited.

A New Carburetor.

The Penberthy Injector Co., of Detroit, Mich., has secured the rights for the Ball & Ball Carburetor in the United States and Canada, and we understand that this carburetor will be manufactured on a large scale. F. H. Ball and his son, F. O. Ball, who were for many years connected with the Ball Engine Co., of Erie, Pa., have been retained by the new company as engineers.

Ever See A Picture Of This Cigar Before?

Honestly, we believe that we could leave the signature off this advertisement and nearly half the men who saw it would know that it was put out by Herbert D. Shivers, Inc., of Philadelphia.

That is because the same cigar and the offer that follows below have appeared constantly for fourteen years.



Fourteen years is a long time. It is an *impossible* time for any cigar to be sold that is not an exceptionally good cigar at an unusually low price.

For fourteen years the Shivers Panatela has maintained the same quality, the same uniformity, the same flavor, the same mildness. Every tobacco man knows that the most trifling change, even in the color of a package, may wreck the sales of a product—so fickle is the public's favor in tobacco.

Yet for fourteen years we have claimed that our Panatela at $5.00 per hundred was the equal of the 10c or three-for-a-quarter cigar sold by "the trade."

We have repeatedly offered to take back any box that did not convince the smoker of this fact, pay all expenses and no charge for the cigars smoked; and our business has grown every year. Our customers have increased. We have been forced to move to larger and larger quarters—**and still we grow.**

Aren't you ready at last to try this cigar? Hasn't it earned its right to your recognition?

OUR OFFER is: Upon request, we will send fifty Shivers' Panatelas, on approval, to a reader of *The Automobile Dealer and Repairer*, express prepaid. He may smoke ten cigars and return the remaining forty at our expense and no charge for the ten smoked if he is not satisfied with them; if he is pleased with them and keeps them, he agrees to remit the price, $2.50, within ten days.

Selling direct from our factory to the smoker is the economic reason why we can offer a hand-made cigar with a selected long Havana filler, and a Sumatra wrapper, for $5.00 per hundred or $2.50 for 50. All our sales are by the box. The majority are on re-orders that come in year after year.

The Panatela is not our only cigar. We make seventeen different shapes, many of them clear Havana cigars. **Our complete catalog mailed on request.**

Read that offer again and see if you don't think it's about time you "took us up."

In ordering, please use business stationery or give references and state whether you prefer mild, medium or strong cigars.

Shiver's Panatela
EXACT SIZE AND SHAPE

HERBERT D. SHIVERS, Inc.
21st and Market Sts. Philadelphia, Pa.

High-Service Repair Parts.

Dealers in automobile supplies, agents for Ford cars, garages and repairmen should be especially interested in the High-Service repair parts for Ford cars which are made and sold by the Hill-Smith Metal Goods Co., 88 Pearl Street, corner High Street, Boston, Mass. They have over 300 repair parts for the trade, and they are continually adding to the number. The list includes rear axle shafts, differential drive gears and pinions, front and rear springs, nuts, bolts, keys, gaskets, bushings, screws, pins, ball bearings, connecting rods, front radius rods, washers, etc. This company has a price list which may also be used as an order blank. Write to-day for a copy of this price list and you will not regret it.

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The Carleton No. 68 Generator

7 Volts, 7 Amperes

Easily solves your lighting problems. Applicable to any car, cycle, boat or miniature stationary plant. Highest quality and moderate price.

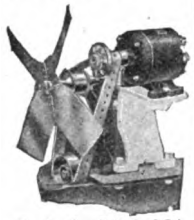
Special Brackets for Ford, Saxon and Metz Cars.

Also Automatic Cutouts, Storage Batteries, Governors and Ammeters.

Special 12 Volt, 10 Ampere Generators

Special chain drive for Fords when desired.

We want local demonstrating agents where we have no dealers.



Showing One Method of Drive

The Carleton Company 180 Summer Street, Boston

W. E. PRUDEN Hardware Company

864 8th Avenue NEW YORK

Sole Agents for

Imperial Mfg. Co.'s

Oxy-Acetylene Welding and Cutting Outfits

Will you give one family a MERRY XMAS DINNER?



We are but your agents—you are the host.

300,000 poor people cheered last Xmas in the U. S. by **The Salvation Army.**

Help us in this way to get close to these people. Give them at least one happy day in the year.

$2.00 Feeds a Family of Five

Send Donations to Commander Miss Booth

118 West Fourteenth Street, New York City

Western Dept., Commissioner Estill, 108 N. Dearborn St., Chicago

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., OF AUTOMOBILE DEALER AND REPAIRER FOR OCTOBER 1st, 1915.

Published Monthly at 71 Murray Street, New York City.

Required by the Act of August 24, 1912.

Editor—A. A. Hill, 559 West 183d Street, New York City.
Managing Editor—No other editor except Mr. Hill.
Business Managers—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 41 Pinehurst Avenue, New York City.
Publishers—Motor Vehicle Publishing Co., 71 Murray Street, New York City.
Owners—Motor Vehicle Publishing Co., 71 Murray Street, New York City.
Stockholders—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 41 Pinehurst Avenue, New York City; Mrs. A. Louise Girardeau, Monticello, Fla.; Mrs. Mildred Ulmer, Monticello, Fla.; Mrs. Harriet L. Johnston, New Rochelle, N. Y.

Known bondholders, mortgagees and other security holders, holding 1 per cent or more of total amount of bonds, mortgages or other securities: No other bondholders, mortgagees or other security holders.

MOTOR VEHICLE PUBLISHING COMPANY.
F. R. WHITTEN, Secretary.

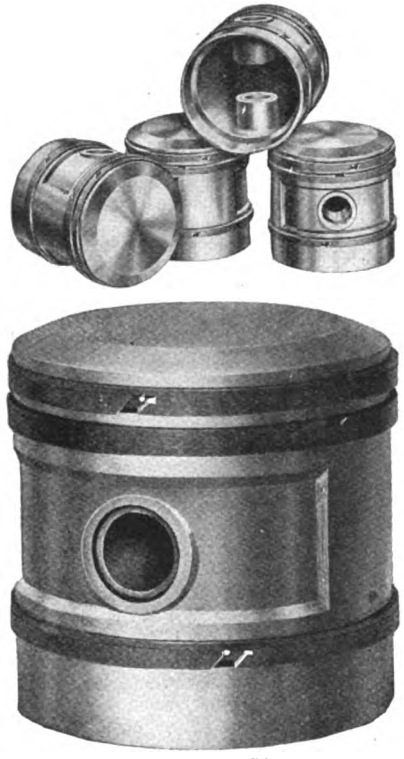
Sworn to and subscribed before me this 17th day of September, 1915.

[L. S.] (Signed) HARRY F. REISS, Notary Public No. 72.

(My commission expires March 30th, 1917.)

Aluminum Alloy Pistons.

The adoption of aluminum alloy for use in pistons in a large number of the high grade motor cars for 1916 has brought about a demand on the part of Ford owners for a similar type of piston suitable for their cars. In response to this demand the McQuay-Norris Manufacturing Co., St. Louis, Mo., makers of the well-known "Leakproof" piston rings, is now announcing a die-cast aluminum alloy piston, completely equipped with "Leakproof" piston rings and suitable for Ford cars. An equipment of Lynite pistons completely fitted with "Leakproof" rings makes a very desirable installation from every point of view. Four Lynite pistons with twelve "Leakproof" piston rings packed in a box ready for installation will sell for $30, and since the "Leakproof" ring equipment for a Ford car formerly cost $18, it is obvious what an attractive price the combination can be bought for. This set can be installed by the Ford owner himself for the rings will be perfectly fitted to the pistons in the factory before going out, and it will only be necessary to take the old pistons out and slide the new ones in.



Lynite Alloy Pistons.

Elected a New President.

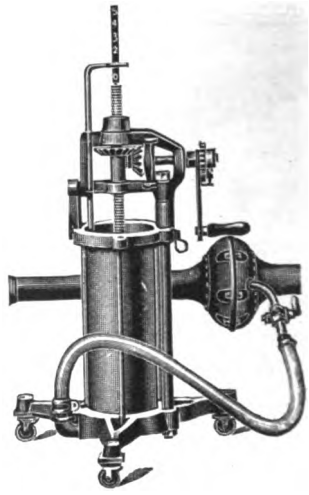
At the annual meeting of the Board of Directors of the New Departure Manufacturing Co., Bristol, Conn., Mr. DeWitt Page was elected president of the company. He has been identified with this concern practically since the first day of its existence. He came to Bristol from Hartford 23 years ago, and accepted a minor position, and he was rapidly promoted from one department to another, serving as paymaster, purchasing agent, and advertising manager. About ten years ago he was elected secretary and entered the Directorate of the company. In December, 1913, he was unanimously elected general manager of the Company. The selection of Mr. Page for the head of one of the most important manufacturing concerns in New England shows the confidence of his associates in the abilities, methods, and policies which have marked his general management of the company's affairs, and the New Departure Manufacturing Co. certainly deserves to be congratulated.

Another Victory for Norma.

On every winning car in the Astor Cup Race of October 9, ignition apparatus was equipped with Norma Ball Bearings, which is in itself very strong testimony in favor of these bearings. Norma bearings are made for magnetos, lighting generators, and starting motors, and for almost every purpose where ball bearings are required. Readers who are interested should write for their catalogue to the Norma Company of America., 1790 Broadway, New York City, N. Y.

The Ekern Portable Garage Grease Pump.

This is a grease pump especially made for public garages, and it certainly fills a long-felt want. All you have to do when a customer comes in and wants his car greased is to remove the plug in the gear case, insert the nozzle of the hose pipe connected with this machine and turn the crank, and the grease is forced into the gear case. The indicator on the machine will show the exact number of pounds of grease, or if liquid oil is used, it will show the number of pints put into the gear case. The pump holds 18 pounds of grease and can be refilled very easily. This is an article which will soon pay for itself in any up to date garage. The list price is $35 and the dealers price $23 with 5 per cent. discount for cash accompanying order. Send your orders and inquiries direct to the manufacturers, Ekern Bros., Flandreau, S. Dak.



Novel Grease Pump.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO., 71-73 Murray St., New York.

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Auto Dealers and Repairmen—

Retail Prices:

Stationary Engines

2 H. P.	$ 35.10
3 H. P.	52.65
4 H. P.	70.20
6 H. P.	100.00
8 H. P.	140.40
12 H. P.	210.90

Portable Engines

2 H. P.	$ 40.15
3 H. P.	60.75
4 H. P.	83.35
6 H. P.	130.00
8 H. P.	176.80
12 H. P.	248.00

Engine Saw-Rigs

4 H. P.	$128.25
6 H. P.	155.90
8 H. P.	205.00
12 H. P.	272.50

(F. O. B. Factory)

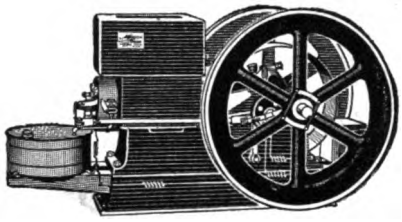
5-Year Guaranty

Here is a fast seller at the retail prices shown at the left. Our liberal dealer's discounts from these prices make you a good profit. Complete line of sizes and styles as here listed. With this agency, you can do the engine business of your trade territory. Write us now while your territory may still be open.

Sell This Engine

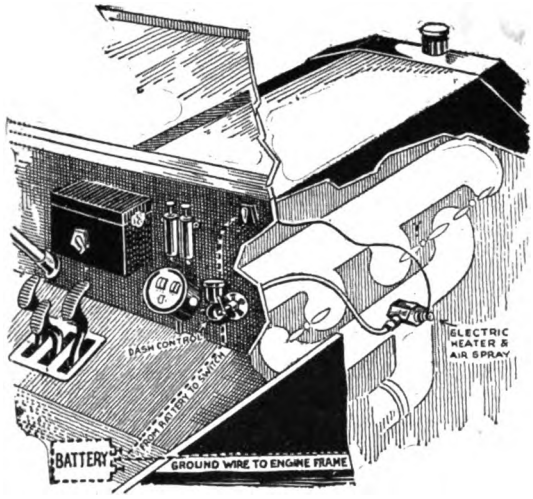
IECO ENGINES
Gasoline, Kerosene & Gas

Through and through high quality. Center-firing, valve-in-head type, with automobile style ignition. Safety spark-shift for easy and safe starting, without cranking. Best of materials and workmanship, with up-to-date fuel saving design of engine. Simple to operate, and durable under the hardest wear, giving even speed and continuous power.



Sold on Trial Every engine fully guaranteed for durability, capacity and all around efficiency. Write for our dealer's proposition under which you can handle this line without risk under our buy-back-in-90-days selling plan. Let us show you the profit in this agency.

Manufacturers Engine Co., 1579 Crystal Ave., Kansas City, Mo.



Start Quickly On Cold Days

Any morning nowadays it's a case of a cold motor—and crank, crank, crank, and prime, prime, prime before you can get it started.

IECO ELECTRIC MANIFOLD PLUG

will eliminate your starting troubles. We say it will. Your money back if it doesn't. The principle is simple. A few drops of gasoline into the priming cup on the dash. No lifting the hood, mind you. Then turn the motor over and - bing!—away she goes. The priming charge has passed through the Manifold Plug which contains an electrically heated coil and has entered the cylinders perfectly evaporated, ready to explode at the first spark. Current is only used while starting. Another thing, it admits auxiliary air to the manifold, saving 20 to 30% in gasoline. Can also be used to introduce kerosene into the cylinders, clearing them of carbon.

PRICE, $5.00. IN CANADA, $7.25.

(When ordering specify voltage of battery—Ford cars require six dry cells.)

DEALERS: Ieco Manifold Plugs and Steer Warms are the biggest hits of the year. They are sweeping the country like wildfire. You cannot afford to lose these ready sales. Write today for our dealers' proposition.

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Motor Car Equipment Co.,	New York, N. Y.
Martin-Evans Co.,	Brooklyn, N. Y.
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The Electric Appliance Co.,	Chicago, Ill.
The Automobile Supply Co.,	Chicago, Ill.
Excelsior General Supplies Co.,	Chicago, Ill.
Wesco Supply Co.,	St. Louis, Mo.
Des Moines Auto Supply Co.,	Des Moines, Iowa
United States Automobile Supply Co.,	Omaha, Nebr.
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The Auto Equipment Co.,	Denver, Colo.

STEER WARMS KEEP THE HANDS WARM WHILE DRIVING

No matter how cold it is they make driving a pleasure. They are small, neat, leather covered grips, electrically heated, that lace on the steering wheel. They are simple, easy to put on and cost nothing to maintain.

PRICES	In Canada
For all gasoline cars, $7.50.	$11.00
Special Ford Model, 5.00.	7.25

(When ordering state make of car and voltage of battery—if Ford whether 1914 or '15 model).



Descriptive Circular on Request.

If your dealer does not handle these articles we will ship prepaid upon receipt of purchase price.

INTERSTATE ELECTRIC CO., 845 Perdido St., New Orleans, La.

Increased Production Makes Lower Price.

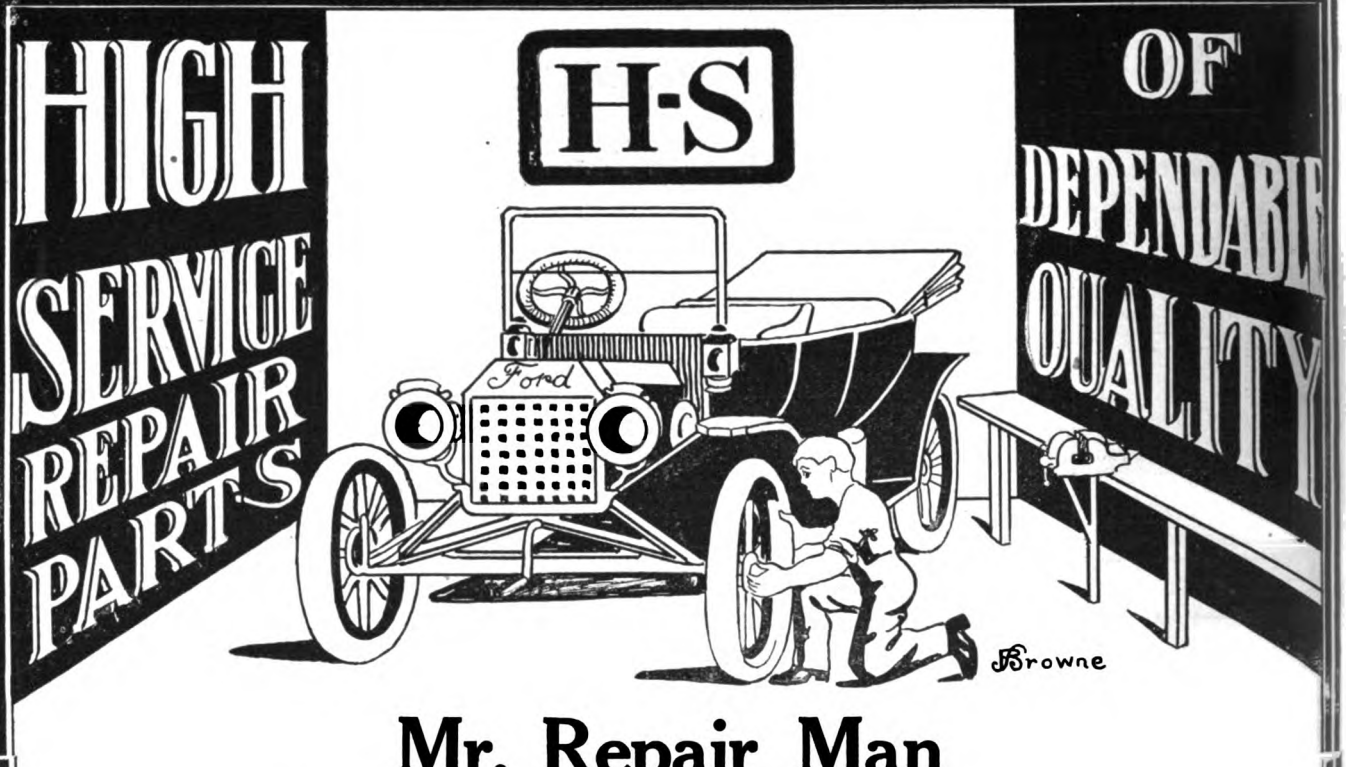
Always in line on modern merchandising and manufacturing, A. R. Mosler & Co. has again established a precedent in announcing a startling price reduction on their Vesuvius spark plug. Increased production and factory efficiency only make this possible, and this in the face of a rising market on raw materials. The Vesuvius is standard equipment on such quality cars as the Pierce-Arrow, Simplex, Locomobile, Jeffery and Case, with a record of unparalleled service behind it. It is authoritatively stated that this price reduction is but the first shot in a tremendous drive on the Vesuvius, in the knowledge that the automobile owner of today recognizes the value of quality merchandise when the seal of the manufacturer's engineer has been put upon it.

Ottofy Heater.

This is of the type which uses exhaust gas to heat the car compartments. The exhaust manifold is jacketed and the jacket extended to the car compartments where it is attached to registers in the floorboards. The hot air from around the exhaust pipe and portion of the manifold is sent through the system to the registers and thence through the compartments. The maker is the Ottofy Motor Car Co., 3040 Locust Street, St. Louis, Mo.

Subscribe to the "Automobile Dealer and Repairer." $1.00 Per Year.

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Mr. Repair Man

Comparison and trial will convince you that our

HIGH-SERVICE REPAIR PARTS

are noticeably superior in fit, finish and material. They will furnish the maximum wear, and will make a satisfied, regular customer, of any one on whose Ford car you install our parts.

The more than generous discount we allow enables you to get our High-Service Repair Parts at a price so low you can make a greater profit handling them, enabling you to save money on your purchase price, and make more money on your sales, or repairs.

Dealers of Auto Supplies, Ford Agents, Garages, and Repair Men, should be especially interested in our High-Service Repair Parts for Ford cars. Full credit allowed for any part returned as unsatisfactory for any reason.

Rear Axle Shafts Differential Drive Gears and Pinions Front and Rear Springs
Nuts Bolts Keys Gaskets Bushings Screws Pins Ball Bearings
Connecting Rods Front Radius Rods Washers, Etc.

We have over 300 Repair Parts and are continually adding to the number. Our price list is also an order blank.

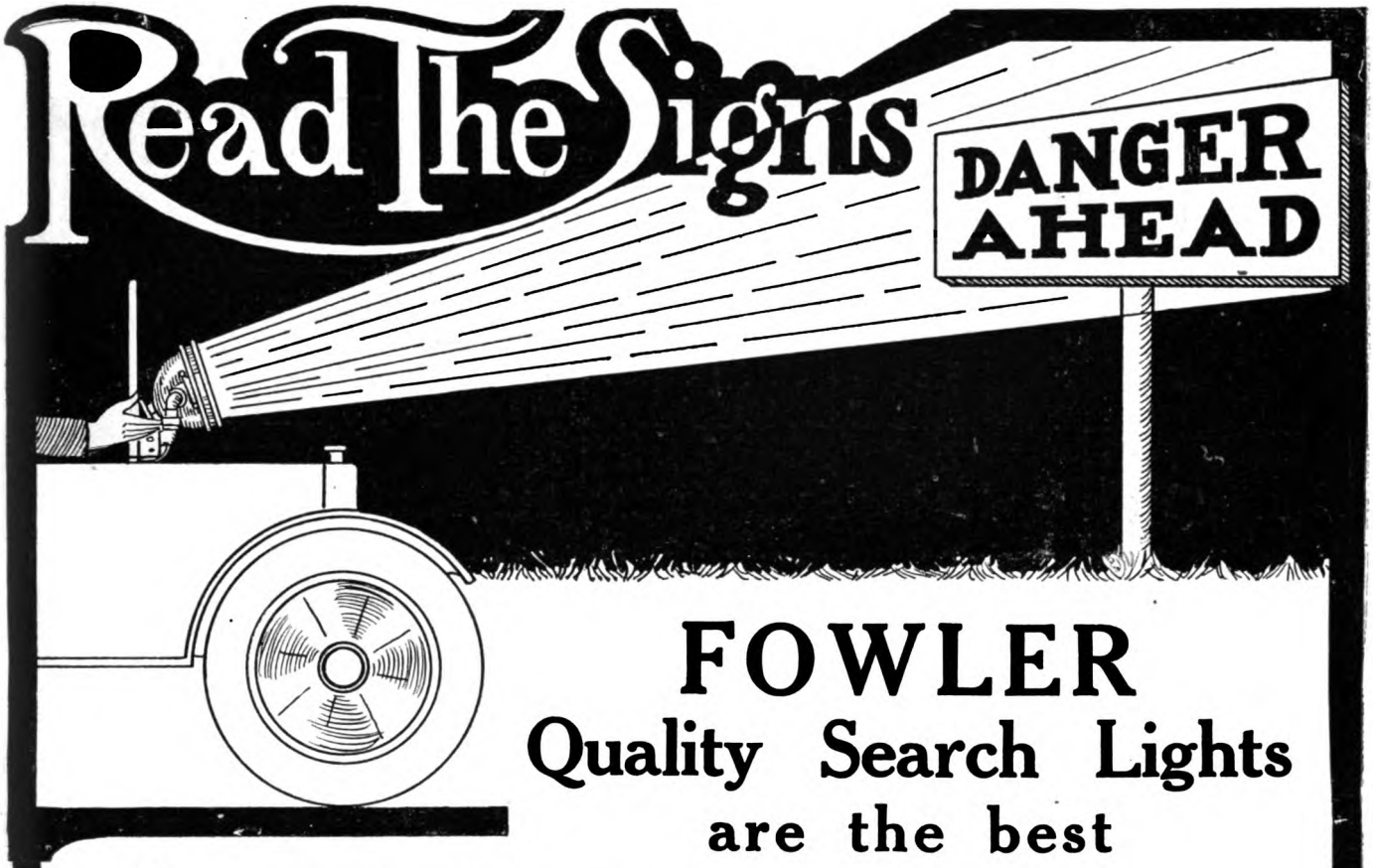
WRITE TODAY FOR A COPY

We can use good salesmen in territory not already covered.

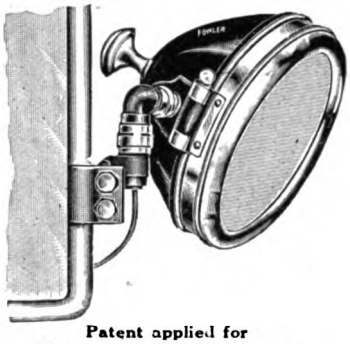
HILL-SMITH METAL GOODS COMPANY

88 PEARL STREET, Corner High Street **BOSTON, MASS.**

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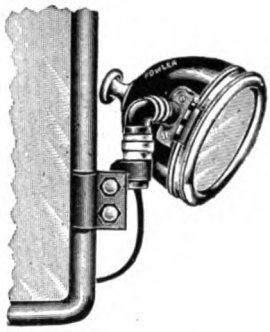


FOWLER
Quality Search Lights
are the best



We guarantee they are the best, after a close examination of all other Search Lights on the market. Made of all brass. Will not rust.

400 Spot Light
with a 24-C. P. Mazda Nitrogen Bulb

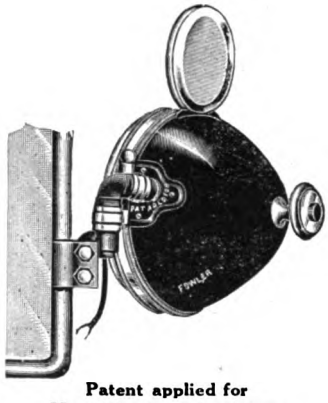


Patent applied for
No. 27½—7½ in. Door
Price $7.50
With Mirror, $10.00

Patent applied for
No. 24½—4½ in. Door
Price $5.50
With Mirror, $8.00

Fowler Swivel Joints are made with strong compression coil springs, providing an even tension and always flexible swivel bracket.

Light Will Stay Put in Any Position



Patent applied for
No. 28—7½ in. Door
With Mirror On Top
Price $10.00

We guarantee any combination of radius and angle forward, back or to the side. Not so with other lamps. Note hollow bracket.

Compare and be convinced.

No Tight or Loose Joints.

No Dangling Wire.

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Monarch Motor Parts Co., 2332 South Michigan Ave., Chicago

Send for free printed matter, giving full particulars.

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To Automobile Owners

Dealers, Garages, Agents, Repair Shops, Jobbers, Manufacturers, Etc.

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We have the Largest Addressograph Plant in the World for Public Business

List of Fords, Overlands, and All Makes at Rock Bottom Prices

Card Systems any Make, any State or Section Thereof

PROMPT SERVICE

New Jersey and New York State Automobile Registrations

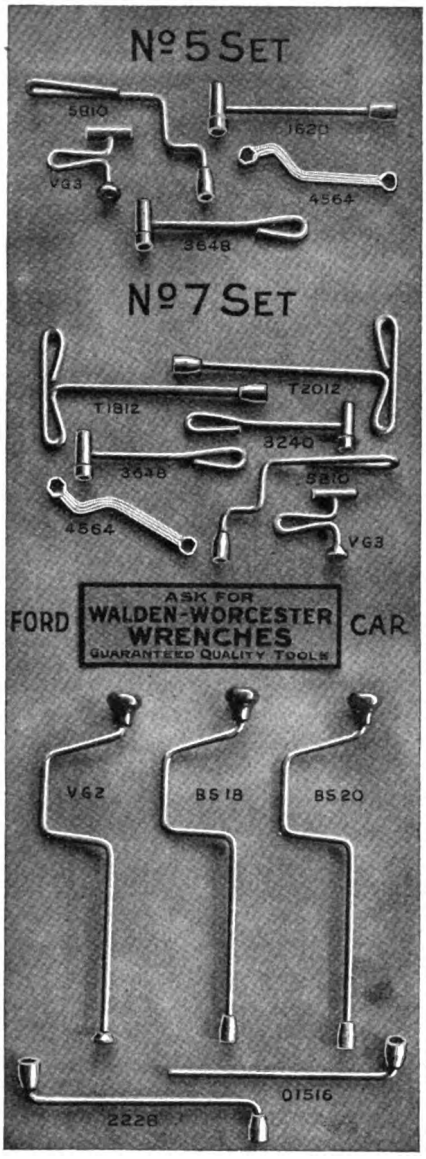
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Send for Sample Sheets.

AUTO LIST & ADDRESSING CO.

1735 BROADWAY Telephone, 6600 Columbus **NEW YORK CITY**

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REAL TOOLS

PRICES

No. 5 Set,	- -	$1.75
No. 7 Set,	- -	$2.50
5810	- - Each,	35c
1620	- - - "	35c
3648	- - - "	30c
4564	- - - "	50c
V.G. 3	- - - "	30c
T2012	- - - "	40c
T1812	- - - "	40c
3240	- - - "	30c
V.G. 2	- - - "	65c
B.S. 18	- - - "	65c
B.S. 20	- - - "	65c
2228	- - - "	40c
01516	- - - "	40c

Walden-Worcester

DIRECTORY OF WRENCHES For FORD CARS

Adjustment—fan, bolt	3648
Bands—slow, low, brake, reverse	4564
Bearing—main	3648
Body bolts	2228
Bolts on engine	T 1812 and B.S. 18
Bracket nut, controller shaft	3240
Brake bands	4564
Case, differential stud nuts	B.S. 18–T1812
Clamp stud nuts on manifold	T1812–B.S. 18
Connecting rods (including 4th)	5810
Controller shaft bracket nuts	3240
Cover—transmission, bolts	B.S. 18–T1812
Crank case cover (lower cover)	3240
Cylinder head bolts	3240-T 2012-B.S. 20
Dash board nuts	T 2012
Differential case stud nuts	B.S. 18–T 1812
Differential drive gear cap screw	3240
Drive gear, differential, cap screw	3240
Drive shaft housing stud nuts	3240–T 2012
Drive shaft pinion	01516
Engine bolts	B.S. 18–T 1812
Fan adjusting bolt	3648
Fan bracket bolt	3648
Fourth connecting rod	5810
Housing bolts, rear axle	3240
Housing stud nuts, drive shaft	3240–T 2012
Hub bolt nuts	2228
Intake, water, screw	3240–T 2012
Joints, universal	B.S. 18–T 1812
Low speed bands	4564
Lower cover, crank case	3240
Main bearing bolt	3648
Manifold clamp stud nuts	T 1812–B.S. 18
Outlet, water, cap screws	3240–T2012
Pinion drive shaft	01516
Rear axle housing nuts	3240
Reverse bands	4564
Slow speed bands	4564
Spindle arm nuts	2228
Spindle bolt and nut	3648
Spindle connecting rod bolt	3648
Transmission cover nuts	B.S. 18–T 1812
Universal joints	B.S. 18–T 1812
Water intake cap screw	3240–T 2012
Water outlet cap screws	3240–T 2012

Note: 1620—Tomahawk may be used in place of 3240, the only advantage, the socket on end is used in spinning nuts off or on. On several parts more than one wrench is listed. The offset gives longer leverage. The tee handle or brace may be more efficient.

The most complete line of Wrenches for use on Ford Cars. All steel—guaranteed tools.

Our directory of wrenches for use on Ford Cars is the result of having actually tried out each wrench on the part named to insure proper clearance around the nut, and working space for the handles. The object to obtain full efficiency for the tool, and use of the same wrench on as many different parts as possible.

Our original designs have been copied but none of the imitators have yet covered all the fine points in design. Your protection is to look for the name **WALDEN-WORCESTER** stamped on every wrench and box. Do not accept substitutes.

There are no "come backs" on **WALDEN-WORCESTER Wrenches.** They are absolutely guaranteed to you and user. Get permanent profits and good will by selling real tools.

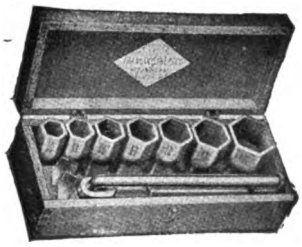
If your dealer or jobber does not carry these tools, advise name and we will ship, charges prepaid, on receipt of price.

SEND FOR CATALOG AND TRADE PRICES.

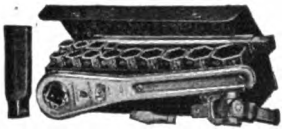
WALDEN MFG. CO., 64 Central St., Worcester, Mass.

We Manufacture Wrenches Only

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No. 6 A $2.20



No. 16 $6.00



No. 10 $8.00



No. 14 $12.00

The "Complet-est" Set

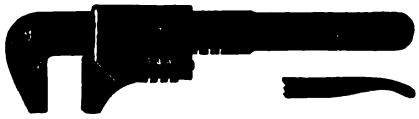


Pliers that are absolutely guaranteed.

Ask for Wrench Book No. 181B



Mossberg No. 7—The sturdiest 6 in. wrench 36c



Mossberg Auto Wrenches

8 in., 9 in., and 11 in. long



Thin model small adjusting wrenches

An Ideal Realized

For 18 years Mossberg Co. has faithfully tried to manufacture the most desired wrenches and tools in the best possible grade of material and labor and yet sell them

At Lowest Prices Consistent with an **Absolute Guarantee**

Judge for yourself if we have not succeeded in considerable degree.

Just write us your wrench troubles. We will be mighty glad to help you all we can.

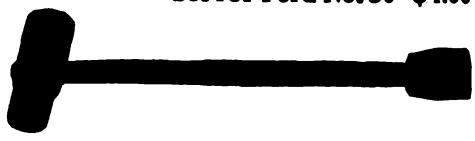
MOSSBERG Means Wrench Service



Set for Ford No. 17 $2.00



Set for Ford No. 30 $4.00



No. 630 for Fords 26c



Hub Cap Wrench for Ford, 10c



Ratchet Transmission Wrench for Fords, 50c



Kit Wrench for Ford 16c



Transmission Wrench for Ford, 12c

Any of these items sent prepaid on receipt of price, if you cannot get them at your dealers.



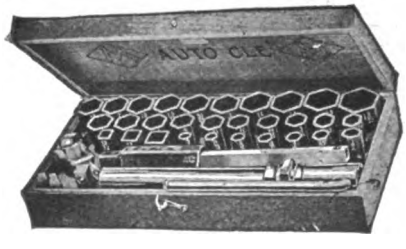
Valve Grinders for Ford, 25c

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

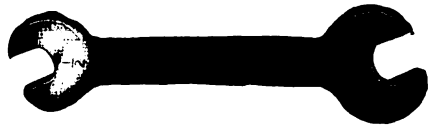
LIST OF BRANCH OFFICES.
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Los Angeles, Cal., 504 Equitable Bldg.
Seattle, Wash., 214 Maritime Bldg.
San Francisco, Cal., 425 Underwood Bldg.
Waynesville, N. C.
Dallas, Texas, Box 927.

The Reliable Auto Cle, $10





Thin model open end Engineers' Wrenches at really reasonable prices.





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Keep Your Customers All Winter

By pushing The Utility Heater, which is adaptable to all Gasoline Cars.

Bringing to Automobile and Accessory Dealers

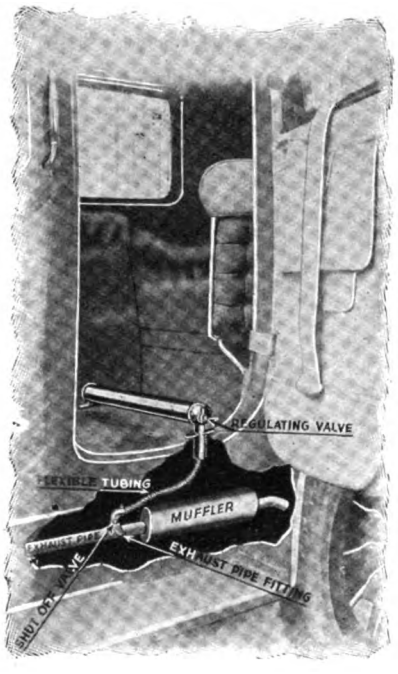
All the fair weather riders, making them all the year 'round callers on you for Supplies and Accessories.

ALL WHO USE THE UTILITY HEATER

Which is a radiator and foot rest combined, that will make any automobile comfortable during the cold winter days.

This device is so economical to operate, using only the hot gases from the engine exhaust. These gases, instead of being wasted, are used to increase the efficiency of your automobile, keeping it at an even, comfortable temperature at all times. A valve, easy of access inside the car, regulates the temperature instantly.

At the same time increase your sales by handling this simple, ornamental and indestructible heater, which is easily installed, making it necessary to drill only three small holes, two in the bottom of the car, and one in the exhaust pipe in front of the muffler, and can be done in half an hour.



This Utility Heater is also a handsome addition to the looks of your car, as it is fully nickeled.

We also make a Special Heater for Ford cars for $12.00. This heater is identical in every particular to the Utility Heater.

Get in on the ground floor before the other fellow.

Write us today for circular, terms and price.

THE HILL PUMP VALVE CO.

MANUFACTURERS OF
MOTOR CAR SPECIALTIES

18-20 E. Kinzie Street **Chicago, Illinois**

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Can You Use More Money?

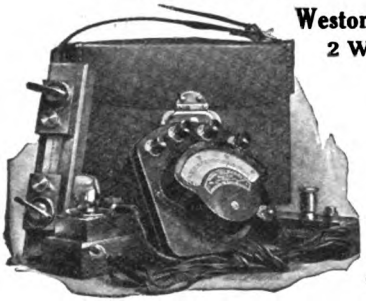
The Garage Man who can repair and adjust Electrical Equipment is going to get the cream of the garage business and make more money. The ever increasing demand for attention to self-starting and lighting systems will compel you to equip to handle this business.

Weston Model 280 GARAGE TESTING INSTRUMENT

Is your one great and urgent necessity, to enable you to quickly locate electrical troubles and apply the proper treatment to remedy them. Its possession will place you a long way ahead of your competitor not so equipped. This instrument is extremely accurate, durable and serviceable. It is the most practical electric equipment you can install.

The Weston Company is pre-eminent throughout the world in the production of highest grade Electrical Precision Instruments.

WRITE US NOW for our Special Proposition to Garage Owners. It will show you how you can handle electrical apparatus intelligently and profitably.



Weston Electrical Instrument Co.
2 Weston Ave., Newark, N. J.

New York	St. Louis
Boston	San Francisco
Philadelphia	Montreal
Buffalo	Vancouver
Richmond	Toronto
Denver	Winnipeg
Chicago	Berlin
Detroit	Paris
Cleveland	London
Cincinnati	Petrograd

Johannesburg, S. Africa



Good Business for Live Dealers

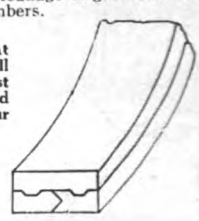
Many car owners would keep their cars in use for winter driving if they thought they could protect themselves against the power losses of cold weather and the winter snows.

K-P PISTON RINGS

offer a way. They give maximum power for winter's demands by utilizing the whole force of each fuel charge. They eliminate power waste by stopping all leakage of gas and oil in the combustion chambers.

"A Motor Is No Better Than Its Piston Rings." —*Efficiency Ed.*

Show the car owner that K-P Piston Rings will protect his motor against winter power losses and you will cash in on your arguments.



Special Inducements to Dealers and Agents.
Rings in All Sizes. Write for Literature.

Keys Piston Ring Co.
3037 Olive St. St. Louis, Mo.



PATENTED Side Lock and Groove

STOP THAT LEAK

You are using too much oil!
You are wasting gasoline!
You are not getting enough power!
DON'T THE UP-KEEP GIVE YOU THE BLUES?

Trade Mark



Patent Applied For

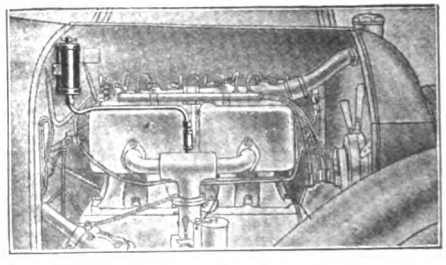
There was a time when water pumps at the City water stations used a fabric or leather packing; not so today. A copper jacket is put in the cylinders. **Large grooves** are cut in the pistons, the volumes of water in the grooves form a packing, small particles of water cannot pass the volumes of water in the grooves. Thus making a perfect packing of water against water. Just so with "NO-LEAK-O" Rings. The volumes of oil in the grooves act as a packing against the oil being drawn or forced up into the firing chamber. "NO-LEAK-O" piston rings have grooves which CONTROL THE OIL, giving perfect lubrication without waste. No smoke. No carbon. No oily spark plugs. No grinding of valves. We absolutely guarantee each ring for QUALITY, ACCURACY and SATISFACTORY service. ONE PIECE, LOW COST, HIGH EFFICIENCY. Carbon eliminated by controlling the oil. *Write at once for complete particulars.*

AUTOMOBILE ACCESSORIES CO., 816 W. North Avenue, Baltimore, Md.

SIMMS High Tension MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers unite in pronouncing Simms Products "Electrical Equipment Par Excellence."

The SIMMS MAGNETO *Co.*
East Orange, N.J.



Send for Catalogue.

TRIPLEX GAS ECONOMIZER CO.,
223 WEST 49th STREET, NEW YORK CITY

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Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri





Don't Guess!

A storage battery represents too much money to neglect it---battery troubles add too much to the cost of your car's upkeep. The

INDESTRUCTIBLE
MONARCH
Storage Battery Tester



will tell you when to charge your battery and it will save you real trouble and real money when it does so.

It is unbreakable. It is absolutely accurate. It is convenient to carry in your vest pocket—you can put it in your tool box with the rest of your tool kit—nothing can throw it out of adjustment. **And** it is guaranteed for 5 years. Pile up these points—and then invest the purchase price—

$1.50

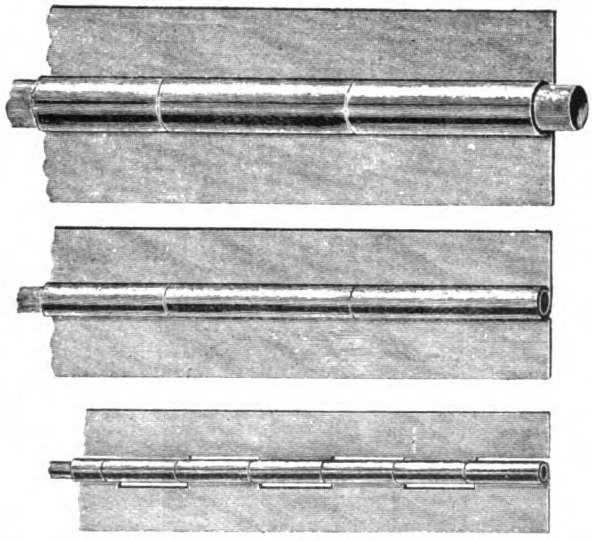
You'll only need one—nothing can destroy it—and you'll always draw dividends from it.

FOR DRY CELLS

The INDESTRUCTIBLE MONARCH AMMETER—accurate and built to last - - - - $1.00

Hercules Instrument Company, Inc.
Dept. D. R. Mount Vernon, N. Y.

Automobile Hood and Continuous Hinges



These hinges are made in a variety of sizes both as regards width and length, as well as size of hinge pins.

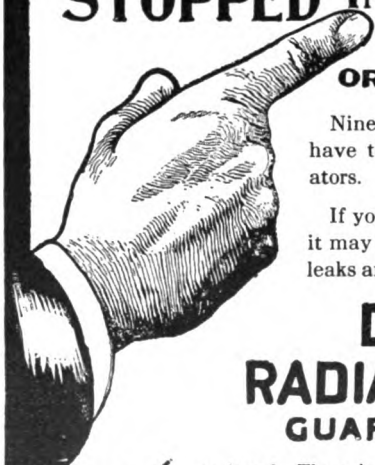
Their range of use is not confined to automobile hoods, but also for **rear deck hinges, shield front sash hinges, tool box hinges, etc.**

The stock widths range all the way from 1" wide when open to 1⅝" wide when open.

Further details with net prices on request.

JOS. N. SMITH & CO., - DETROIT, MICH.

RADIATOR LEAKS
STOPPED IN 3 MINUTES
OR MONEY BACK



Nine automobiles out of ten have trouble with leaking radiators.

If yours has not leaked as yet, it may before long. Prepare for leaks and always have a supply of

DAYTON RADIATOR FIX
GUARANTEED

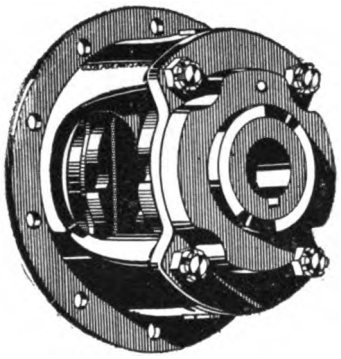
50¢ on hand. There is enough radiator cement in one package to mend all the leaks you may have. Cheaper than paying a plumber's bill.

Send 50 cents today for package and if it is not satisfactory, we will refund your money at once.

Write for copy of testimonials. Agents wanted.

WEARWELL RUBBER CO.
1033 W. THIRD DAYTON, OHIO.

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BAILEY Gearless Differential

Ford, Overland and Chevrolet Replacements now ready

DRIVE YOUR CAR IN SAFETY THIS WINTER!

Think of it! With the Bailey Gearless Differential the motorist can laugh at snowy, sleety, slushy, slippery roads. Thousands of car-owners have installed it—thousands more will do so in the next few months.

Skidding, slipping and sidesway eliminated; positive drive to both rear wheels; power always delivered to the wheel having traction. Pull through roads ordinarily impassable—and the loose wheel doesn't spin around in uneven going.

The Dealer's Harvest-Time— Get Our No-Risk Proposition

Every Bailey Gearless Differential is sold on a guaranty of satisfaction or money back in 30 days. And we have a complete plan of co-operation with the dealer.

Write for it. You'll see the Bailey Gearless Differential as regular equipment on a lot of new cars pretty soon—and the replacement business is a big thing growing bigger all the time.

GEARLESS DIFFERENTIAL CO.

866 Woodward Avenue DETROIT, MICHIGAN

Jobbers Carrying Stock:

Chanslor & Lyon Co., San Francisco, Cal., and Branches
Auto Equipment Co., Denver, Colo., and Branches
The Post & Lester Co., Hartford, Conn., and Branches
Motor Car Supply Co., Chicago, Ill.
Hippee Motor Supply Co., Des Moines, Iowa
Tri-City Electric Co., Davenport, Iowa
Tisch Auto Supply Co., Grand Rapids, Mich.
Minneapolis Iron Stove Co., Minneapolis, Minn.
W. S. Nott & Co., Minneapolis, Minn.
Janney, Semple & Hill Co., Minneapolis, Minn.
Reinhard Brothers Co., Minneapolis, Minn.
Williams Hardware Co., Minneapolis, Minn.
Reed Motor Supply Co., St. Paul, Minn.
C. J. Smith & Co., St. Paul, Minn.
Nicols, Dean & Gregg, St. Paul, Minn., and Branches
Electric Manufacturing Co., St. Paul, Minn.
Marshall Field & Co., Chicago, Ill.
Kansas City Automobile Supply Co., Kansas City, Mo.
Motor & Machinists Supply Co., Kansas City, Mo.
N. J. Engineering & Supply Co., Passaic, N. J.
Woods Auto Supply Co., Inc., Utica, N. Y.
M. & M. Supply Company, Cleveland, Ohio
Pennsylvania Rubber & Supply Co., Cleveland, Ohio
Specialties for Ford Cars Co., Philadelphia, Pa.
Consumers Auto Supply Co., Pittsburgh, Penna.
L. & L. Motor Supply Co., Sioux Falls, S. D.
Chemi Co., Richmond, Va., and Branches
Ferris-Dunlap Auto Supply Co., Dallas, Texas
Tri-State Motor Company, El Paso, Texas
Julius Andrae & Son Co., Milwaukee, Wisconsin
Omaha Rubber Co., Omaha, Nebr.
Paxton & Gallagher, Omaha, Nebr.
U. S. Automobile Supply Co., Omaha, Nebr.
Capital Electric Co., Salt Lake City, and Branches
James S. Remick Co., Sacramento, Cal.
Spokane Cycle & Auto Supply Co., Spokane, Wash.
Kilmer & Sons Co., Spokane, Wash.
Ballou & Wright, Portland, Ore., and Branches
H. F. Brownell & Co., Sioux Falls, S. D.
Henderson Garage Co., Shreveport, La.
Southwick Auto Supply Co., Wichita, Kansas
Auto Supply & Tire Co., Wichita, Kansas
C. A. Harberg Rubber Co., Wichita, Kansas
Burwell Smith Supply Co., Oklahoma City, Oklahoma
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John Millen & Son, Ltd., Montreal, and Branches
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SAFETY FIRST

USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D. **CHATHAM, N. Y.**



STA-TITE

There's Good Profit for Dealers Who Sell

STA-TITE PISTON RINGS

"Power to Burn—Without Waste"

They so increase the speed and power of a motor and are so economical that every user is delighted and soon sends his friends into your store for some of these wonderful STA-TITE Rings.

Made in three sections—two outer rings fitting over an inner ring—they effectually prevent loss of compression, and by keeping oil from the combustion chamber, stop waste, excessive formation of carbon and smoking.

STA-TITE Rings fit perfectly, last indefinitely, and are fully guaranteed. They sell fast because they are the best rings to be had, increase power and save money.

We also make "Quality" snap rings— cast individually—the best ordinary piston rings to be had. All sizes carried in stock.

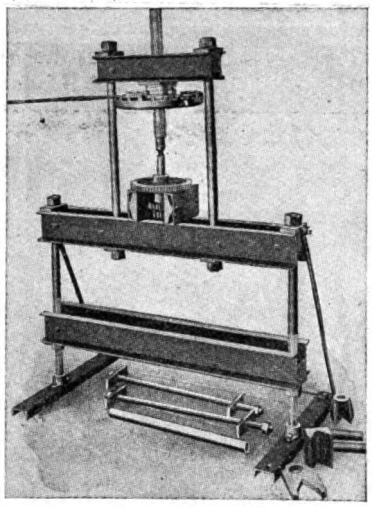
Get our dealers' price—it means good profit for you.

THE PISTON RING COMPANY

Specialists in Piston Rings

MUSKEGON - MICHIGAN

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DONT BATTER YOUR SHAFTS BEARINGS &.WITH A SLEDGE

As well as wearing yourself out with unnecessary exertion. It can be done quicker, easier and better if you

USE A MANLEY UNIVERSAL AUTO PRESS

Capacity 20 Tons. THE SCREW DOES NOT REVOLVE.

This press is indispensable in the Garage or Repair Shop, as it will straighten a bent axle, press out bearing bushings, crank shafts, axles, etc. Many other uses will be found for the Vise Block and "V" Nose, for cutting pipe, holding rear system, etc.

Remember the Universal Auto Press is 42 inches wide on the lower bolster, it will therefore

List Price $49.00

Take In, Not A Part Of, But Every Piece Of Work,

that a garage will be called upon to do.

The avalanche of orders following our first announcement of this tool, testifies that it is the Press the Garage Man has been waiting for, the Press that suits his conditions.

The price also pleases him, so **get in line** and

Write us today for our catalogue, describing this Press fully.

THE UNITED ENGINE & MFG. CO., - - Hanover, Pa.

Miller's No. 14 Three Cavity Sectional

(PATENTED)

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

With Gasoline Burner Outfit, extra - $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.

MILLER'S REPAIR MATERIALS

Common Tread Stock, per lb	$0.40
Standard Tread Stock, per lb	.55
High Grade Tread Stock, per lb	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried....Net,	1.10
*Miller's Three in One Repair Stock	.80

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's Improved Adjustable Sectional Vulcanizers

One of the 47 Kinds We Manufacture



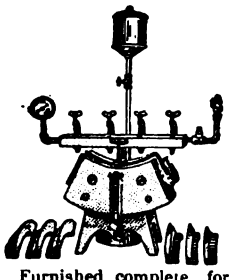
Patented

Other Patents Pending

That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

For Steam Line or with Gas or Gasoline Burner } Furnished complete with 26 Bead Molds and 7 Tread Molds.....$95.00 Less All Molds..... $42.00

MILLER'S SECTIONAL VULCANIZER
With Tube Attachment



Furnished complete for Steam Line Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $41.50

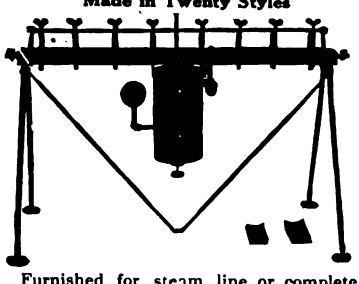
Miller's High Pressure Air Pump

is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to **300 lbs. pressure. Write for details.**

PUMP ONLY, PRICE, SINGLE, $35.00

ALL KINDS of Vulcanizing Equipment, etc.:—Large and small kettle vulcanizers, adjustable sectional vulcanizers, inner tube vulcanizers, inside vulcanizers, retreading vulcanizers, adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no-cement patches, repair stocks, **bicycle tires, motor cycle and auto casings, and heavy red tubes of extra quality.**

Miller's Inner Tube Vulcanizers
Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an **abundance of steam.**

PRICES FROM $5.00 to $30.00

Miller's Rubber Instruction Book.

Price Prepaid, $1.00 Net

Write for our 52 Page *catalog which lists Vulcanizers of* All Sizes *and* Styles, *and Equipment for Tire Shops. Write for prices on* Miller's Heavy Wrapped and "Cog" Tread Tires *and* Heavy Red Tubes. *Address Dept. D.*

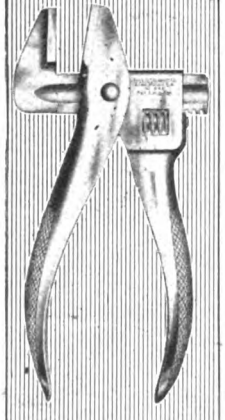
CHAS. E. MILLER
Anderson Rubber Works
ANDERSON, IND., U. S. A.

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Handy Tools

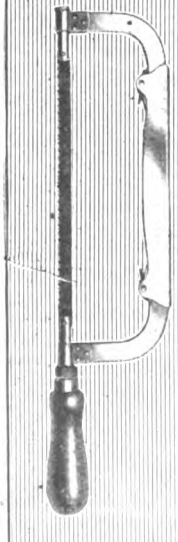
TOOLS for the motorist must first of all be handy tools. There are many bolts that are almost inaccessible for the ordinary wrench but easily reached and turned with the **Starrett Ratchet Wrench.** This consists of a long handle into which fit wrenches of all needed sizes. The ratchet makes turning easy in the most cramped spaces.



Starrett

Expansion Pliers

may be used either as a wrench or pliers. The jaws give a grip so powerful that the tool can even be used as a pipe wrench. There are many uses for this tool about the garage or the home.



Starrett Hack Saws

cut faster, last longer and do cleaner work than most because of the high quality tungsten steel, the proper set and shape of teeth, the improved methods of manufacture.

Starrett Tools include 2100 styles and sizes.

Write for free catalog No. 20-DC

The L. S. Starrett Co.

"The World's Greatest Tool Makers"

Athol, Mass.

New York London Chicago

Oxy-Acetylene Welding and Cutting



Welding steel rings 1¼ by ¼ inch at a cost of 5 cents each.

Make Added Profits By This Process

Manufacturers of automobile parts, metal furniture, racks, window sash, steel tanks, boilers, machine tools, laundry equipment, surgical apparatus and many other products have simplified construction and increased efficiency and profit through oxy-acetylene welding.

In some lines it has entirely displaced the rivet, resulting in higher quality at less cost.

Oxy-Acetylene welding makes added profits possible for you, by providing the best, quickest and cheapest method of metal joining.

The oxy-acetylene process is not limited to production work. It often more than pays for all needed equipment in time saved on repairs by repairing a single piece of broken or worn equipment, preventing tie-ups in production, delays and expense of replacement.

Necessary equipment is not expensive. We furnish high-grade apparatus for $60; Canada, $75; acetylene service at slight additional cost. Adaptable for oxy-acetylene cutting with the addition of special cutting apparatus. Thorough instructions are furnished free to every user of the Prest-O-Lite outfit. We will train your operators free if you desire.

Prest-O-Lite PROCESS

Employs Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) in portable cylinders—backed by Prest-O-Lite Service. Used as conveniently as cylinders of oxygen. Saves large initial outlay and heavy depreciation of making crude acetylene in carbide generators. Perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

Start Now—Get Full Details

Doing Oxy-Acetylene welding for others is a highly profitable business. The cost of equipment is low. Immense and growing demand assures profitable operation from the start. Even at very moderate charges, the profits from this end of your business are too big to be neglected. It is a good business opportunity for enterprising men.

The many possible uses for Oxy-Acetyline welding in your garage will surprise you. Oxy-Acetylene literature, thoroughly illustrated, sent free. Write your name and address on margin of this page and send to

The Prest-O-Lite Company, Inc.

The World's Largest Makers of Dissolved Acetylene

Main Offices and Factory
820 Speedway, Indianapolis, Ind.

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Merritton, Ontario

53 Branches and Charging Plants



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BRAENDER
Tires and Tubes
Are Famous For Their QUALITY

We wish to announce that irrespective of action by any other organization, *Braender quality will be maintained.*

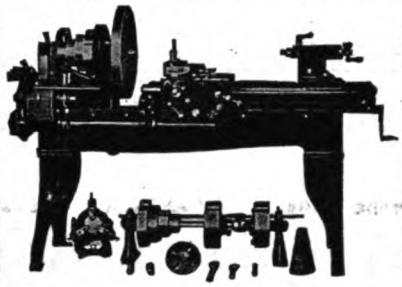
BRAENDER NET PRICES TO CAR OWNERS

Tires	Plain	Non-Skid	Gray Tube	Red Tube
30x3	$9.00	$10.35	$2.35	$2.60
30x3½	11.60	13.35	2.70	3.00
32x3½	13.35	15.35	2.80	3.10
33x4	19.05	21.90	3.90	4.35
34x4	19.40	22.30	4.00	4.45
36x4½	27.35	31.45	5.20	5.80
37x5	32.30	37.15	6.30	7.00

Braender Rubber & Tire Co.
Factory: Rutherford, N. J.
New York, 250 West 54th Street
Agents in principal cities

Established Agents Solicited.

THE UNIVERSAL GARAGE LATHE
IS OUR 14-24" SLIDING EXTENSION GAP LATHE



Saves investing in a large expensive lathe. Swings 14½" over top bed, and 24" through gap. The 7½ ft. machine takes 8 ft. between centers.

Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

Taper attachment, milling attachment, and other accessories if wanted.

Machine is strong, rigid and accurate, has 2⅛" spindle with 1⅜" hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

JUST THE THING FOR GARAGES AND REPAIR SHOPS
Send for New Literature and Prices.
Barnes Drill Co., Inc. 1907 818 Chestnut St. Rockford, Ill., U. S. A.
Builders of the All Geared Drill



SMOOTH-ON
TRADE MARK REG. U.S. PAT. OFF.

IRON CEMENTS
No. 1 and No. 3

are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

Price of Motor Repair Package, Complete - **$1.00**

SMOOTH-ON MFG. CO.,
Jersey City, N. J.

CHICAGO, 221 N. Jefferson St. SAN FRANCISCO, 36 Sacramento St.

The No. 3 Brunner Belt Driven Air Compressor Outfit $43.69



FOR THE GARAGE OF 20 TO 25 CARS CAPACITY

Outfit includes a No. 101 Compressor, 26 gallon Welded Steel Air Tank, Gauge, Safety Valve, Check Valve, 3 Needle Valves, 25 feet Resistoil Air Hose and Automatic Tire Connection.

Complete, $43.69 f. o. b. Utica, N. Y.

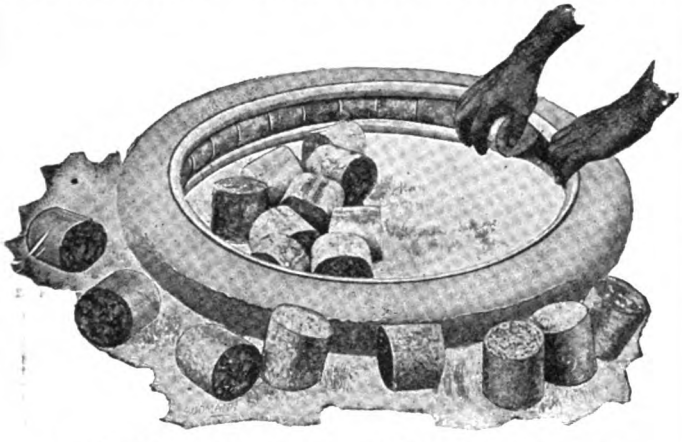
HAVE YOUR JOBBER ORDER ONE TO-DAY

Motor or Belt Driven Outfits, Stationary or Portable. All sizes—all prices—one quality—The Best.

Write for Catalogue No. 12 and name of Brunner Jobber in your territory.

BRUNNER MFG. CO., UTICA, N. Y.

National Rubber Tirefiller



Ends All Tire Trouble—A Perfect Substitute for Air

Made of Pure Rubber, cut in small particles, treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing inner tubes. Doubles the life of the casings—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has all the easy-riding qualities of the air-filled tire, with none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.

NATIONAL RUBBER FILLER COMPANY
208 COLLEGE STREET - MIDLOTHIAN, TEXAS

MOTOR EYE
SEES ALL TELLS ALL



DETECTS MOTOR TROUBLE INSTANTLY

Flashes a warning of danger before the harm has been done. The motor is the car's most costly piece of mechanism and should be given protection commensurate with its importance. A ruined motor means a ruined car. $2.50 invested in prevention may save $100 expended in repair bills.

A radiator thermometer is the only known means for instantly detecting trouble beneath the hood of a running car.

READY TO ATTACH
$2.50

MOTOR-EYE is the cheapest motor insurance obtainable. Don't pay more for devices that won't do more.

Pin a money order to the attached coupon and get one of these little sentries out on your radiator cap keeping a never-tiring eye on what is going on inside. Money refunded if not satisfied.

COUPON

W. LEWIS MACK, General Distributor
"Department A," 26 W. Jackson Blvd., Chicago, Illinois

Gentlemen: Enclosed find money order for $2.50 for which kindly send me, postage prepaid, one MOTOR EYE.

Name.....

Address.....

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Metal Cannot Wear if it is Constantly Protected with the Right Kind of Lubrication

TRADE MARK REGISTERED IN

NON-FLUID OIL

UNITED STATES PATENT OFFICE



is the ***only*** lubricant for bearings and gears which ***never fails*** to lubricate, because it never freezes and it never gums. In coolest weather your bearings are fortified against wear because the destructive rubbing and heating from friction is arrested and absorbed by the lubricant itself.

Get A Can Today And Prove It

The original NON-FLUID OIL is identified by orange-colored cans bearing the above sprocket-wheel trade mark. Avoid substitutes.

New York & New Jersey Lubricant Co.
165 Broadway, New York

"K No. 00 Special" grade for sliding gear transmission

"K No. 000" for differential, compression cups and all bearings

Reduced prices

Ask your dealer

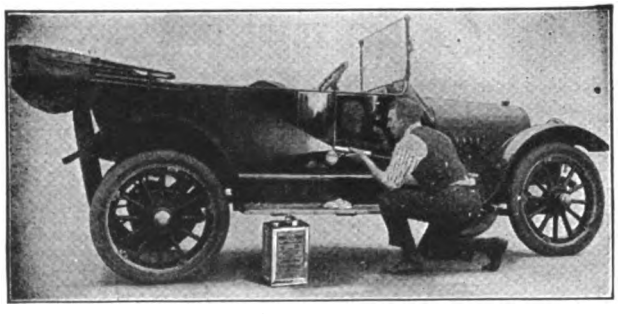
WONDER-MIST

Cleans and Polishes

It removes dust and stains and restores the original lustre to any polished surface.

It contains neither acid, gum nor any other injurious substance.

It preserves and protects the finish.



Applied with sprayer, which deposits the liquid in a fine mist evenly. Then polish with a cheesecloth. It is extensively used in Public Garages and by Automobile Owners. A trial makes a constant user.

If your dealer cannot supply you, send us his name.

The Wonder-Mist Co., 14 Federal St., Boston, Mass.

Detroit

Alive With Power

You are never "short of juice" with a Detroit Battery. And if you are a dealer you are never short of customers.

An Expert Says:

"Of all the batteries, the Detroit is first in capacity, first in capacity for weight and first in durability."

Made for Every Car and Starter

Detroit Battery dealers can supply any car in their community with the best battery made. Sales are limited only by cars.

LIST PRICE REDUCED 50%

Write for Full Particulars.

DETROIT BATTERY CO.,
DETROIT, MICH.

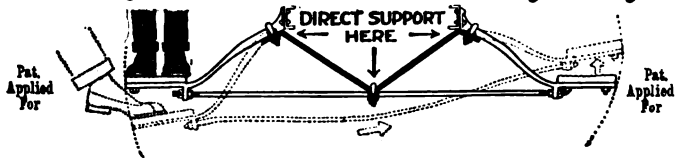
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Ford

owners stop the Big Noise

By Making Your Car as Quiet as an Electric and as

Sturdy as a Truck for Heavy Duty



DOTTED LINE shows the teeter and buckle as you step on your car now.
SOLID LINE shows how rigid CASEY braces are guaranteed to make it.

The strongest chain is limited by the strength of its weakest link. The weakest link in your Ford car is the step boards.

If you doubt this just step on your own Ford as a test and you will positively prove that the dotted lines here shown are not exaggerated but taken from an actual demonstration.

The solid lines in drawing clearly illustrate the most practical design for rigidity and strength, which follows the trusty principle of three point structural steel trussing as used in Bridge building and other permanent construction.

Two dollars, invested in a set of Casey Step Braces are not alone the first and only cost, but that they will positively support your Step Boards and Chassis as illustrated, besides eliminating this rattling from your Car during its entire life, we guarantee absolutely.

Any time you prefer to go back to the destructive Teeter Board, we will pay all transportation expenses and give you your Money Back, without a question.

Anyone can easily attach the Casey Step Braces in a very few minutes. No drilling or fitting necessary. All you need is a wrench. Shipping weight 4 pounds. Casey Step Braces complete, per pair..... **$2.00**

Our letter files have thousands of letters from pleased customers expressing exceptional satisfaction and service:

JENNINGS MOTOR CAR CO., JENNINGS, S. D., writes: "Express us at once twelve more sets of Casey Step Board Braces. We find them one of the very best things for Fords that have been put on the market."

H. W. GILL, PORTAL, N. D., writes: "Parcel post me two sets of Casey Step Board Braces, one I am ordering for a friend. Please thank 'Casey' for this valuable tip, and also the AUTOLOG."

J. M. MUILENBURG, HURLEY, S. D., writes: "I would not take $10.00 for my Casey Step Board Braces if I could not buy another set. They are worth more than ten dollars to any Ford user. I particularly show them to all my Ford friends, realizing how 'Casey' won my eternal gratitude, in giving my own car a more enduring and noiseless foundation for heavier service."

CASEY ASCO MANUFACTURING CO., 1500 Grand Ave., KANSAS CITY, MO.

For Leaky Cylinders

Superior to All Others



PATENTED AUGUST 6, 1912

A Piston Ring Which Gives Compression in "Out-of-Round" Cylinders as Perfectly as in True Ones



Here is a piston ring that gives 100% efficiency to every type of motor, engine, compressor or pump.

Ideally adapted to use in Automobile and Motorboat engines.

Gives compression when all others fail. No need to rebore worn cylinders—simply install EVER-TIGHT piston rings and the motor is good as new.

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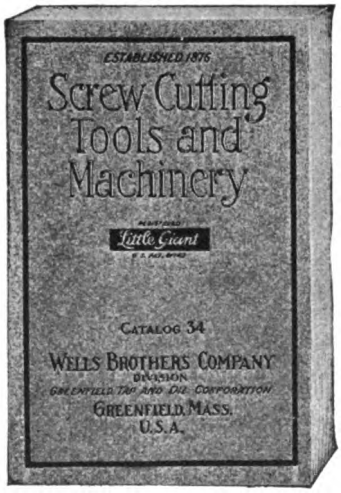
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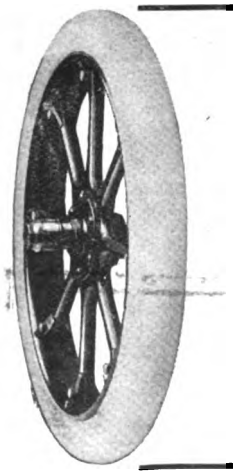
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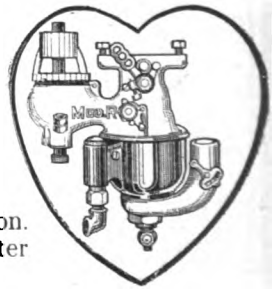
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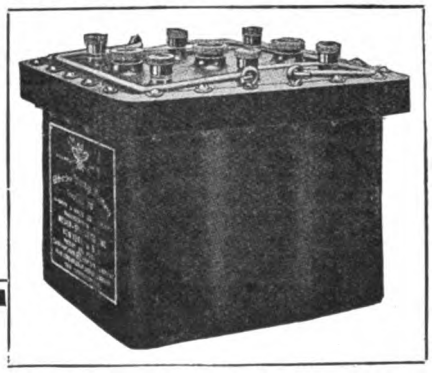
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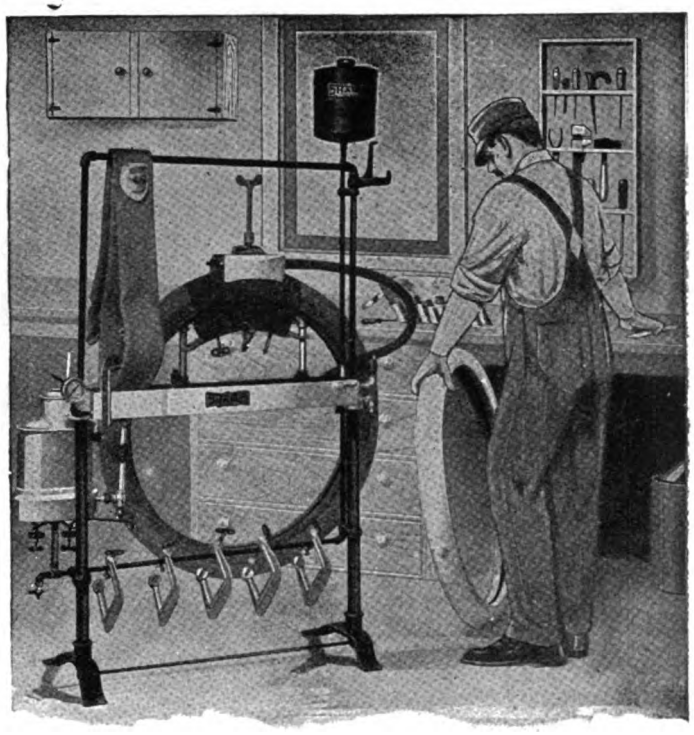
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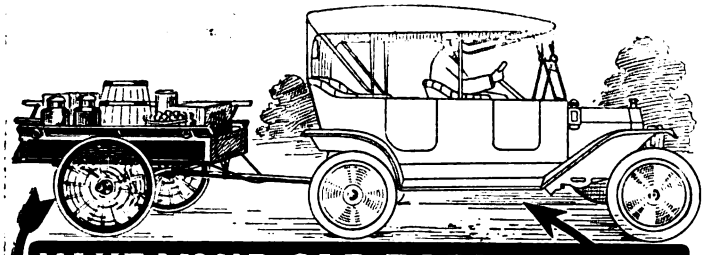
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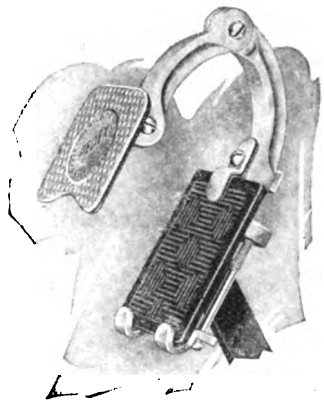
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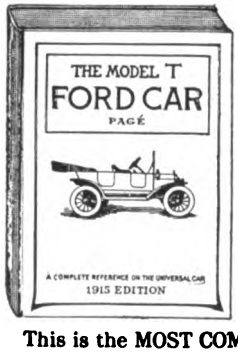
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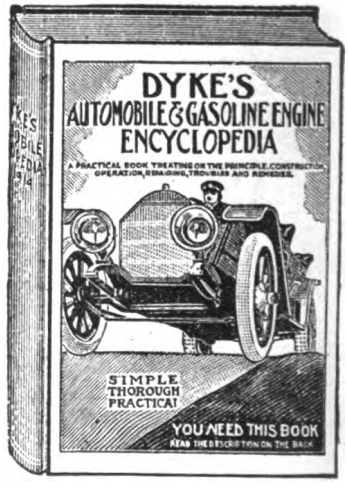
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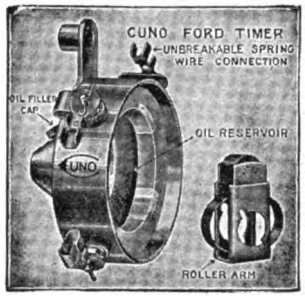
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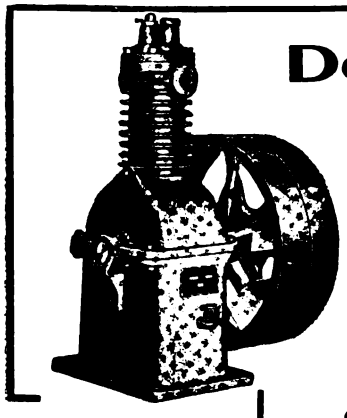
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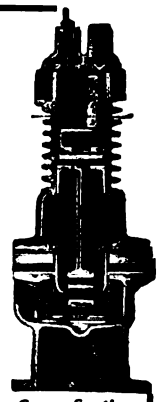
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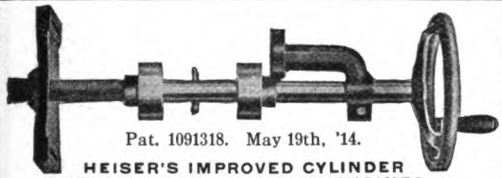
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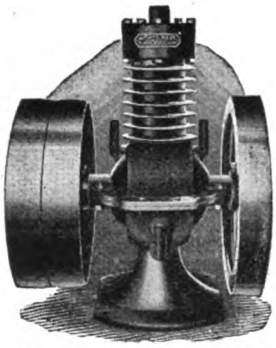
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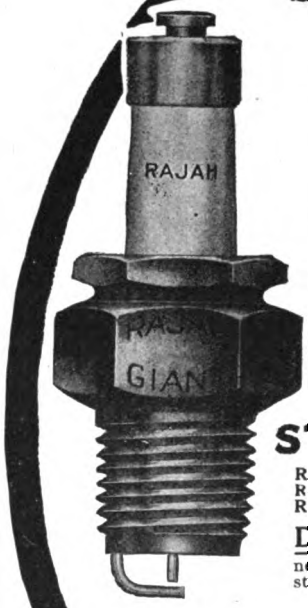
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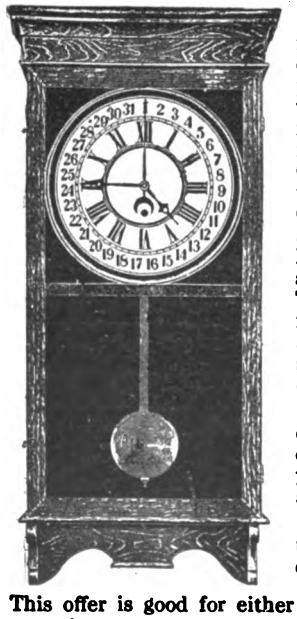
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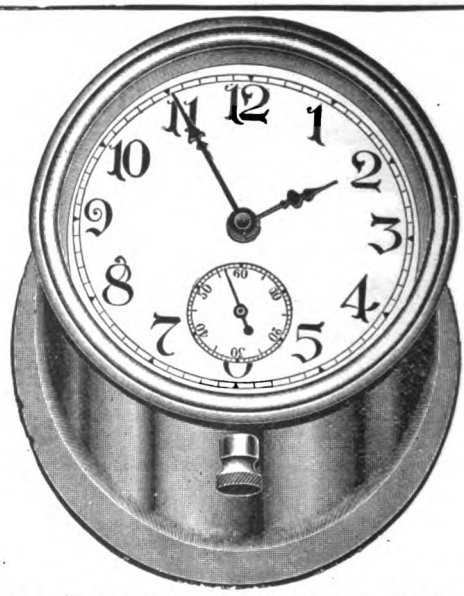
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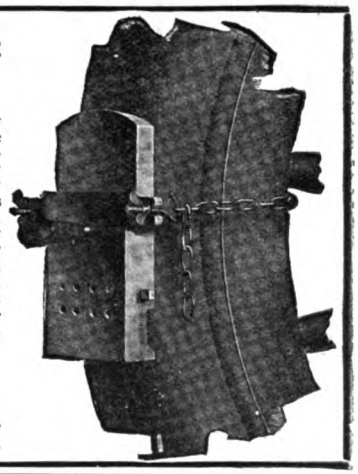
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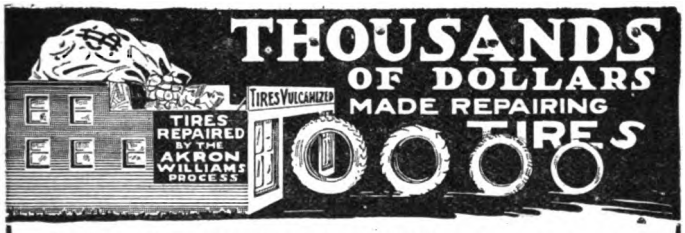


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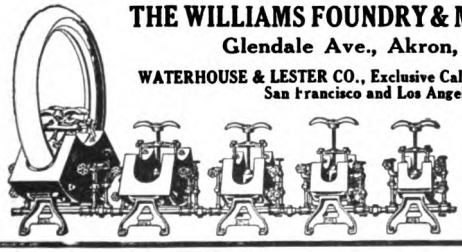
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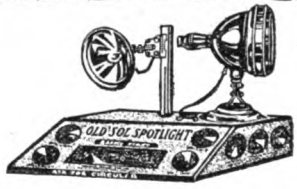
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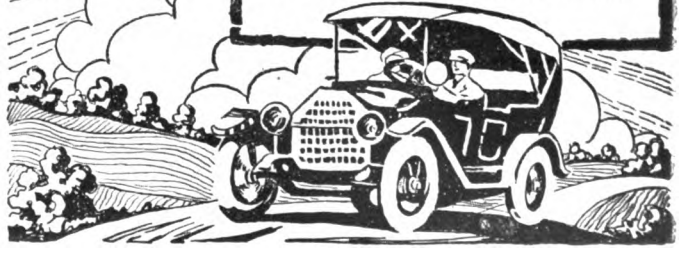
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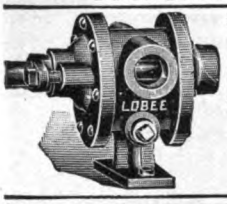
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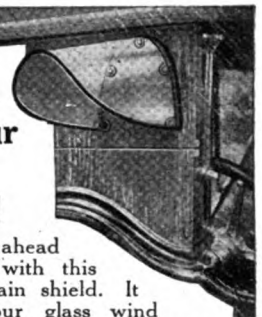
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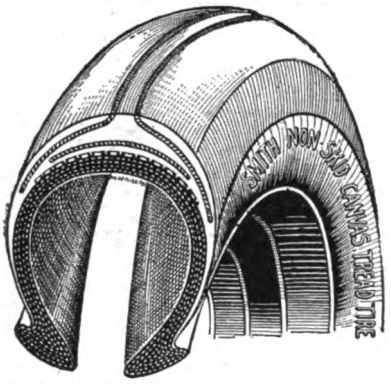
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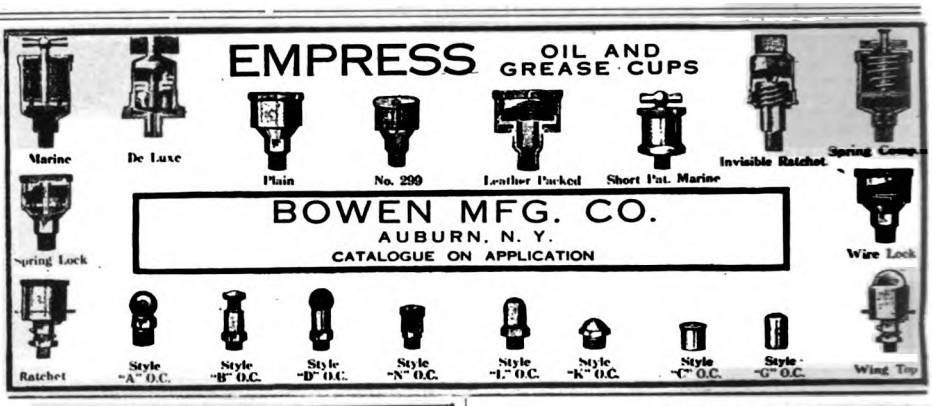
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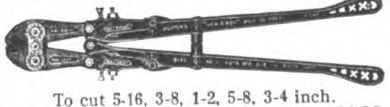
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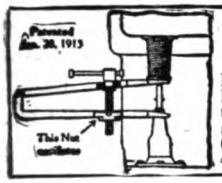
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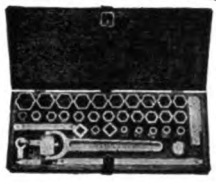
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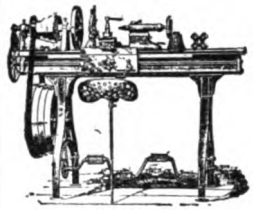
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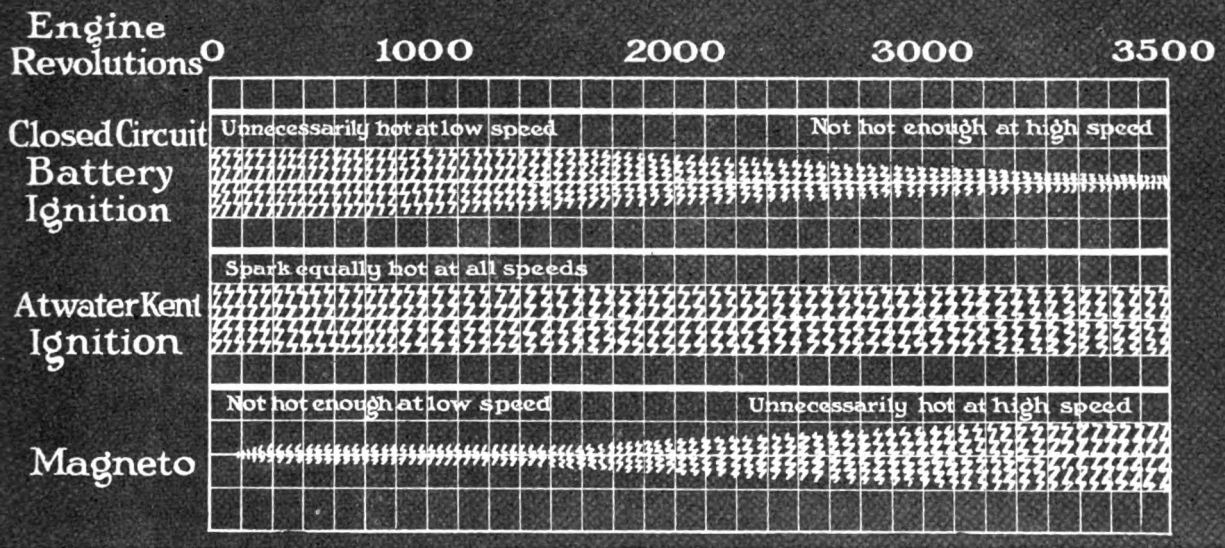
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Ignition



What Is Your Opinion?

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Manufacturers of closed-circuit battery ignition devices claim an advantage over the magneto in producing a hotter spark at low speeds than at high.

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Atwater Kent Ignition is different from all other battery ignition devices—being built on the simple open-circuit principle. Its success is due to its unique mechanical construction, on which basic patents are controlled.

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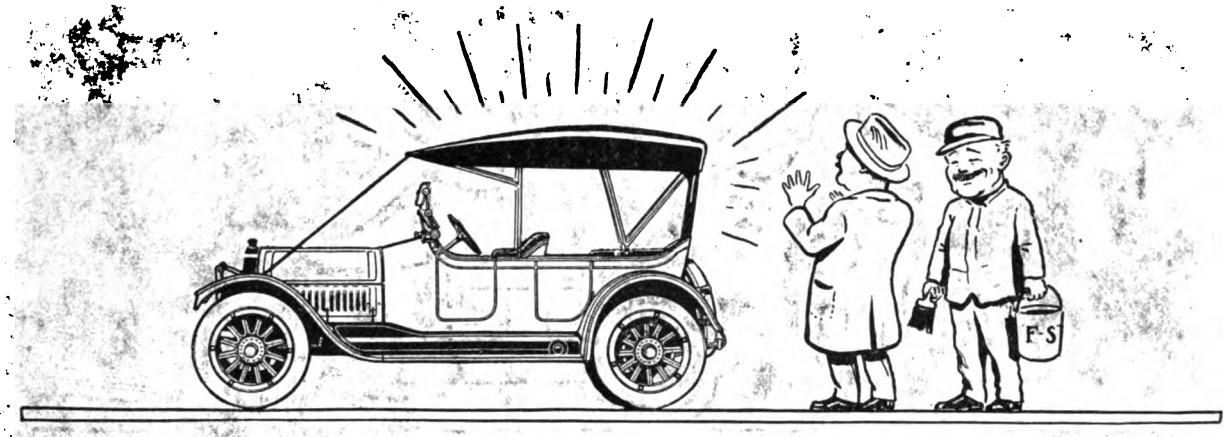
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It won't crack in folding and is absolutely non-injurious to fabric.

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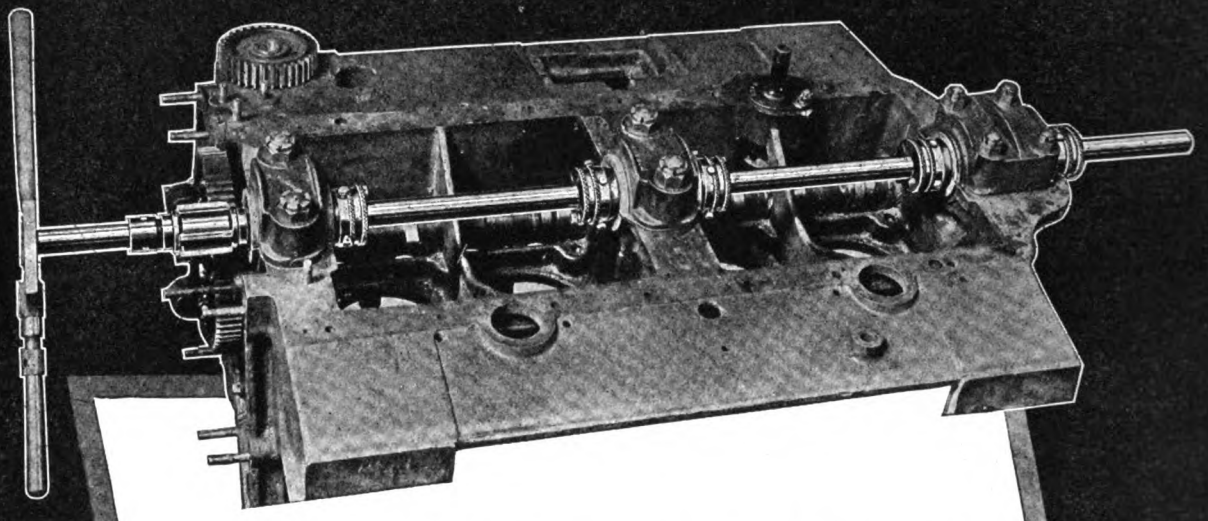
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Better Work in ¼ the Time!

Consider the advantages a repair shop or service station would have if it could **ream** the bearings of four motors, doing a perfect job, while competitors were hand scraping one set with ordinary results.

Well, that is exactly what happens after a shop is equipped with a

MARTELL A-L-I-G-N-I-N-G REAMER

Because of the short time required for reaming, such a shop could afford to drop the price a little and still make more money per job. The lower price together with better work and speedier service would insure a monopoly of work in that vicinity.



This reamer insures absolute alignment of bearings, accurate size, perfect gear mesh, and produces truer, smoother bearings. No bother in scraping, taking prints, etc., as with the hand scraping method. Set No. 1 for bearings on all standard cars. Set No. 2 for light car bearings such as Ford, Metz, etc.

Send for free booklet—"**A Better Way to Scrape Bearings.**"

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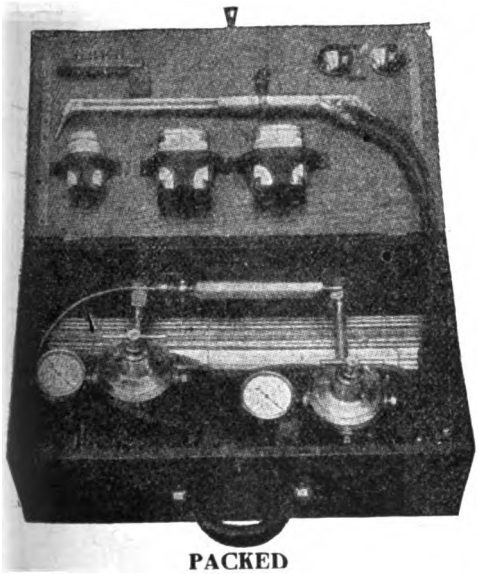
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Thousands of Waterhouse Equipments are making and saving for their owners, put one to making and saving for you.

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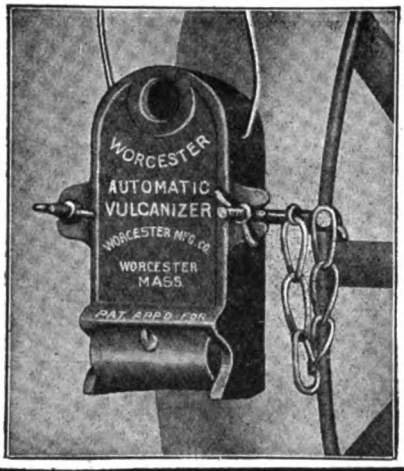
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Either order through us or your jobber.
Only be sure to specify Waterhouse.

WATERHOUSE WELDING COMPANY

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That should be in every auto kit and will save you many a dollar at garage and repair shops. It will also do away with the carrying of extra wheel or shoe attached to the car.

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as it will enable you to fix instantly, while on the road, or in your garage, any puncture or blow-out, from a pin-head to an ugly gash,

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or taking the auto to a garage for repairs, that make you dig down deep in your pockets.

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"Worcester Made"

requires no experience to operate. Every machine is guaranteed, adjusting all tire troubles in the shortest possible time, avoiding all road delays, making permanent repairs in Tube or Shoe, that are lasting, cost little, safe, speedy and strong.

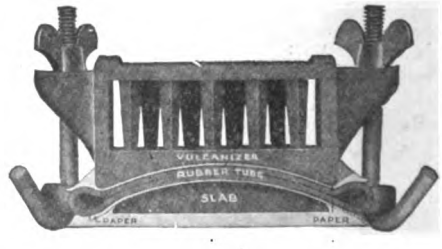
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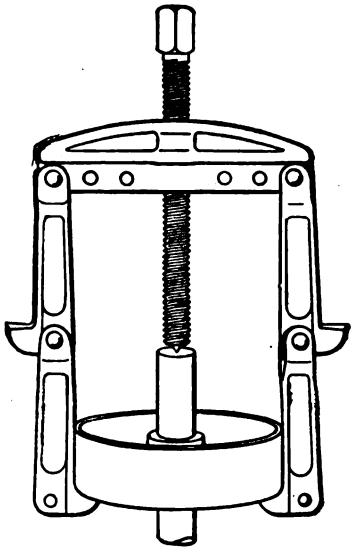


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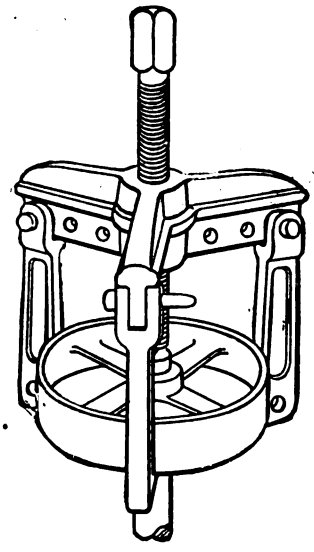
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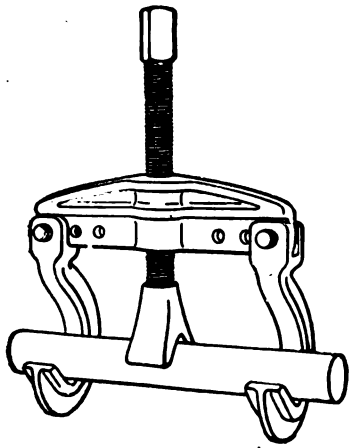
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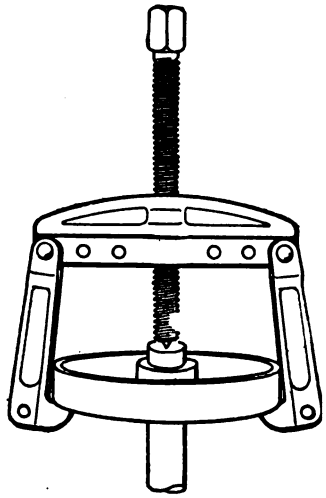
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Pipe Bending and Shaft Straightening Attachment

The point of the screw is flat with inserted tempered tool steel point. Will not spread centers. Works equally well on work without centers. The strain is taken on the flat point of screw.

Write for circular "D."



Removing Work Near End of Shaft

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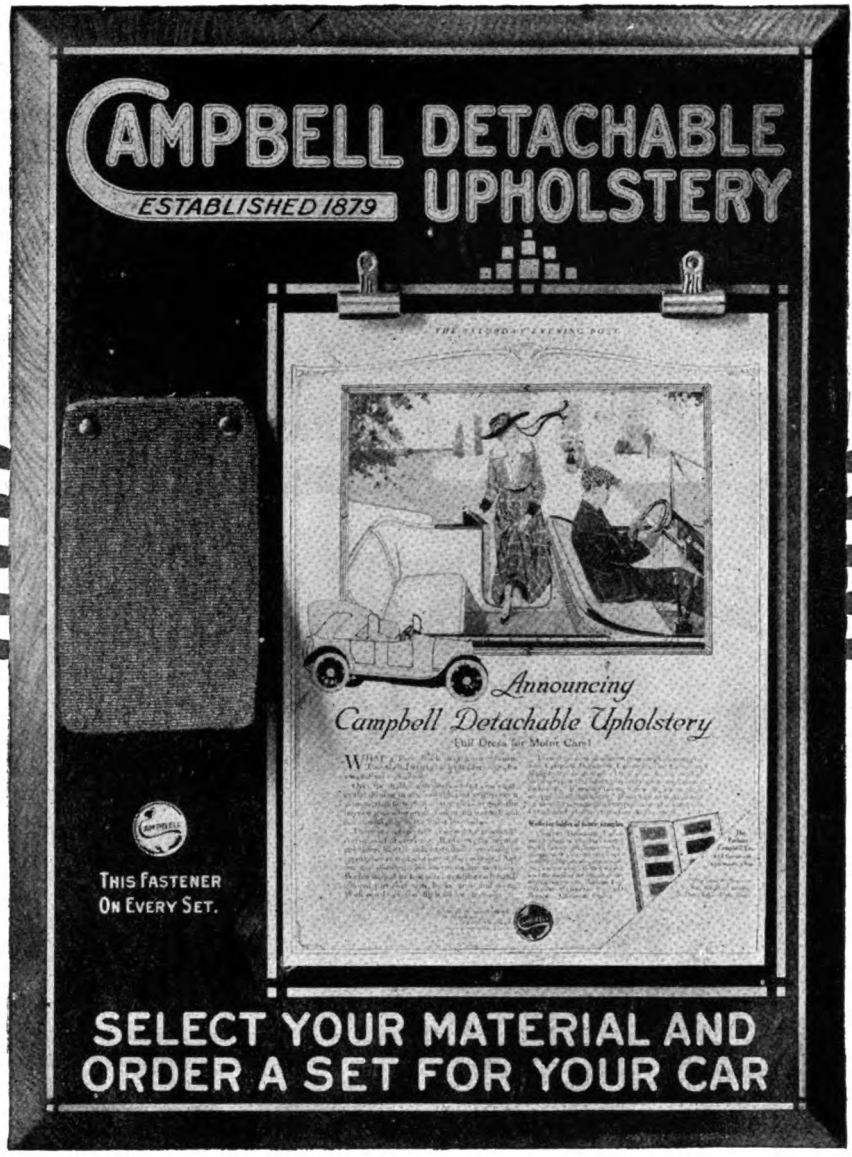
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Reserve Artillery!

How we help the dealer "cash in" on The Big Push

Last month we announced our big campaign in the Saturday Evening Post and seventeen other national mediums.

It is the Big Push !—the strongest support ever given the automobile dealer in the sale of an article like Campbell Detachable Upholstery.

Now we announce the Reserve Artillery—the selling force we furnish our dealers so that they may convert the magazine-created demand for Campbell Detachable Upholstery into dollars in the cash drawer.

The beautiful display stand illustrated above is but one of the Big Guns. We give you in addition handsome posters in seven colors, booklets, etc., to follow up your trade and make sales.

Without any concentrated selling effort Campbell Detachable Upholstery outsells all other articles of interior trim for motor cars. But backed by the tremendous advertising campaign we are putting behind it, Campbell Detachable Upholstery is the livest accessory you can stock.

If you want to sell prestige, luxury that has no competition, and an article that is in a class by itself, that insures you against mail-order competition, write or wire for samples, prices and trade discounts on Campbell Detachable Upholstery and details of our co-operative selling plan. The Perkins-Campbell Co., 628 Broadway, Cincinnati, Ohio ; New York Office, 89 Chambers Street.

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an instant Success

The trade wasn't long in getting onto a good thing. Orders for McQuay-Norris LYNITE Pistons, LEAK-PROOF Ring equipped, for Ford Cars, are coming in from all over the country.

Live dealers have realized the sales possibilities of the proposition. They know the biggest and easiest profits belong to the fellow who is stocked and organized ahead of his competitors when the demand sweeps in.

Think of those 700,000 Ford Owners on the lookout for this chance ever since aluminum pistons were first talked about. A ready-made market for you. Get the facts about our proposition—tell the Ford Owners around you about it—get their orders first.

McQUAY-NORRIS
LYNITE
ALUMINUM
PISTONS

completely equipped with

McQUAY-NORRIS
LEAK-PROOF
PISTON RINGS

Send for new illustrated folder on LYNITE Aluminum Pistons—full of valuable information. Also FREE booklet—"To Have and To Hold Power", explaining the merits of the famous LEAK-PROOF Piston Rings. Write Dep't R.

Sold by all up-to-date supply houses and repair shops.

MANUFACTURED BY
McQUAY-NORRIS MANUFACTURING CO.
ST. LOUIS, U. S. A.

Canadian Factory: W. H. Banfield & Sons, 372 Pape Avenue, Toronto

New York, Chicago, Philadelphia, Pittsburg, San Francisco, Los Angeles, Cincinnati, Seattle, Kansas City, St. Paul, Atlanta, Denver, Dallas

4 Pistons Fully Equipped $30.00



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The "Barefoot" Tire——

——and Why.

◆ ◆ ◆

WHEN you take your Shoes off tonight, do this:
—Bear your weight on your right Foot and, without lifting it off the floor, press it forward and backward firmly.

Then observe that only the bony and muscular *Structure* of your Foot *moves* forward and backward, while its *Sole* stays *fixed* on the floor.

That demonstrates the *rolling motion* of flesh and muscle, the elastic Cushion quality which *reduces friction* in walking, and prevents slipping (backward, forward, or sideways).

It supplies that CLING quality, which gives *Traction without Friction.*

It protects the Bones and Sinews of the Foot against the Wear and Tear of action, as a lubricant protects Metal moving parts, while providing the wonderful "Barefoot" *hold* on *slippery* surfaces.

◆ ◆ ◆

CONSIDER now the means by which *Tires* have been given maximum Traction,—*i. e.*, by means of a "sandpapery" texture in the Rubber of their Anti-Skid Treads.

Assuredly such Tires *do* give Traction.

But, every time the Brakes are put on, to make *such* Tires grip the road, the relatively hard, unyielding, and comparatively brittle, texture of the Rubber in their Treads causes these Treads to *grind away* on the pavement, to WEAR OUT fast at the point of contact.

The *sudden* efficiency of their *grinding-Traction* also tugs so sharply on the Rubber Adhesive between the layers of Fabric in Tire as to separate these layers.

There is little "give" to them—just as there is little "*slide*" to them.

So, they gain Traction at the expense of *Mileage.*

Naturally such Tires require *a great BULK of such Rubber* in order to deliver reasonable Mileage before worn out.

And, therein they differ radically from GOODRICH "Barefoot" Tires.

Because,—

—The Safety-Tread on Goodrich Tires is made of a very *unusual, secret,* and *exclusive* Compound, which we will here call "Hyper-Rubber."

It is *much lighter* in weight, than the Rubber used in other makes of Tires, being free from the "sandpapery" ingredients that are heaviest and inert.

Observe, that every *pound* saved on the *weight* of Tires (or any part of a Car *below* the Springs) is equal to a saving of 30 pounds when supported *above* the Springs (ask your Engineer).

Its lightness, however, is secondary to its STRETCH, its enormous STRENGTH and Longevity.

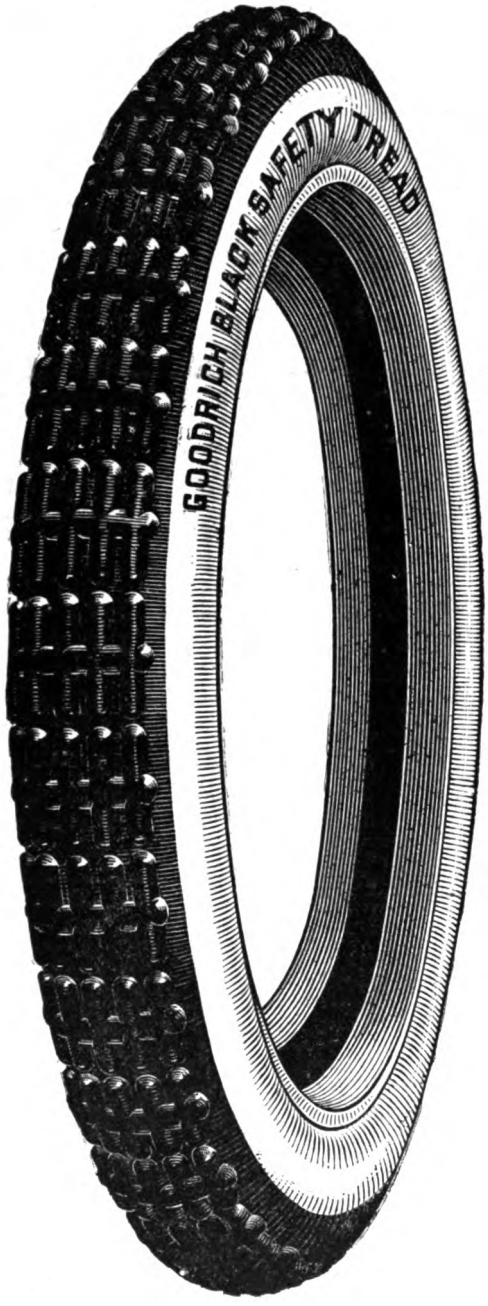
◆ ◆ ◆

AND here is how it acts in Automobiling,—
—When the weight of the Car bears on this clinging "Hyper-Rubber" Tread, and the power is applied to go ahead or reverse, the *stretch* in the Sole (or Tread) of the Goodrich Tire acts as a sort of Lubricant between the Fabric Structure of the Tire and the Road.

Then the Hyper-Rubber "Toes," of the Goodrich Safety-Tread Tire, CLING to the pavement (instead of *grinding against* it), just as your Bare Foot would *cling* to a slippery surface—*without Grind,* and so, with the minimum of Frictional Heat or Wear for *maximum* Traction.

Goodrich "Hyper-Rubber" is made into Goodrich Motor Cycle, and Bicycle, Tires, as well as into Goodrich Rubber Boots, Over-Shoes, Soles and Heels.

THE B. F. GOODRICH CO.
Akron, Ohio.



You will know them by their stylish
Black Treads

GOODRICH FAIRLIST TIRES

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TRADE K-W MARK

PROTECTION

The name K-W is really a symbol of protection for both the motorist and the dealer.

TO THE FORD OWNER—

The K-W Autolock Switch protects your Ford car **absolutely** against theft or tampering when left in garages or in the street.

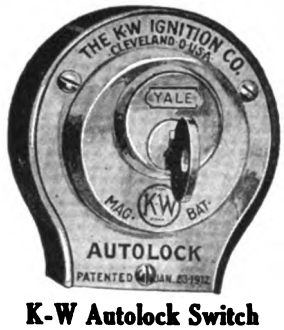
The K-W Master Vibrator protects you from the annoyance of poor ignition. It gives you sure and better ignition than a high tension magneto—easier starting in cold weather, etc.

The K-W Road Smoothers protect you and the parts of your car against the jolts and bumps common to riding over rough, rutty roads. They give you smooth riding over every inch of the roughest roads.

Right in your neighborhood, you will find a Ford car equipped with a K-W Vibrator, Autolock Switch or Road Smoothers. Ask the owner what they are doing for him every day. He can tell you better than we of the efficiency, economy and reliability of K-W products.

The K-W Autolock Switch positively protects your car against theft, the unauthorized use of your car when left in garages, and is even proof against your self-negligence, because you cannot forget to lock your car.

It takes the place of the ordinary switch, and can be easily attached to any make coil in five minutes—a pair of pliers and a screwdriver being the only tools necessary. Its use is as simple as locking a door. You use a key instead of a plug. To start—insert key and turn to magneto or battery. To stop—turn key to neutral.



K-W Autolock Switch
$3.50 complete

To lock—simply withdraw key. Your key in your pocket is your assurance that you will find your car "locked" right where you left it. Without the key it is impossible to operate the switch. Removing the screws will not remove the lock unless your key is inserted.

Each Autolock Switch is provided with a Yale pick-proof lock and three keys—no two locks with keys alike.

Sold by reliable dealers everywhere, at $3.50; if you don't know your dealer, sent prepaid on receipt of price.

TO THE DEALER—

The integrity of the name K-W prohibits exaggerated claims and promises. It's a symbol of fair dealing, as important to you as this mark on K-W apparatus is a guarantee to the user of quality, reliability and service. This broad, square deal K-W Policy protects you, Mr. Dealer.

The K-W line is a profitable one for live dealers. Write for our liberal sales plan today. 1916 offers a wonderful opportunity.

VISIT OUR BOOTHS AT THE SHOWS
At NEW YORK, D92-93 At CHICAGO, No. 22 Armory Balcony

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$15.00 With Regular Kick Switch

Easier Starting in Cold Weather

is but ONE of the advantages of equipping your FORD with a

TRADE K-W MARK

Master Vibrator



$16.00 With K-W Autolock Switch

Other advantages are:

Perfect Ignition—More Power
One adjustment instead of Four

A hotter spark—Smoother running engine. Less carbon deposits—Less gasoline used. Cleaner spark plugs—No worry.

Sold by reliable dealers everywhere. If your dealer can't supply you, sent prepaid on receipt of price.

Don't Wait Until Spring To Buy Your

TRADE K-W MARK REG US PAT OFF

Road Smoothers

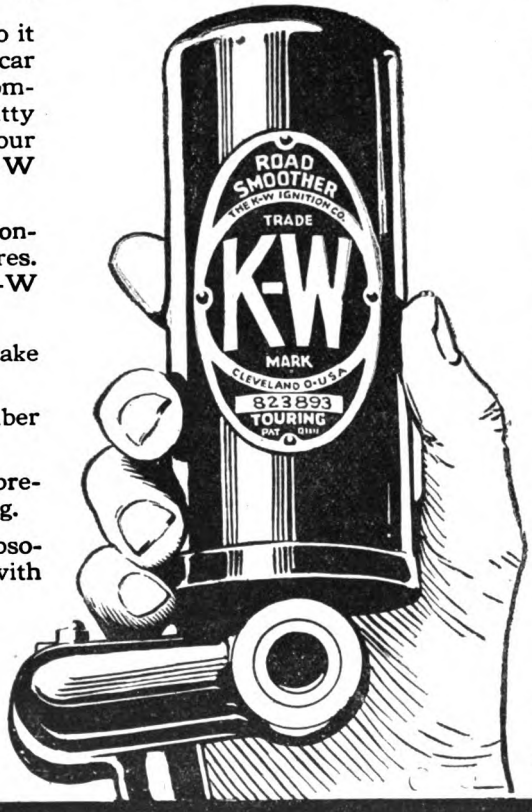
QUICKLY APPLIED TO YOUR FORD CAR

Put a set on now—you can do it in half an hour—and get big, car comfort from your light, economical Ford. Frozen roads are rutty and hard to drive over if your car is **not** equipped with K-W Road Smoothers.

Your comfort, safety and economy demands these four features. You'll find them only in K-W Road Smoothers:

1. A spring to effectively take up the shock.
2. An anti-rebound air chamber to check the rebound.
3. Anti-side motion links to prevent side rocking and swaying.
4. A construction that absolutely does **NOT** interfere with the steering.

Each of these features is in itself vital to your comfort and safety. It's only when they are combined in one device that you will get the greatest pleasure from your car.



But after all's said and done, it's results that count; and the K-W guarantee covers not only workmanship and material, but **results** as well.

$15 SET OF FOUR
One For Each Wheel

K-W Road Smoothers are quickly and easily attached. No holes to drill and no tools necessary, except a wrench. And the final and biggest advantage is that they increase the radius of your car's usefulness, and bring you home with "that satisfied feeling" after a day of comfortable motoring.

If your dealer can't supply you, sent prepaid on receipt of price.

Write for booklet,
"That Satisfied Feeling,"

TRADE THE K-W IGNITION Co. MARK
2817 Chester Ave. CLEVELAND, OHIO. U.S.A.

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HEATS YOUR CAR



RIDE IN LUXURY

PERFECT WINTER COMFORT

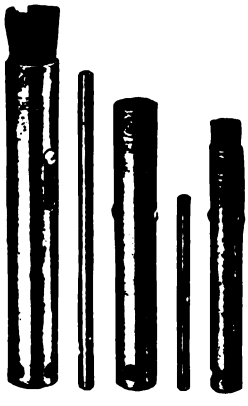
At a summer-time temperature while Jack Frost is nipping the outside in the coldest weather, without a cent additional cost to the up-keep of the car.

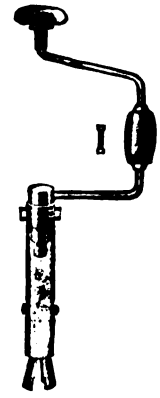
The Utility Heater

is a radiator and foot rest combined, the only practical heater ever made, utilizing the hot gases exhausted from the engine. Temperature kept at the desired point by a regulating valve inside the car.

No odors or gases can escape from this heater, nor can it burn anything coming in contact with it. Fully nickeled and an ornament to any car. Can be permanently installed in half an hour. Simple, ornamental, indestructible, an attractive addition to any car.

List Price, Utility Heater - $15.00
" " " Jr. Heater For Ford Cars $10.00





Brace Attached Ready for Use

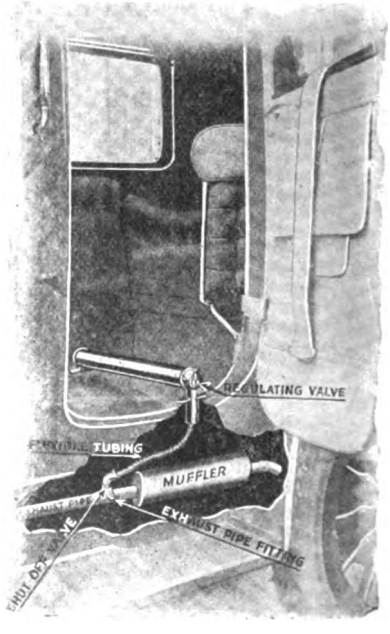
A New Combination

The Utility Socket Wrench Set and Detachable Brace.

The most serviceable tool ever made. It can be instantly attached to any of the three socket wrenches, making it possible to operate them like bit braces, and makes it possible to remove any kind of nut, bolt, etc., without injury, no matter how hard they stick.

No tool on the market like it.

List Price, Combination Set - $3.50
" " Utility Wrench Set - 2 50



The Hill Pump Valve Co.
18-22 East Kinzie Street, Chicago, Ill.

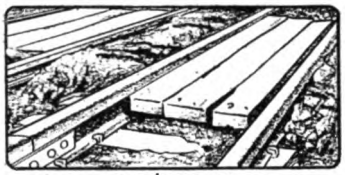
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IT "IRONS" THEM OUT

Cross Paths, Rails, Ruts and Bumps, Cobble Stones and All Other Road Irregularities



CROSS PATHS



RAILS



RUTS & BUMPS



COBBLE STONES

As far as comfort is concerned, every road is a smooth road for the man whose car is equipped with the

*Hartford SHOCK ABSORBER

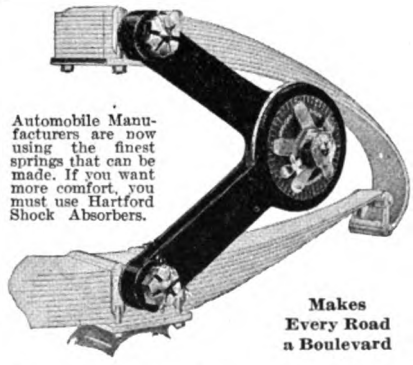
Even the extremely rough kind, with deep ruts and prominent bumps, is traveled without jerky jolt and jounce.

Solid comfort is his, all the time.

A real shock absorber. First in use, the pioneer; first in efficiency.

Affords scientific spring control, preventing abnormal action. Keeps the tires on the ground, saving wear and tear. Absorbs road and engine vibration. Controls side sway, prevents spring breakage, makes for comfortable travel over all roads and materially lessens up-keep expense.

Write, giving make, year and model of your car, and we will tell you how to make it truly comfortable.



Automobile Manufacturers are now using the finest springs that can be made. If you want more comfort, you must use Hartford Shock Absorbers.

Makes Every Road a Boulevard

HARTFORD SUSPENSION CO. E. V. HARTFORD, President **141 Morgan St., Jersey City, N. J.**

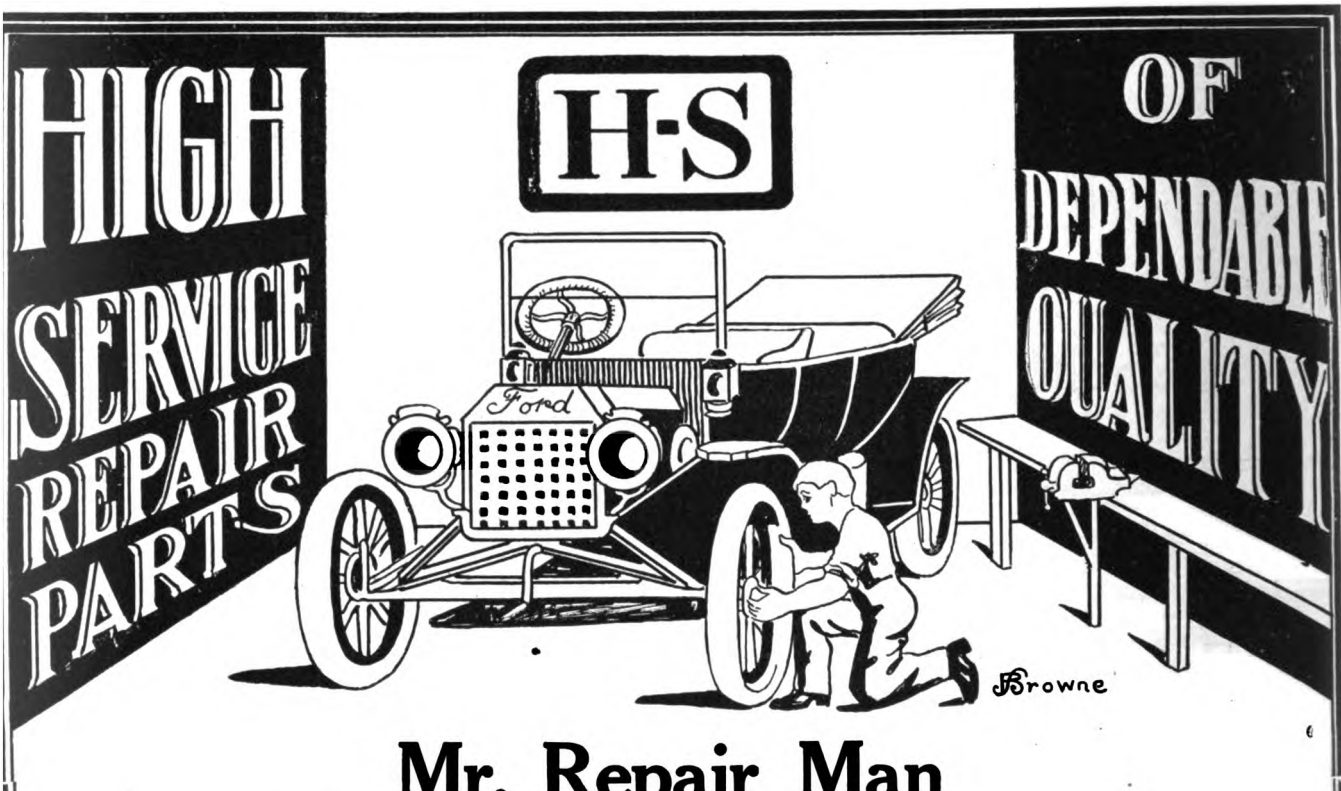
Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

BRANCHES: **Boston,** 319-325 Columbus Avenue; **Chicago,** 2637 Michigan Avenue; **New York,** 1846 Broadway and 212-214 West 88th Street; **Indianapolis,** 425 North Capitol Boulevard.

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* Formerly Truffault-Hartford.

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Mr. Repair Man

Comparison and trial will convince you that our

HIGH-SERVICE REPAIR PARTS

are noticeably superior in fit, finish and material. They will furnish the maximum wear, and will make a satisfied, regular customer, of any one on whose Ford car you install our parts.

The more than generous discount we allow enables you to get our High-Service Repair Parts at a price so low you can make a greater profit handling them, enabling you to save money on your purchase price, and make more money on your sales, or repairs.

Dealers of Auto Supplies, Ford Agents, Garages, and Repair Men, should be especially interested in our High-Service Repair Parts for Ford cars. Full credit allowed for any part returned as unsatisfactory for any reason.

Rear Axle Shafts Differential Drive Gears and Pinions Front and Rear Springs
Nuts Bolts Keys Gaskets Bushings Screws Pins Ball Bearings
Connecting Rods Front Radius Rods Washers, Etc.

We have over 300 Repair Parts and are continually adding to the number. Our price list is also an order blank.

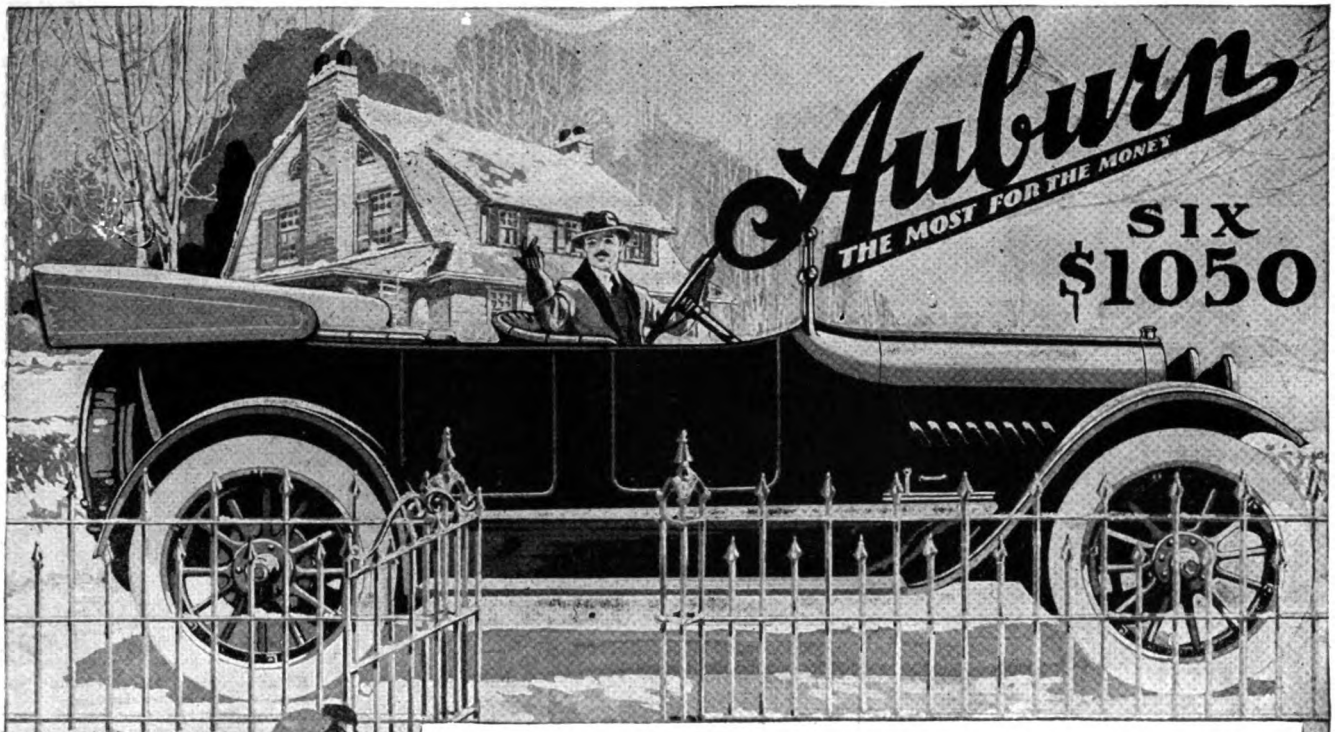
WRITE TODAY FOR A COPY

We can use good salesmen in territory not already covered.

HILL-SMITH METAL GOODS COMPANY

88 PEARL STREET, Corner High Street **BOSTON, MASS.**

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"No Car Is Easier To Sell"

The vast majority of cars will be bought this season by people who have owned cars before.

It is human nature to change.

This means thousands of car buyers will ***come down*** from higher priced cars to the common sense Auburn prices. Also thousands will ***come up*** from the cheap cars to the economical but good-looking and roomy Auburn type.

Don't judge until you let us submit the ***proof*** that the Auburn gives "The Most For The Money". And where can you find a car backed by a more reliable and successful institution built upon sixteen years' experience?

In looks, the Auburn ranks alongside the most costly imported cars.

In mechanical construction, it is sane and dependable—perfectly modern but not experimental in any feature.

We were one of the first to realize that the foundation of permanent business must rest upon ***money-making dealers.***

It costs you nothing to learn the Auburn proposition for dealers, so write us at once. No matter where you live, small town or city, write us—we have something of vital importance to tell you—***we have an offer you cannot afford to overlook.***

Model 6-38; $1050—Six cylinder, 3x5; Cantilever springs; Electric lighted and started; Spacious tonneau and driving compartment; 34x4 tires; 120-inch wheel base; Completely equipped; 3 and 5 passenger models.

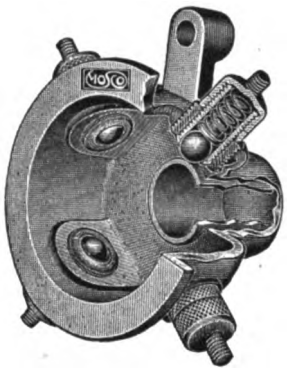
Model 4-38; $985—Four cylinder, 3⅞x5; Cantilever springs; Electric lighted and started; 34x4 tires; 114-inch wheel base; Completely equipped; 2 and 5 passenger models.

Model 6-40A; $1375—Six Cylinder, 3½x5; Cantilever springs; Electric lighted and started; Luxuriously roomy tonneau and driving compartment; Folding auxiliary seats; 35x4½ tires; Completely equipped; 2 and 7 passenger models.

Auburn Automobile Co., Auburn, Indiana, U. S. A.

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CATALOGUE NOW READY — MOSCO SPECIALTIES — FOR 1916







Bemus Timer Patents {Sept. 24, 1907 / Dec. 17, 1907 / Feb. 16, 1915 / Apr. 27, 1915} Others Pending

WHY were tens of thousand of these Timers sold in 1915? Why were we able to obtain a national distribution in a phenomenally short time? Why did 1,000 dealers from Boston to San Francisco look to us exclusively in 1915 for Timers for Ford Cars? **BECAUSE**

THE BEMUS BALL CONTACT TIMER

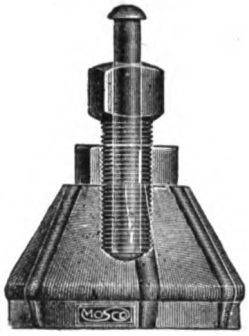
STOPS THAT SKIP. By reason of the method of mounting—on the time shaft—the main cause of skipping is eliminated. You will be surprised at the improvement here.

SMOOTHES OUT THE RUNNING to a degree which you would have believed impossible.

GIVES THE MOTOR MORE POWER, MORE SNAP, STEADIER PULLING, AND DOES AWAY WITH THAT JERKY RUNNING ON LOW THROTTLE.

PRICE $2.25

Reinforcement of advance arm by moulded-in steel bushing is a late feature.



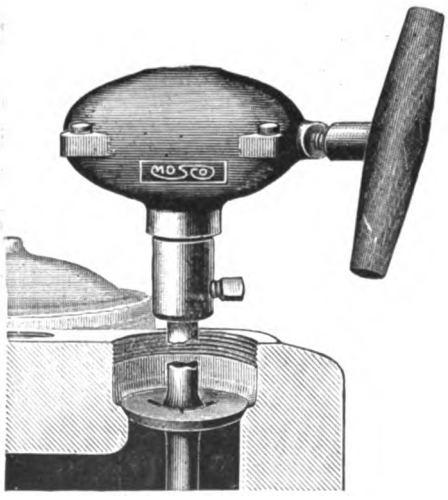
Patented {Mar. 24, 1913 / Dec. 15, 1914}

WHEEL PULLERS

(Loose Plunger Type)

For Ford, Overland, Buick and Maxwell Cars

Every practical man knows that the only way to start a wheel which is stuck or "frozen" to the axle is to drive back the axle while pulling the wheel. Two men are required by the old method—the ordinary wheel-puller will never take off a stuck wheel—one man can do it easily with the MOSCO pullers. They have loose plungers extending through the screws—and bearing on the end of the axle. A blow with a hammer on the plunger, a turn of the screw, another drive with the hammer, and the wheel is off—no matter how long it has been on, nor how fast it is stuck. Information and prices on request.



THE MOSCO VALVE GRINDER

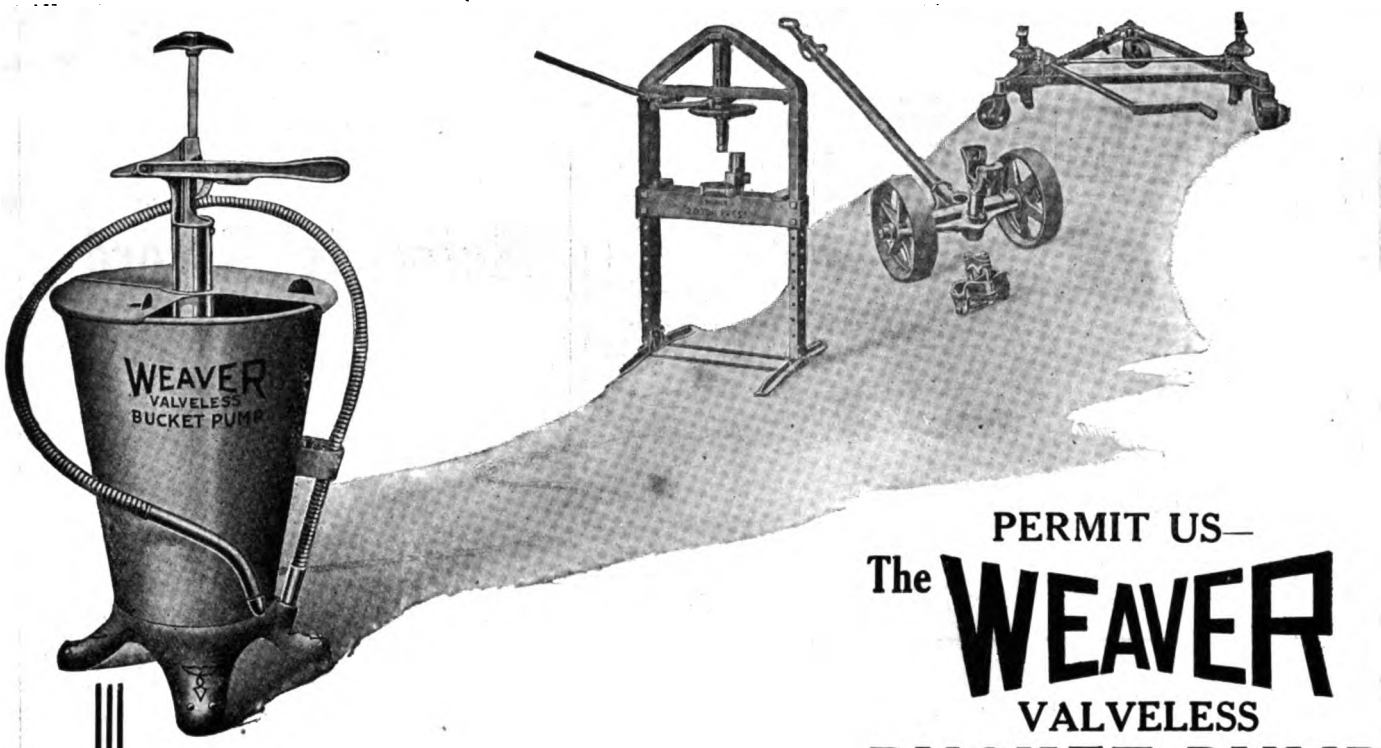
This tool differs radically from others in many respects, but mainly in the fact that it can safely be used by those unskilled or inexperienced in valve grinding. It is really more of a machine than a hand tool, and it renders valve grinding an ACCURATE MECHANICAL OPERATION rather than a guess-work hand job. The working principle is absolutely new. The operating handle is attached to a chain coiled on a pulley, carrying the tool chuck. The operator pulls the handle, rotating the tool and the valve; a spring on the chain pulley pulls in the opposite direction, automatically reversing the rotation of the valve. Much greater rapidity can be obtained with the MOSCO GRINDER than with the ordinary tool, resulting in a very superior finish on the seats. Made of the best materials—thoroughly guaranteed. At the price at which it is listed this grinder should be in every tool kit. In ordering state make and year of car or motor.

PRICE, $1.50 Each

MOTOR SPECIALTIES COMPANY

MANUFACTURERS, WALTHAM, MASSACHUSETTS

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PERMIT US—

The WEAVER VALVELESS BUCKET PUMP

WHILE the Weaver Bucket Pump is amply capable of standing upon its own merits—we do not hesitate to point with pride to its long line of "blue-blooded" ancestors—confident that they will win for our infant prodigy instant recognition and endorsement among the most exclusive of the Automobile Fraternity.

The same originality and ingenuity which characterizes each article of "WEAVER" Garage Equipment is strongly evident in this Valveless Bucket Pump.

THE "THREE-WAY" FEATURE

One great advantage of the "Weaver" Pump is the fact that our valveless construction permits lubricants to be handled in "three ways."

First—The lubricant can be forced out of the bucket and into the desired receptacle.

Second—Grease or oils can be sucked out of the differential, transmission housing, etc., and **forced into the bucket.**

Third—Where the lubricant to be removed from the differential or transmission is of a different variety or quality from that contained within the Bucket, the barrel or chamber of the Bucket may be sucked full of the foreign lubricant and discharged again through the hose into a **third receptacle without disturbing the content of the Bucket.**





SELF-MEASURING

The barrel has a total capacity of exactly one pound of grease or heavy oils. In handling light lubricating oils which are usually sold by liquid measurements, ten full strokes of the lever handle will discharge exactly one quart.

STEEL HOSE

The Weaver Bucket Pump is equipped with ⅝-inch Flexible Steel Hose which is practically indestructible and cannot be affected by the grease.

CONSTRUCTION

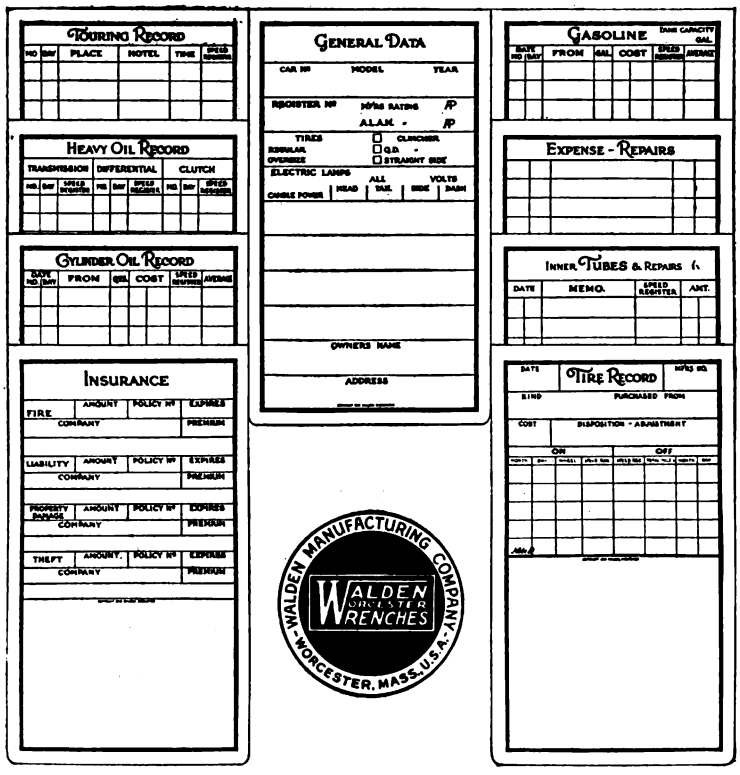
The Bucket proper is made of heavy sheet iron and has a capacity of 25 pounds of grease. The barrel is of 16 gauge brass tubing, two-inch diameter, containing a plunger which will not leak and is impervious to the action of grease and oils. Shipping weight, 25 pounds.

List Price, - $12.00

WEAVER MANUFACTURING COMPANY

2167-79 So. NINTH STREET SPRINGFIELD, ILLINOIS

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Motorists' Record

You may be interested to know accurately the cost of operating your car. You are certainly interested to know its efficiency. This book will enable you to keep as complete record as desired.

FREE

Mr. Motorist:

You can obtain one of these books from your dealer or jobber without charge. ***Ask for it.*** If they are unable to supply you, write us direct, giving name of your dealer or jobber and enclose two cent postage stamp and it will be mailed direct to you.

To Dealers and Jobbers:—If you are selling Walden-Worcester-Wrenches and are interested to distribute some of these books, write us at once, they are free to our customers in the trade.

Combination Socket Wrench Sets

Ratchet Wrenches

SOCKET WRENCHES

Service Wrenches—Ford Car

Tire and Rim Wrenches



Write for catalog No. 17 and trade prices ——

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STA-TITE

THE RING *that holds the* KEY

to your MOTOR TROUBLES

DOES YOUR MOTOR LACK POWER?
Increase by using ☞

DOES YOUR MOTOR LOSE COMPRESSION?
Prevent by using ☞

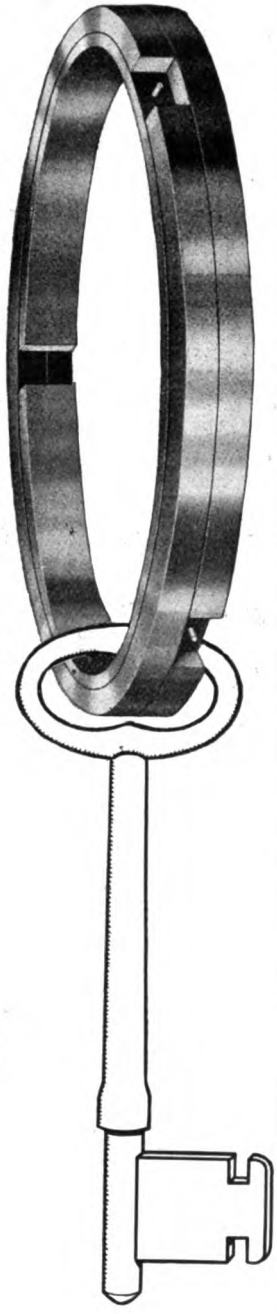
DOES YOUR MOTOR USE TOO MUCH GAS?
Decrease by using ☞

DOES YOUR MOTOR WASTE OIL?
Save by using ☞

DOES YOUR MOTOR SMOKE?
Stop by using ☞

DOES YOUR MOTOR FORM EXCESSIVE CARBON?
Eliminate by using ☞

DOES YOUR MOTOR FOUL ITS SPARK PLUGS?
Correct by using ☞



Liberate yourself from these troubles
We have given you the KEY

STA-TITE

The Eternally Tight Ring

THE PISTON RING COMPANY

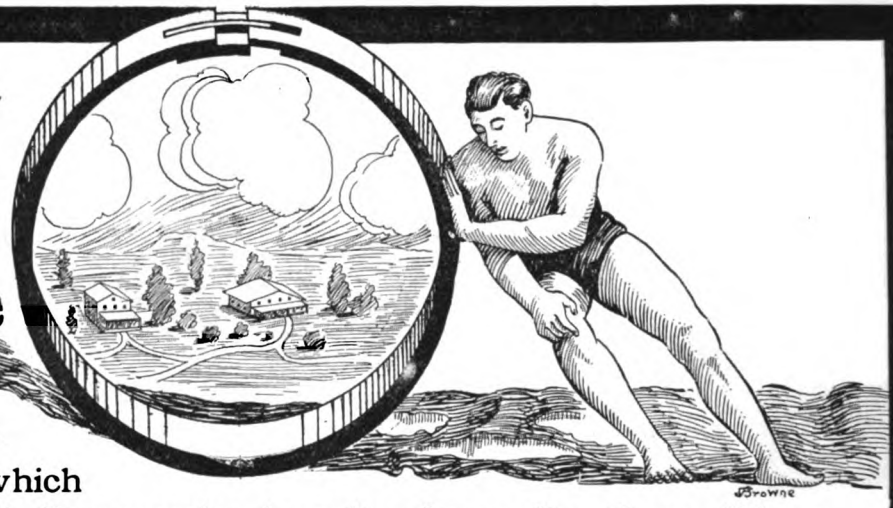
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MUSKEGON, MICHIGAN

If not to be had from your dealer, write us direct

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POWER To Climb a Hill, Or Travel a Rough Wet Road, in the Winter



IF you install Peerless Piston Rings, which maintain a Tight High Compression in spite of any climatic conditions.

Furnishing a Reserve Power

That can only be proved when you try it. The Peerless Piston Rings are eccentric and positively the only rings that are completely compression-tight and carbon-proof.

Simple---Sensible---Economical and Efficient

Money back guarantee goes with each ring. Can you ask more?

Write us today for prices and concessions.

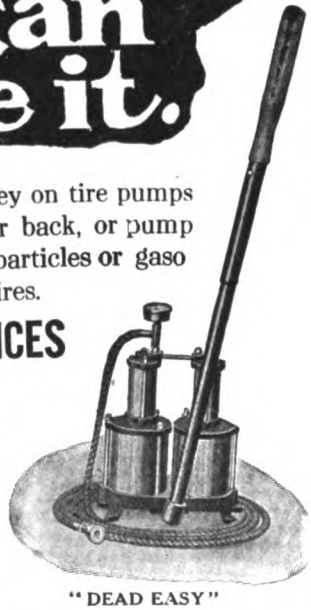
LARSON & HILKER, Distributors, 19 S. La Salle St., CHICAGO, ILL.

At Our Risk- You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



"DEAD EASY"

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's **"Dead Easy."**

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY

BATTLE CREEK, MICH., U. S. A.

"NORMA"

BALL BEARINGS

If you substitute some other bearings for the "NORMA" Bearings you find in high-grade magnetos, lighting generators and starting motors, you take responsibility from the accessory maker and shoulder it yourself. The maker stands back of his machine, with "NORMA" Bearings in it. He will not, if you substitute others. Why burden yourself with needless responsibility? Get a stock of "NORMA" magneto sizes, to-day.

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

"NORMA"

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Harvey
RACINE

BOLTLESS AUTO SPRINGS ARE GUARANTEED AGAINST ALL DEFECTS

All automobile springs look pretty much alike, but there's a vast difference—an unseen difference—in durability and general efficiency.

Harvey Springs are **guaranteed from end to end.** They are made of the finest selected steel. The plates are scientifically formed and tempered on the Harvey patented machines, which make them with an accuracy and uniformity that is not possible to obtain with hand labor. Each step in the manufacture of Harvey Springs is carefully watched and every spring is carefully inspected and tested before being shipped. You may rest assured that all springs passing our rigid inspection will give absolute, lasting, positive satisfaction. Harvey Springs are

MADE WITHOUT A HOLE AT CENTER

Instead of a bolt, a small depression, or bead, is used to keep the plates from shifting. This preserves all the strength at center, or point of greatest strain.

You can recommend Harvey Boltless Auto Springs without fear or hesitation to your closest friends and most particular customers. They have more real quality than any other springs you can buy anywhere—at any price. They are strong, durable, resilient, easy-riding and

HAVE NO WEAK SPOTS

You can build up a good profitable spring business on the solid worth and merits of Harvey Springs. Send us your orders. We will ship stock springs immediately and are prepared to make special springs to order in shortest possible time. Our Quick Service Department will ship you springs that won't break. Try us on your next order.

JOBBERS, DEALERS AND GARAGEMEN NEED THIS BOOK



It contains a complete list of springs for over 300 of the leading makes and models of automobiles, also detailed measurements, specifications and other valuable information that has never been published before. With this book you can order replacements without fear of making a mistake. Send for a copy of the **"Harvey Auto Spring Book"** today and keep it for quick and ready reference.

WE WILL MAIL IT TO YOU FREE.

We Carry Over 10,000 Springs

We carry over 10,000 Springs in stock at our factory for quick shipment. Harvey Springs are also carried in stock at all leading jobbing centers. Write us for name of your nearest jobber.



The Harvey Spring Co.

849 SEVENTEENTH STREET

RACINE WISCONSIN

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A SCIENTIFIC OIL PACKING PISTON RING
BUILT BY PEOPLE WHO KNOW HOW



Our Customers Our References

More power, less oil, less gasoline, less friction, less repairs.

A Saving On Every Count

Write for folder, ask for special trial offer.

Distributors wanted, good territory still open.

Write for special proposition.

High Efficiency
Low Cost

Automobile Accessories Co.
816 West North Avenue
Baltimore, Maryland

Every Garage and Dealer
. . Should have this box of . .

RAJAH TERMINALS

An efficient, strong and dependable clip connection that will not loosen. Used by leading car and magneto manufacturers. Write for prices and information. . . . . .



Rajah Terminals bear the same GUARANTEE of quality as the famous

RAJAH SPARK PLUGS
"Ignition Absolutely Sure!"

Rajah Giant Plug Retails **$1.50**
Rajah Standard Plug " **1.25**
Rajah Waterproof Plug " **1.50**
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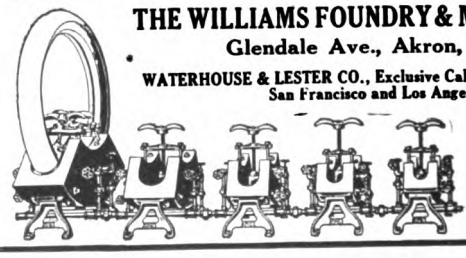
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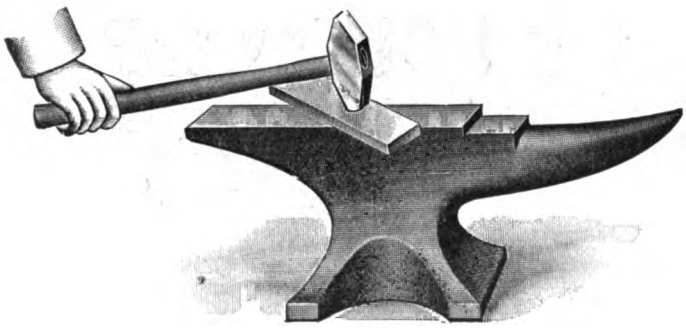
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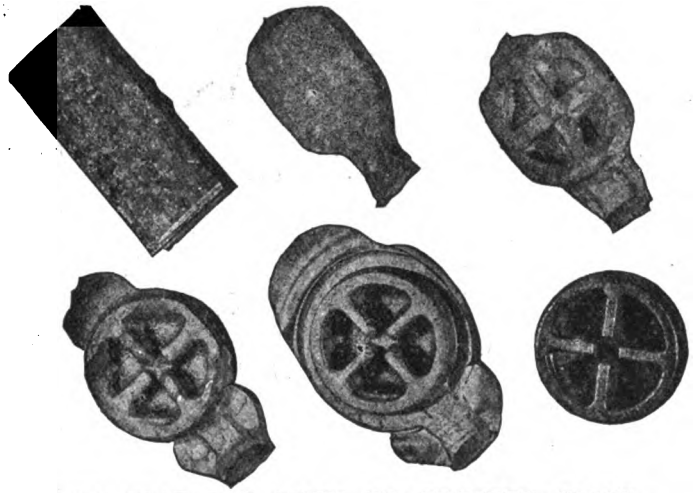
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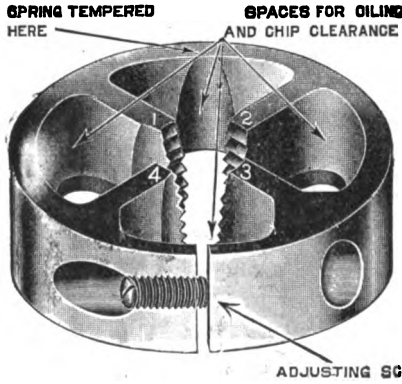
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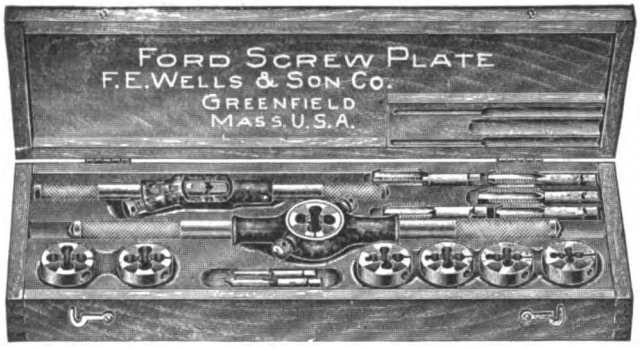
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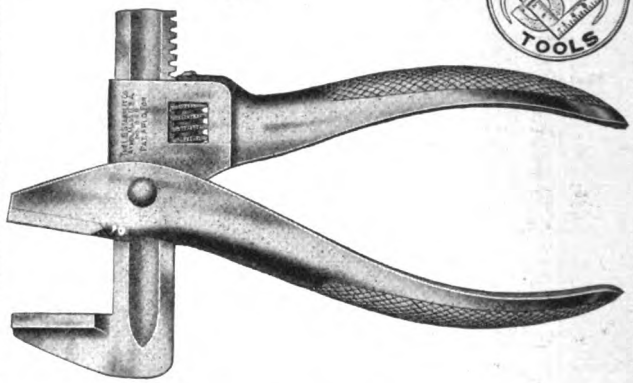


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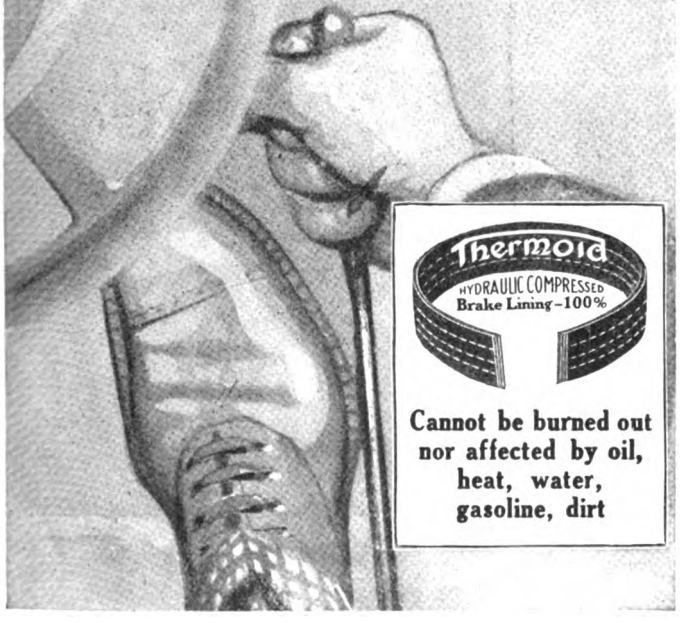


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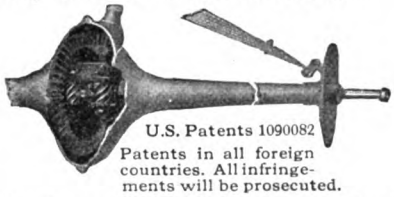
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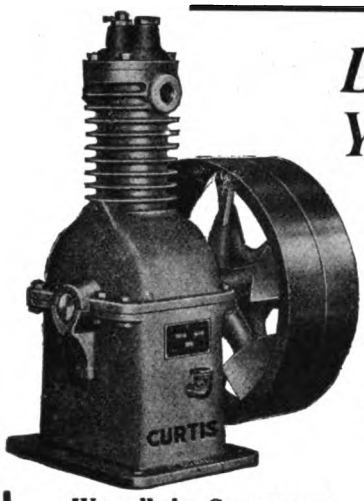
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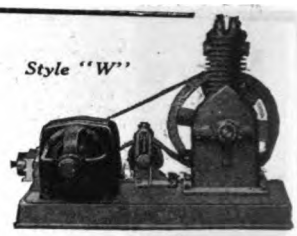
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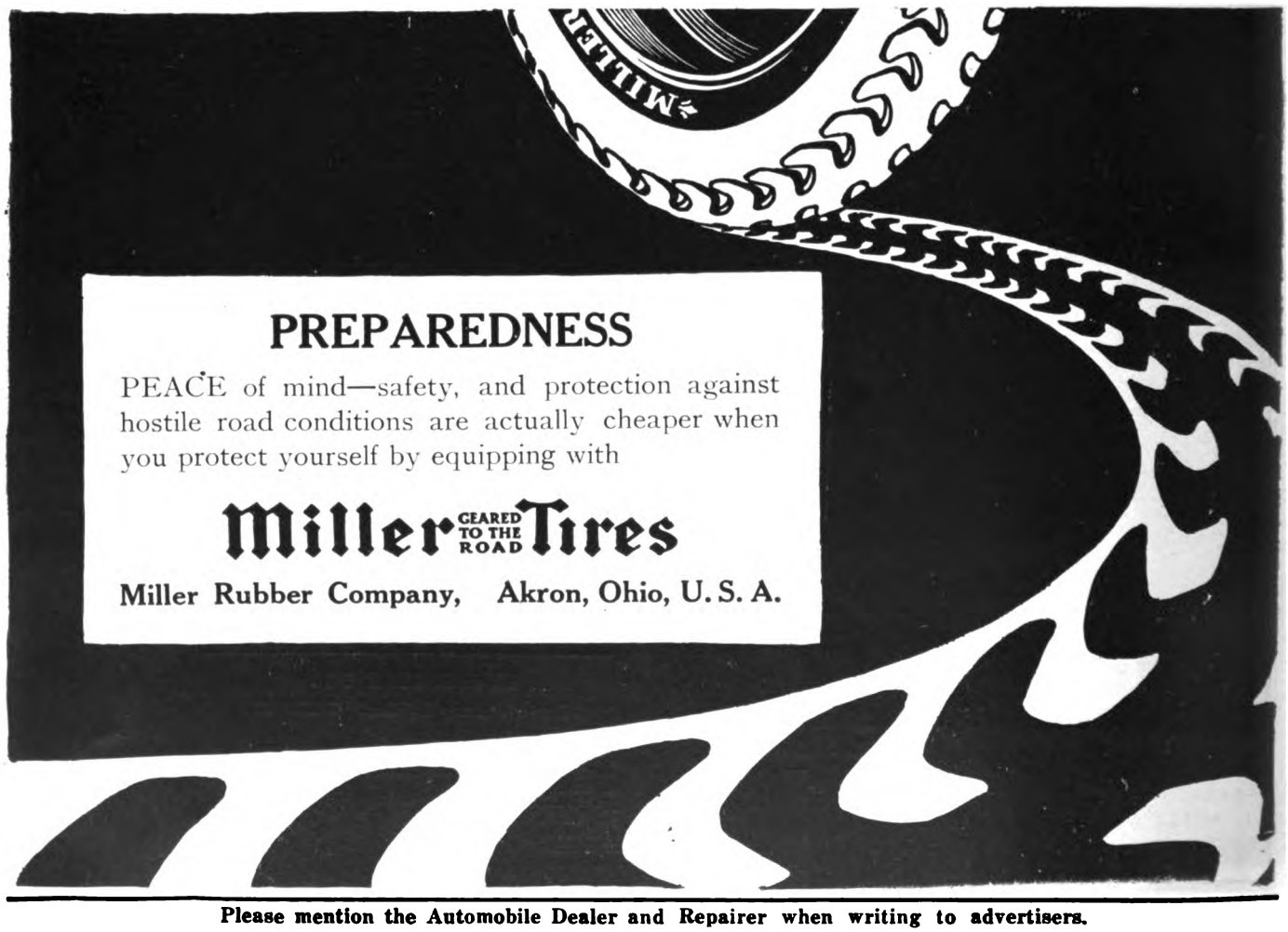

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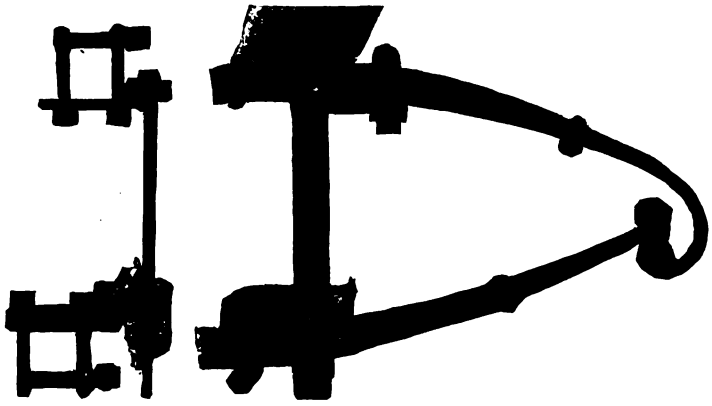
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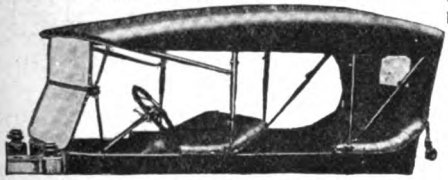
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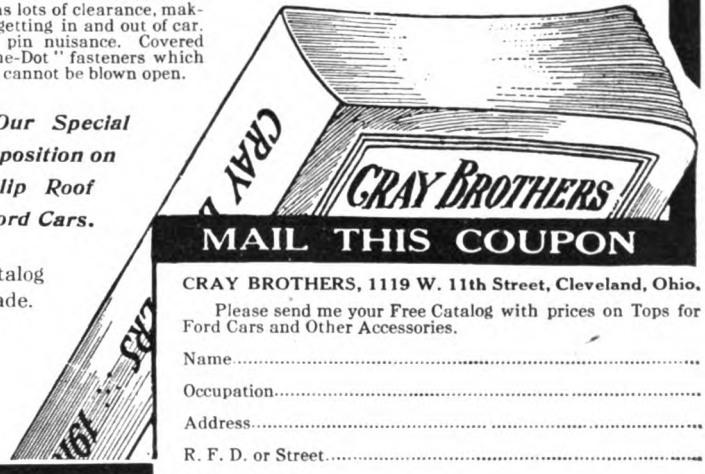
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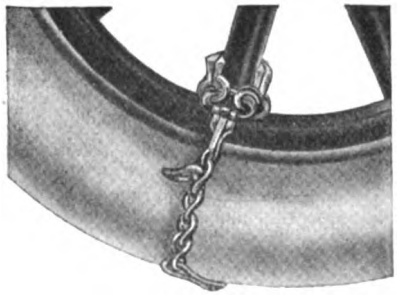
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A JOURNAL OF PRACTICAL MOTORING

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STARTING THE ENGINE.

Some of the Factors That Contribute to the Difficulty.

BY C. P. SHATTUCK, M. E.

The time is fast approaching when the motorist, particularly the new owner of an old car, one that must be started by hand, will experience difficulty in starting the engine. The average new owner is of the opinion that the present grade of fuel is wholly to blame, but a careful analysis of the average case will reveal a number of other factors which contribute to difficulty in starting. The writer is of the opinion, and his contention is borne out in practice, that much of the difficulty experienced in starting is due to causes other than the gasoline, and that by remedying these troubles it will not be necessary to exhaust one's self by ineffectual cranking.

Before discussing methods and devices for overcoming troubles, some of the troubles confronting the manufacturer of carburetors and having a bearing upon the subject will be of interest. It is not generally known to the laymen that it is a simple matter to construct a carburetor that will make for easy starting in cold weather, but unfortunately such a design does not obtain the other results sought; that is, operative efficiency is more or less sacrificed. The mileage obtained from a gallon of gasoline is a factor which largely influences the decision of a prospective purchaser to a large extent.

The object of the designer of a carburetor is to obtain a device that will suitably proportion the gasoline to the air and to properly vaporize the fuel. In all practical carbureting devices the liquid fuel is brought into the presence of the air with which it is to combine by means of a pressure depression exerted upon the discharge end of a tube or passage so constructed and located as to cause the fuel to be carried off by a moving column of air.

The proportioning of the fuel and the air is subject to irregularities as a result of temperature change, not always seasonal changes, but the motor itself. The last named changes are greatest, especially with low atmospheric temperatures, and as a result irregularities in mixture proportioning are greater in the winter than in the summer. Changes in the temperature, whether it be the air entering the carburetor, or of the motor proper, tend to alter mixture proportions. There are other factors involved but a discussion of these technical points will not be of interest to the reader, but the above named conditions will afford some idea of the problems encountered by the carburetor manufacturer. With the more modern types, equipped with devices for enriching the mixture for starting without interfering with the operative mixture, the greater part of the difficulties have been overcome.

The older types of carburetors generally require more or less changing in the adjustment of the fuel and air supply, and a mixture making for easy starting is generally likely to be excessively rich at operating speeds, as is frequently noted by the exhaust of old motors in cold weather. The exhaust is accompanied by a pungent odor and black smoke. With such carburetors operative efficiency is sacrificed for easy starting, and many owners prefer the latter to the former.

A factor contributing largely to difficult starting of the old type of motor in cold weather is the design of the intake manifold, a most important adjunct of the carburetor. The marketing of a motor fuel of low volatility has resulted in the redesigning of intake manifolds. They are made shorter, are placed near the top of the cylinders, where the heat of the water jackets assists in vaporization of the fuel, and in several instances the intake manifold is entirely eliminated, the inlet passages being cast

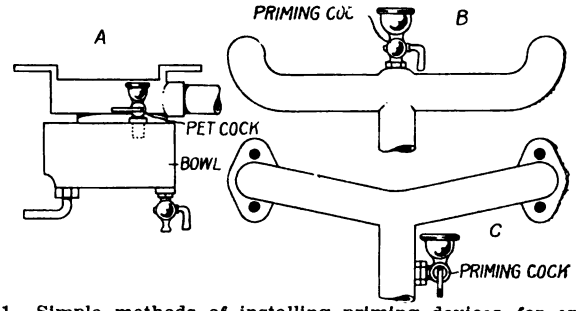


Fig. 1.—Simple methods of installing priming devices for enriching the mixture for starting in cold weather.

with the motor. Such construction, coupled with a a rapid rotation of the crankshaft by the motor starter, has eliminated starting troubles to a great extent, but not wholly, as will be pointed out.

When the mixture leaves the carburetor it is not a true gas, it consisting chiefly of liquid particles carried in mechanical suspension in the moving air current. A definite velocity is needed to maintain this suspension, and the moment the speed of the moving air current is decreased below a certain velocity the larger particles of fuel are deposited on the walls of the intake pipes and the mixture no longer contains that amount of gasoline that was metered into it by the carburetor. Whenever a moving fluid comes in contact with foreign surfaces the velocity of the surface stratum is markedly diminished by the friction of the contact, termed "skin friction," an amount dependent upon the condition of the smoothness of the frictional surface. That portion of the air column which comes in contact with the walls of the manifold frequently falls below the critical velocity, even though the interior of the column be maintained well above it. This wetting of the surfaces is commonly, but erroneously, attributed to "condensation." Condensation implies a change of state from a gas to a liquid. As the gasoline has never been a gas, during the process under consideration, the term condensation is a misnomer.

The liquid film, wetting the walls of the manifold,

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is subjected to the attraction of the moving air column, with the resulting evaporation of the liquid. This evaporation takes place only from the surface of the fuel and is a slow process with low grades of gasoline. The processes of deposition and evaporation are noted when starting some engines on a cold morning. After running a short time the rate of evaporation, assisted by the rise of the temperature beneath the hood, equalizes with the rate of deposition and the motor runs smoothly and without that "surging."

The tendency of the liquid to seek the outer periphery of all curves in the induction pipes is another factor increasing the proper distribution of a mist-laden mixture. No matter how finely the fuel may be comminuted, so long as it remains a liquid its specific gravity is greater than that of the air and, being thrown violently against the outside of the curve by centrifugal force, its velocity is lessened by the impact. The result is a tendency to impoverish the mixture. With the tortuous passages of some manifolds, it is probable that nearly all of the unevaporated fuel is deposited before reaching the cylinders, and it is not uncommon to note with poorly designed manifolds an actual dripping from around the throttle shaft and from the primary inlet to the carburetor, after one has become exhausted by the ineffectual cranking of a cold motor. While these defects in manifold design have been eliminated to a great extent in the modern motor, it can be readily seen that some of the starting troubles experienced are due to inefficient manifolds. It is important that each cylinder receive an equal quantity, as well as a mixture possessing the same chemical and physical characteristics. Some older types of motors preclude this. Add to these complications those present with the early forms of carburetors and it is no wonder that trouble is experienced in obtaining a mixture that will afford easy starting and operative efficiency.

With some types of motors it is essential that the crankshaft be rotated at a high rate of speed or spun. Unfortunately, however, there are some motorists who do not master the knack of overcoming the starting torque to spin the motor. This is particularly true if the engine has stood for a long time and the temperature is well below the freezing point. And if there be abnormal space between the walls of the cylinders, rings and pistons, the congealed oil makes it more difficult to overcome the starting torque.

Difficult starting in cold weather is frequently the fault of the owner. Dealing first with the car not equipped with a motor starter or priming devices and relying upon dry cells or a storage battery as a source of current supply, it may be said that many motorists do not take into consideration the fact that batteries that will start the motor easily in warm weather will fail in the winter. Cold has a certain effect upon electricity derived from chemical action and because of this fact the dry cell and storage battery require careful attention. If the dry cells give a reading below 10 amperes, it is best to discard them for all new. One poor cell in a group will set up considerable resistance to the passage of the current. Storage batteries should be maintained according to the directions of the maker, even the cells charged by the generator of the lighting system.

Timers or commutators often are responsible for difficult starting, especially if dirty, for certain foreign elements set up a considerable resistance to the passage of the primary current, resulting in a weak spark. Worn rollers and metal segments and loose bearings prevent a good contact, and similarly if the points of the vibrating coil be fused or dirty, they impose a resistance in the circuit, affecting the intensity of the spark at the plug. Dirty and oil-soaked wires in both the primary and secondary circuits decrease the efficiency of the spark, for it should be borne in mind that the intensified electricity will always take the path of the least resistance.

Failure to start the motor on the magneto—the true high-tension type—in cold weather is frequently due to too large a gap of the contact points or the points may be pitted or dirty. The contact points will wear after considerable service and the space between them when fully separated should be measured with the gauge accompanying the magneto. In the inspection of the components of the ignition system, the motorist, as a rule, overlooks the spark plugs. Many owners do not take into consideration that certain types of plugs have electrodes that are affected by the intensified current; that the gap is increased by the burning action of the current. This increase is so slow that it is not noticeable until the motor is hard to start in cold weather. The writer recalls a particular instance which illustrates how one can be deceived when measuring the gap of a spark plug. The car was of a popular make and the best results were obtained with a 1/32 inch gap. The motor was difficult to start and at low speeds missed. The owner, a practical motorist, had been over everything without locating the trouble. He had gauged the gap and found it apparently correct, but upon the writer examining the electrodes he found that the current had burned quite a recess in the electrode of the shell. This increased the gap considerably. Upon installing a new set of plugs with the gaps correctly gauged the hard starting and missing disappeared. It demonstrates the importance of conforming to the gap recommended by the maker of the ignition system and the advantages of a spark plug employing eelctrodes not easily affected by the intensified current.

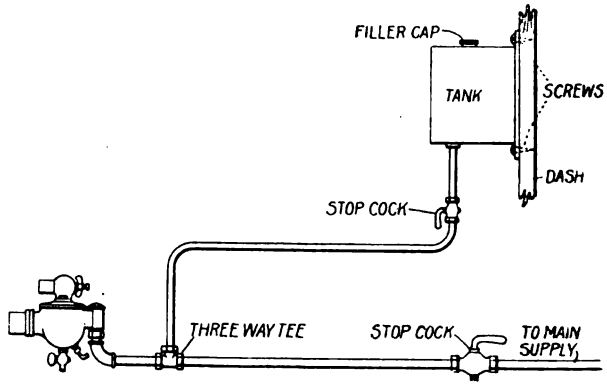


Fig. 2.—Home-made priming apparatus for supplying highly volatile fuel until the motor becomes warm.

Natural wear of the spark control linkage and the driving mechanism of the ignition apparatus will contribute to hard starting. Invariably the motorist who starts his engine becomes accustomed to placing the lever on the quadrant in a certain location; in fact, it becomes a habit. With the wear of the linkage, etc., the spark occurs later, and if the motor be started on the magneto some owners do not take

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into consideration the fact that it is not always possible to attain the same rate of speed when rotating the crankshaft in cold weather as in the summer. Consequently the spark should be further advanced.

Poor contacts at the switches are factors making for trouble in starting, and worn pins retaining the throttle valve of the carburetor admit extra air which dilutes the mixture at cranking speeds. Worn valve stems or guides will admit extra air as will imperfect gaskets between the cylinders and flanges of the intake manifold. Frequently dilution of the mixture is caused by leakage of air between the carburetor and manifold. The amount of air drawn in may be small, but if the fuel supply must be increased to compensate for the extra air, the mixture will be unduly rich at operative speeds, which will breed engine troubles.

When one or more of the above-named conditions exist, it is not reasonable to expect the motor to respond to ordinary treatment. One does not desire to expend large sums in correcting faulty design, but starting can be greatly improved by an inspection of the components mentioned to note if faults exist. One must not expect that the installation of a motor starter on an old motor will wholly overcome starting troubles. Under certain conditions the motor starter must have assistance. It will rotate the crankshaft but it will not vaporize fuel of low volatility nor correct ignition or mechanical troubles. Even if the car be equipped with a motor starter, in extreme cold weather and particularly when the car has been standing a long time, it is advisable to enrichen the mixture or prime the cylinders or both. The writer has noted instances where the motorist exhausted the battery in endeavoring to start without priming, etc. If the motor does not respond, do not continue to waste current, but prime the cylinders.

The motorist who garages his car in a heated building and who does not expose the motor to low temperatures for any great length of time when it is not running, does not as a rule experience trouble in starting. But the automobilist whose garage is not heated must employ means to coax the engine into life. There are thousands of owners storing their cars in unheated buildings, especially in the suburban and country districts, and whose means do not warrant the installation of heating apparatus. Under such conditions the mixture must be enrichened, either by temporarily restricting the air supply or increasing the amount of fuel or both. And it should be borne in mind that during cold weather the air supply should be cut down slightly or the fuel supply increased. The amount and method will depend upon the carburetor.

The simplest form of priming is to displace the spark plugs and pour about a tablespoonful of gasoline into the combustion chamber; that is, if the motor be not provided with priming cocks. Spark plugs having priming features are marketed and will save time and effort. A few words on the difference between priming and flooding will be of value to the novice and to some experienced motorists. Priming means injecting a rational amount of fuel into the cylinders. Flooding is the addition of more gasoline or other inflammable fluid for the same purpose. The latter condition makes starting more difficult and sometimes impossible. When on an extreme cold day the cylinders have been primed and the motor fails to respond, it is useless to pour more gasoline into the cylinder until the first quantity has been removed. Open the primary cocks and with the ignition switch on, crank the motor. Then close the priming cocks and the motor will generally start. Enriching the mixture does not mean supplying so much fuel that it will not ignite.

Where there is a tendency for the fuel to be deposited on the walls of the intake manifold, and the slowness of the liquid to evaporate creates a lean mixture, as previously described, the home-made devices shown at Fig. 1 will be of value. Those shown at B and C consist of a priming cock fitted to the intake manifold, an arrangement obtained by by drilling and tapping a hole to take the thread of the priming cock. A small quantity of the priming fluid is thus introduced onto the walls of the intake manifold overcoming the lean mixture. The method shown at A is utilized by an experienced motorist owning an old car with an early vintage carburetor. It consists of a petcock so placed on the bowl of the carburetor that the priming fluid raises the level in the float chamber, and as the motorist employs a solution of ether and gasoline, his engine responds readily.

Another home-made priming device is shown at Fig. 2. It consists of an auxiliary fuel tank mounted on the motor side of the dash. The tank is connected with the main fuel line by tubing, and a shut-off valve controls the flow of the liquid. A stop cock is also incorporated between the main tank and the tee of the auxiliary line for the purpose of shutting off the fuel from the large tank. To utilize, the main supply is shut off and the carburetor drained. This removes the regular fuel and in addition insures a clean carburetor. The auxiliary tank contains a mixture of ether and gasoline, about one part ether to five of fuel. As soon as the motor becomes warmed up, the supply is cut off and the regular fuel supplied. The owner employing this device also utilizes it for feeding kerosene to the cylinders for assisting in removing carbon. In constructing the tank the filler cap should be drilled to provide an air vent as the flow is gravity.

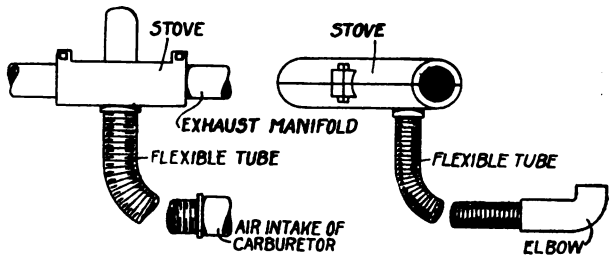


Fig. 3.—Hot air attachments which assist in starting after the initial explosions.

Some cars cannot be started easily by priming and among the practical methods are: covering the air intake of the carburetor and pouring boiling hot water over it and the intake manifold; utilizing a cloth bag about two or three feet long, filling it with sand and placing in the oven of the stove until thoroughly heated, then wrap the bag around the intake pipe and carburetor; using warm water to refill the radiator when the water has been drawn off, and moistening the electrodes of the spark plugs with gasoline.

Suggestions have been made for employing an electric light or a lamp under the hood, but the former will require considerable time and the latter is not practical, especially if the carburetor should flood. There are numerous apparatus and devices

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marketed which greatly assist in overcoming starting troubles. These provide means for injecting fuel into the intake manifold or cylinders, heating the interior of the intake pipe by electricity, etc.

Relative to the utilization of the heat of the exhaust gases, it does not make for easy starting, but after a few intial explosions are obtained the heat is advantageous. Fig. 3 shows the application of two different types of hot air outfits. Both consist of a stove or housing which is clamped over the exhaust manifold, and the heat is conveyed by means of a flexible tube to the fixed air intake of the carburetor. The heat transferred greatly assists in vaporization of the fuel and also makes for economy. These attachments are not expensive and can be obtained to fit practically every type of standard carburetor.

While the experienced motorist is familiar with the advantages of thoroughly blanketing the radiator when the car is to be left on the street, etc., the novice will find that by using two robes and covering the hood also, that the heat will be retained for a considerably longer period, for it should be remembered that the heat from the motor rises.

INTERMITTENT MISFIRING.

A Few Rules That May Help Out of an Annoying Trouble.

Investigation, diagnosis, and cure of regular misfiring, whether in one or more cylinders, are simply child's-play. It is the rarer care of irregular, occasional and intermittent misfiring that worries. Even the expert cannot usually go at once to the seat of trouble. He has to "nose around" till he "spots" it. The only consolation about this class of troubles is that they tend ultimately to become chronic, and then they are easily traceable by the regular tests, and easily cured.

You feel, from the faltering of the engine, that misfiring is going on at odd times. You stop the car, and apply the regular tests at the coil, with the engine running. Under such tests, however, the engine may behave perfectly, giving no sign of misfiring. Thinking you may have been mistaken, you run the car once more, when the faltering begins again. No doubt about it this time; yet the coil tests once more tell you "All's well."

The fact is that the tests will rarely tell you anything about intermittent misfiring; they will only tell you about regular misfiring; the reason, of course, being that conditions, when the car is running, are different from those existing when the car is at rest. Chief among those different conditions are road vibration, speed and heat—though there are others.

So you must get at the bottom of your trouble by an entirely different method from that of the coil tests. It is not a very satisfactory method, but it is the only one available. You must make a mental note of the particular conditions existing at the time when, and when alone, misfiring occurs, infer from them the possible causes of the misfiring, make your investigation among those possible causes, and any adjustments or replacements that may seem to be needed in the parts concerned.

Here are a few guiding rules on those lines—by no means complete or exhaustive—which may help you in time of trouble:

If misfiring occurs only at high speed (irrespective of engine heat), suspect the commutator cover.

If it occurs at slow speed (irrespective of engine heat), suspect the commutator brush.

If it occurs in picking up speed (whether in starting or otherwise), suspect too close adjustment of the carburetor disc, i. e., shortage of gasoline at the jet.

If it occurs at the top of a long, steep hill, when the engine has got very hot, regular firing recurring when it has had time to cool down after the top of the hill has been passed, suspect a cracked spark plug.

If it occurs on any up-grade, before the engine has had time to get really hot, suspect looseness of the coil units in the box, particularly the two middle ones.

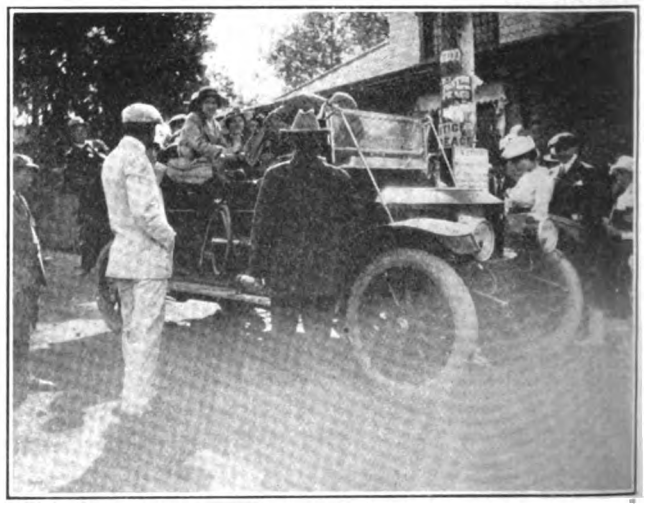
If it occurs under any conditions, but especially in fast running on the level or downhill, with throttle nearly closed, and is accompanied by spitting and popping in the carburetor, suspect obstruction in the gasoline supply at jet.

If it occurs only over a bumpy road, suspect a loose low-tension contact somewhere (probably a terminal), or a bare spot in the insulation of one of the low-tension wires, bumping causing the bare spot to shake into contact with some conductor in its neighborhood.

A TRIP TO THE CLOUDS.

Made in an Automobile and by the Lincoln Highway Route.

Now that it is over and done, sister declares she would not take a small gold mine for the experience,



The Start.

but at the time—well, if she could have stepped off and walked, and it hadn't been so terribly far to the bottom, and our tickets only good on a certain train, it is dollars to peanuts she'd have deserted the car on the very first ridge and left us and it, to our fate in the clouds.

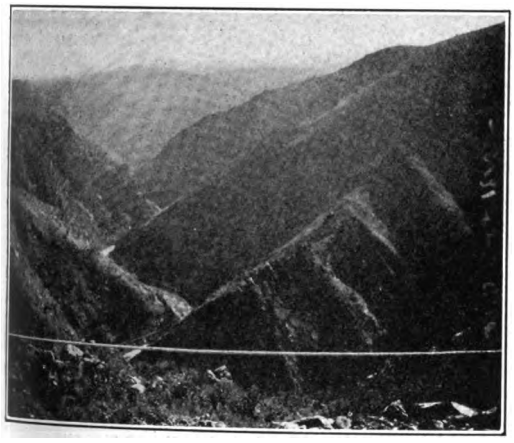
Now, after all, could you so much blame her, she being a timorous body, for automobiling out from Golden, Colorado, on the Lincoln Highway, is absolutely the most thrilling in all the West. The motoring takes its start at Golden. Your equipage is a four-seated affair, each seat meant to hold three riders, and in charge of a genial young fellow wearing khaki. The route leads past an old statehouse of Colorado, and then on and up the heights. Cotton-

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woods shade it lightly and here and there is an attractive camping-ground. Speaking generally, you seem to be headed for a long range of mountains and the cattle feeding near you seem to bob their heads as though in knowing grimace of what lies in store.

At first, the scenery distracts and you do not notice how you're rising. Slopes, with a green tree growth are all around, and on these the shadows of still other slopes rest. The road then begins to serpentine and ere you know it you have turned around and are traveling back toward Golden, but on a higher level, of course. What is more, you see your own road ahead, and you begin to realize how dizzying its edge is.

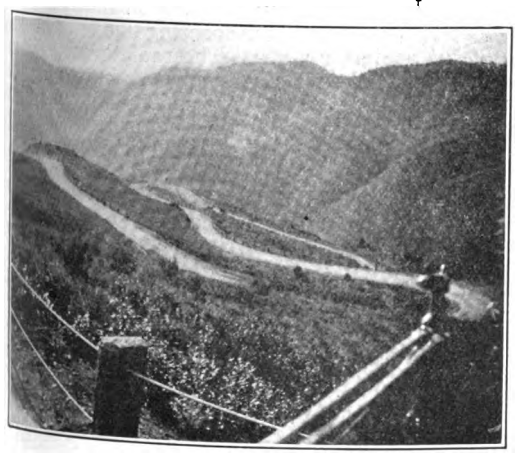
Meantime, speed is growing and the chugs of the engine grow louder. Down in the valley the School of Mines takes your notice. It is soon gone and in-



A View of the Road.

stinctively you are noting the broad earthen turnouts at the curves of the pike. Signs prohibiting the cutting of Christmas trees and other foilage on the slopes skim past you. The entire district is a park you recollect, and meantime you are traveling ever higher.

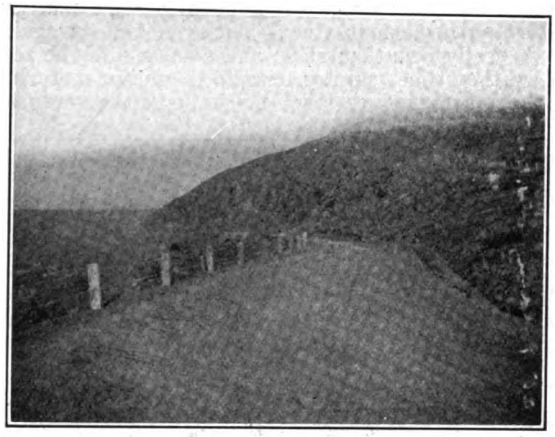
You notice the loco weed and the wild pea in the



Back and Forth.

mountain meadows; the lovely view out over a green valley; the men at work on the road dart past you, and your seatmate, you overhear, is taking some comfort in the series of stone posts, joined by a steel cable, at the roadside. That cable should halt, at least momentarily, any auto skidding at its stage of of the road.

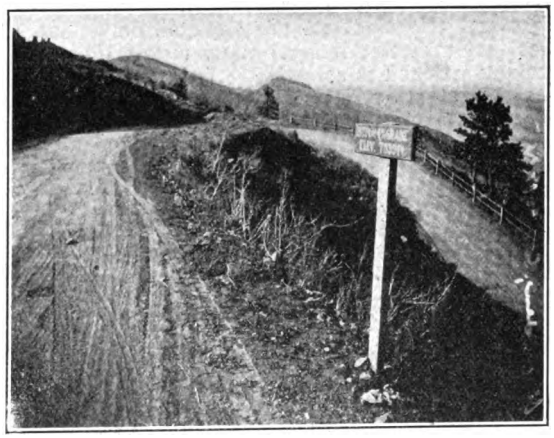
Higher and ever higher! It is a typical mountain



The Protective Chains.

ride this, if ever there was such. The highway itself is of a hard, yet loam-like stuff.

Ever so often other autos are passed. Altitude the world over seems to dizzy the mind and these go by at a pace which would say, "puts faith in God and your brakes alone." We stop to take up a boy



A Switchback.

who is bound for the summit and has a "pull" with the driver, and cramped a bit by this new fare set between us, we continue on to "Excelsior," as it were.

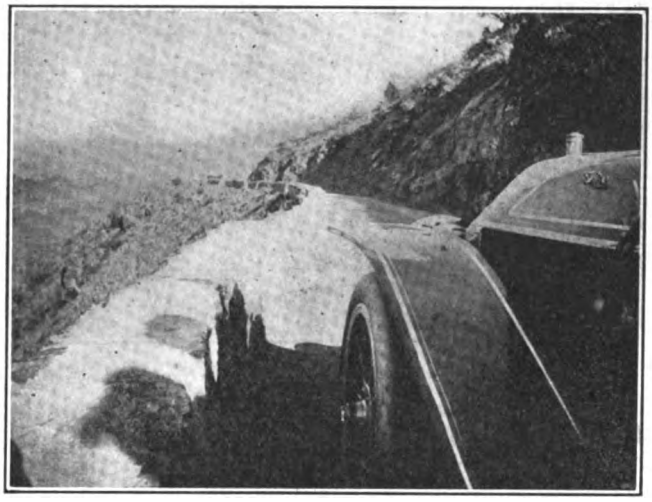
We are coming, by this time, to a new line of flora. Slopes covered with the yucca begin to rise and a low chapperal. A fine, open stone springhouse is a favorite place to stop and enjoy the glorious view of mile on mile of the mountain tops. "Windy Point," the guides have dubbed this, and you soon know why, as you tarry to count the endless peaks within view. Past the point, the road leads into forests of cedars. The chauffeur sounds the whistle as he rounds every curve here, and though he hardly slacks speed there's a sense of danger in the air. Occasionally a wagon is passed. Once, as you slow down near such, you make out four separate loops just below in your trail. Far, far in the distance the town is visable. The mounting is a bit easier be-

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yond here, but in turn you are out at the very brink of the precipice and you get a dizzying sense of absolutely no protection at the edge.

Leaving Golden 4:17 of the afternoon, at 4:32 you make your first real stop on a high plateau, affording a glorious view. Then, on and on again, by a really beautiful slope and squarely to the top.

By that time you are used to mountain motoring and are somehow rested. You take in the views on



Climbing.

every hand, take your pictures and stretch your legs. Then your chauffeur gives some facts of interest. The round trip ride you are engaged on is but 16 miles; you'd declare it is as many more. The highest point reached is some 7,512 feet, and yet travel is not bothered by rain and only three days all last year were they traveled with snow. Twelve autos are in the regular service up here, although, of course, any other motorist is free to come. Ours is a ninety horsepower car, and the round trip uses only three and a half gallons of gasoline. The steep-



Up at the Top.

est grade is a 10 per cent. one, and the mildest is a 3 per center. At one point, a lake, a hundred miles distant, is plainly visible. There, the five minutes' stop is over and you must be going. Down, down, round and round, over and about, and finally you are back at Golden. Safe and sound? Oh, yes, indeed —a glorious trip. Only, somehow, you don't get to Golden very often, and the chances are you'll never take it again.

WHILE DRIVING.

How to Find Out If Anything Is Wrong With the Car.

From G. E. Greenleaf, New Jersey.—One of the best methods a motor car driver can use for finding out whether anything is wrong with the mechanism, is to be alert to new sounds anywhere in the machinery as the car moves over the highway. It is not at all difficult for a person who has driven a car several months to note unusual noises proceeding from the machine and by discovering the cause and attending to it at once he may save much inconvenience at a later date. Missed explosions occur not infrequently during cold weather due to poor vaporization of the fuel. This type of missed explosions is particularly noticeable when first starting the motor and may continue until the motor is thoroughly warmed when it will generally cease if the ignition is in good condition.

Modern carburetors are water jacketed with water from the radiator but this does no good until the motor has been run long enough to heat the water: therefore in addition to the water jacket a hot air pipe with an expanded end surrounding the exhaust pipe should be connected to the carburetor air intake.

The first few explosions will heat the exhaust pipe and the air passing to the carburetor will thus be heated with resulting improvement in the vaporization of fuel.

Sometimes, this "missing" is caused by defective ignition. Possibly, there is a loose connection, a spark plug may be cracked, or the breaker points in the magneto need adjusting. In order to detect whether the motor is firing evenly the cut-out should be opened occasionally, but if there is no cut-out, the car should be slowed down to about ten miles per hour, when any irregularity of explosion will make itself manifest by a jerking motion.

Good modern motors operate very quietly and thus the operator's ears should be alert to any knocking or pounding proceeding from the following sources. The most common causes of knocking are:

Spark advanced too much, carbon in the cylinders, causing pre-ignition and overheating due to some defect in the cooling system. The radiator may have sprung a leak, the water pump may have stopped working, or the water-jackets and radiator may be clogged with sediment. After a motor has been run for a long period the bearings are likely to be worn which will cause a noticeable vibration. Knocks from this cause will be more of the nature of a rap as compared with a sharp, metallic sound for the first mentioned causes. In the event of a continued metallic clang in the motor, the car should be brought to an immediate stop. Otherwise, the overheating will work serious injury to the reciprocating parts, melting out the lining metal of the bearings and even causing the pistons to "seize" or stick fast in the cylinders. Unusual rattling sounds proceeding from the chassis or body indicate that something has broken loose which may be in need of immediate attention. A sudden snap occurring while the car is passing over a rough road should be taken as a warning that a spring has broken. If this is found to be the case, the car should be driven most slowly and carefully until a repair shop can be reached. Very often an ordinary country blacksmith can forge a spring leaf which will serve as a substitute for the

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original until such a time as the spring can be conveniently repaired.

Emergency spring repairers can be bought which can be quickly clamped on the spring at the break and if the car be carefully driven will carry the load safely until such time as the spring can be repaired.

Two pieces of old spring about 12 inches long and two spring clips fitting the springs will serve the purpose of an emergency repair and take very little room in the tool box. One piece of spring is to be placed on top and one on the bottom of the broken spring with a spring clip surrounding the whole at each end, or if the break is near the end of the spring both the repair pieces may be put on the bottom, extending past the break and both clips put at one end around the whole.

If neither of these devices are at hand a temporary repair may be made by placing the largest wrench in the tool kit so that it spans the break and closely winding the whole with strong cord about ¼ inch diameter.

The condition of the tires is a matter to which the driver should give his careful attention. Nothing is more exasperating on an otherwise enjoyable trip than many tire changes. If the car, while traveling over a smooth, dry road, evinces a tendency to skid to a certain side of the road or if it is hard to turn the steering wheel, a tire is flat. This should be remedied immediately as running on a flat shoe even for short distances cuts the tube to pieces besides breaking down the side walls of the tire. One should not take trolley tracks, cross walks, and similar obstructions at high speed, as by so doing several plies of fabric are almost sure to be broken. When the car is housed for the night it is a good plan to examine and remove from the tires any obstructions which may have lodged therein, filling the resulting cuts with some plastic compound. Tires should always be run with the pressure recommended by the makers, unless they are oversize tires which may permit running a little softer.

When the motor car coasts down a hill occasion should be taken to see if the brakes grip with their accustomed firmness. Either set of brakes should hold the car on any hill where traction can be obtained. The novice not infrequently starts off with his emergency brake set. If this is not detected soon, the brake lining will probably be burned out besides throwing a heavy strain on the driving gears and wasting gasoline.

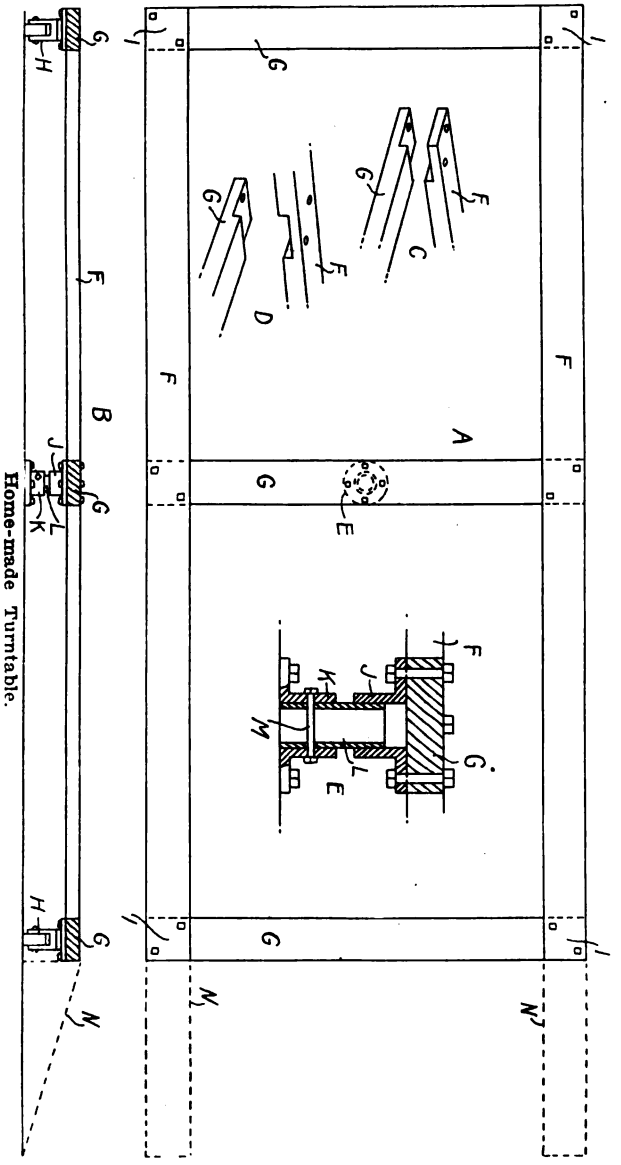
During the stop for luncheon, the driver ought to make a cursory examination of the chassis to see that there are no broken springs or bolts. There should be no dripping of the gasoline permitted for an instant on account of the fire hazard. If the gasoline drips, it is probably caused by the float valve of the carburetor not seating properly or possibly there is a leaky pipe. Many cases of overheating can be traced to the petcock on the bottom of the radiator jarring open, thus allowing all the water to run out.

The writer has not intended to make driving a car seem like a burden but merely to enumerate some of its features which, if given reasonable attention, will tend to reduce repair bills and promote for the greater enjoyment of a willing servant.

A porcelain spark plug may be tight when cold and leak when the engine is hot. This is due to unequal expansion of metal and porcelain.

Suggestion for a Turntable.

From E. G. B., New York.—The turntable shown in the illustration is made of wood, and is designed accurately for Ford cars, but can be so constructed as to accommodate any make of car with a longer wheel-base, by using longer side members, while the rest of the construction remains the same throughout. In the sketch A is a plan view. B is a sectional view. C shows the method of connecting the end members to the side members. D indicates how to connect the center member to the side members.



View E shows the construction of the center bearing, on which the turntable revolves. The side members, F, are 11 feet 4 inches long by 6 by 2 inches. The cross members, G, are 5 feet 3 inches long by 6 by 2 inches, and are connected to the side members as shown in view C and D. There are four stock ball-bearing rollers, H, with a 3-inch wheel attached to the four corners, I, of the turntable. These rollers act as legs or supports and assist in the operation. The pivot or center bearing is made up from two pipe flanges, J and K. Flange J is bolted to the center member, G, by four bolts. Flange K is bolted to the floor of the garage. A 2-inch pipe, L, is held

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secure in flange, K, by a bolt, M, while the other end of the pipe is loose to revolve in the flange, J, when turning the turntable. The bolts that connect the cross members to the side members are countersunk in the top surface of the turntable, so not to interfere with the tires of the car. Block N, shown in dotted lines, are blocks of wood cut from timber 8 by 6 inches. They are made wedge shape and are 2 feet 4 inches long. The blocks can be placed at the end of the turntable when the car is to be placed thereon, and removed when not in use. This design of turntable can be moved and placed against the wall of the garage whenever necessary, and the flange K, with the pipe L, can be easily removed from the floor by removing the four bolts. This turntable can be built at a very low cost, and will be found useful. When your car enters the garage head-on and runs on the turntable, it can be turned to go out front first.

RIVET REPAIRS.

Driving Them In and the Method Known as Backing Them In.

BY JAMES F. HOBART, M. E.

On page 38 of the August issue, Mr. J. N. Bagley makes some pertinent and interesting remarks regarding the driving of rivets and his advice may well be followed by mechanics in doing both old and new work. In driving rivets, particularly in rather light material, such as is used in automobile work, I have a great liking for the method of riveting known as "backing them in."

Fig. 1 shows this method. The two vertical plates to be riveted together, are drilled in the usual manner as shown at A, with the rivets a little smaller than the hole, placed in position as shown at B. For hot riveting, the hole should be about 1/16 in. larger than the rivet, but for cold riveting, the holes may be just as much larger than the rivets as will let them slide into the holes. Usually, ¼ inch rivets, to be driven cold, are made just small enough to slide easily through a ¼ inch hole, therefore nothing may be allowed for extra size of the hole, but in hot riveting, a size smaller (1/16 in.) rivet is used than the diameter of the rivet hole. Thus far the work is the same as in regular riveting, but now, instead of "holding on" to the head of the rivet, the dolly is applied to the point of the rivet as shown at C, and all the driving is done upon the head of the rivet. In this engraving, a button set is shown at D, fitting the head of the rivet as shown by the dotted line E. Force is applied by means of the hammer F, to drive the set against the rivet head.

The force of the hammer blow is transmitted through the set D, into the rivet B, which, being unable to move because of the mass of metal in the dolly C, the rivet is enlarged or upset. The metal, being unable to move endwise, flows sidewise as shown at G, forming a sort of head. But the metal in the rivet flows sidewise at A, as well as at B, and fills the hole A completely. At the same time, a portion of the hammer blow force is expended in forcing the plate N in the direction of the rivet movement. This brings the plate N into very close contact with plate O, which is very desirable. But plate O is prevented from moving freely sidewise by the partial rivet head G, therefore each hammer blow has a tendency to bring the plates closer and closer together and to hold them there.

When ordinary riveting is done, the proceeding is as shown by Fig. 2, the plates P and Q, not being affected very much by the hammer blows, at least not until after the head S has attained a considerable size. At the beginning of the riveting operation, the first effect of the blows is to drive the rivet back through plates P and Q, their inertia holding them

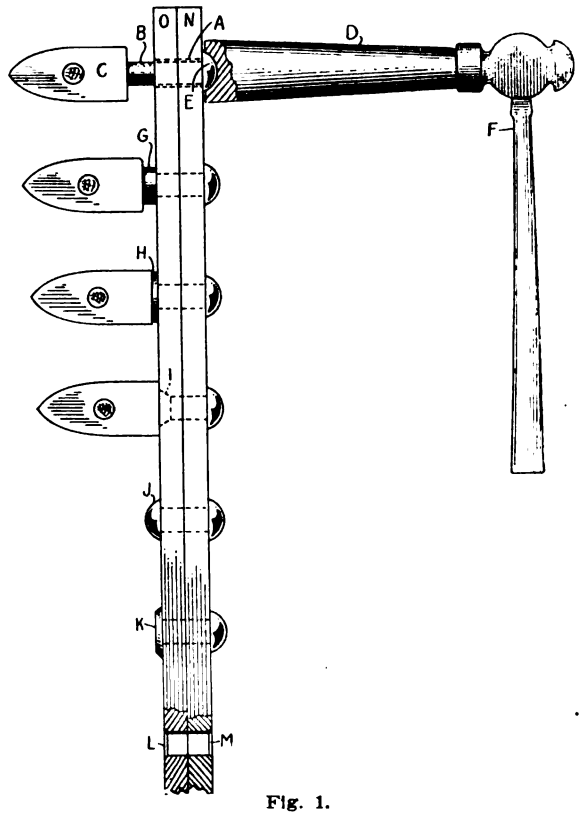


Fig. 1.

stationary while the rivet is driven backward until the force of the blow is absorbed in upsetting the rivet S, and in a slight recoil of the dolly R.

In this method of riveting there is always a tendency to drive the plates apart instead of driving them closer together. The tendency is also to drive the rivet out of the plate instead of farther into it. And there is a further inclination to drive the rivet through the head which is being formed. In fact, to shear off that portion of the head which overlaps the plate around the rivet hole.

All the power there is, to bring the plates together, when riveting as in Fig. 2, is that portion of the hammer force which upsets the rivet and enables the head to flow out around the rivet in spite of the tendency to be driven out through the rivet hole. It seems, by this way of riveting, that the rivet head is being made under the most adverse conditions imaginable. It is much like pulling a rod upward through a hole in the floor, where every new hold for the hands must be obtained by giving the rod a quick upward heave, letting go and catching it again before it can drop back as far as the last heave threw it upward. But with the "backing-in" method, the conditions are altogether different. The plates are directly driven together by the hammer blows. The rivet is directly compressed or upset and the recoil of the dolly does no harm, for whatever reactions took place in the rivet or in the plates, were completed before the impulse reached the dolly.

In making the various styles of rivet heads, the same thing holds true and the backing-in method

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remains far ahead of the other way. Thus in making the thin, almost flush head, as at H, this method is extremely good for there is no reactionary stresses placed upon the thin head as would be the case were the rivets "driven-in."

In making the countersunk head as shown at I, every possible bit of plate closing and rivet driving power is made use of and the expanded countersunk head seems to hold all the slack that can be gained by driving upon the head of the rivet—something which is not as easily accomplished when driving-in the rivets. It is easy to obtain a full round head by the backing-in method and J shows a rivet which has been formed by holding against it, during the driving, a dolly which had its face formed into a die the shape of a button head.

At K, there is shown the effect which may be obtained by giving the dolly-face the necessary shape, but in driving these last two shapes of head, there is always a bit of uncertainty as to whether the rivet will be tight or not, after it has been driven. Should the rivet be the least bit too short, then the dolly, or the set, whichever was used, would come against the plate and the rivet cannot be driven tight, no matter how much hammering may be done upon the rivet. Therefore, it is necessary to leave the rivet blanks just a trifle too long so the set or the dolly can never reach the plate. This is what causes the double line along the bottom of head, J. If the blank be too long, this base will be so large as to be unsightly. But when the length of rivet is just right, the head will look as though there were a thin washer underneath it, and the washer will be but a trifle larger in diameter than the base of the rivet head.

In most repair riveting, there is more demanded from rivets than when they are placed in new work, therefore they should be given every chance possible that they may do their work well. One thing, which is often overlooked in riveting, is to see that the

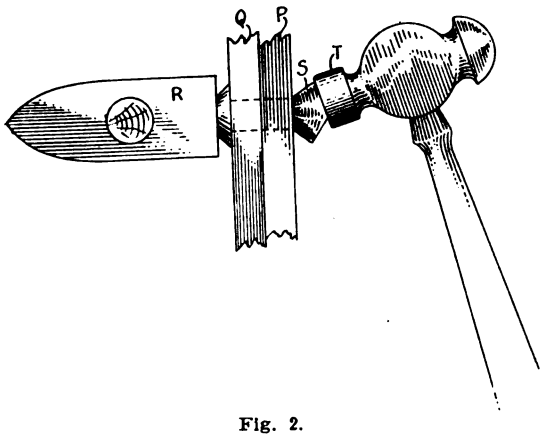


Fig. 2.

holes in the plate have the sharp outer corners removed. When the corners are left sharp as at A, there is every inducement for the rivet head to be sheared off by external stress, or to fly off under internal strain.

Rivets are often cut out of a seam by striking the side of each head with a sledge hammer which has a very sharp corner. The rivets placed in holes with sharp corners, come off very easily under the blows of a sledge in the hands of an experienced man, but where the sharp corners have been taken off around the holes, it is much harder to remove the rivet heads in this manner.

Fig. 1 shows at L and M the manner in which outer sharp corners should be removed from all rivet holes. A reamer, a drill, or a countersink has been run into the end of each hole and the slightest possible corner removed. The face left need not be more than 1/64 in. or 1/32 in. wide, in order to greatly strengthen the rivet at its weakest point, or where the head joins the body. By slightly chamfering the corner of the plate, the rivet is given a corresponding fillet which greatly increases not only the holding power of the rivet but the drawing together power also. A rivet driven in a hole with the sharp corner removed, can pull the plates together with much more force than is possible in a rivet driven into a hole where the sharp corners have been left on.

When it is necessary to rivet a thin cast iron section to steel, then there is a chance of breaking the casing by the uneven drawing power of the rivets. When the rivets are backed in, there is much less danger of breaking the cast iron than when they are driven in the usual manner.

PAINTING A FORD CAR.

It Requires Knowledge, Patience, Care and Considsiderable Time.

From J. M. Freeman, Maine.—Will you please tell me in your next issue how to paint a Ford car?

Reply.—The work of painting the car may be divided into three general classes, these consisting of touching up and varnishing, painting the chassis and varnishing the body, and the burn-off job. The first named consists of matching the colors and touching up of the places from which the paint has been displaced. If the original Ford color, black, is to be selected it is easily matched. Brighter colors are more difficult. If the paint be badly checked or flaky it will have to be removed. Do not attempt to use the torch unless familiar with it as the wood is likely to be burned. The easiest method is to employ a chemical remover, a fluid that is applied with a brush and which so softens the paint that it can be scraped off with a putty knife.

Remove the body from the chassis and place it on stands or barrels of convenient height. If the old paint be removed, go over the surface with No. 1½ sandpaper and finish with No. 0. The surface must be as smooth as glass before applying the first priming coat which fills the pores, sealing them against moisture and affording an elastic ground for the remaining coats. A primer for wood is made of white keg lead and raw linseed oil slightly colored, or ground white lead and turpenntine with a coloring pigment. Use about one part oil to six of turpentine and apply with a two-inch ox hair brush. Allow four or five days before applying the second coat. For metal bodies use a prepared primer or make one by mixing three parts turpentine, two parts raw linseed oil and add a teaspoonful of pale drying japan to each pint of the mixture. Apply with a soft round or oval bristle brush and allow at least 24 hours for drying. Before applying the priming coat, clean the metal thoroughly with benzine.

The next step is puttying and glazing the cracks, pores, etc. Mix equal parts of dry white lead, japan and rubbing varnish, and when smoothing out with the knife be careful not to cut or gouge the priming coat. Allow the putty to become hard and then smooth with No. 0 sandpaper. The use of rough

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stuff is not generally considered necessary with metal bodies.

Several coats of rough stuff are applied with wood bodies. Rough stuff can be purchased ready mixed and thinned down to a consistency slightly heavier than ordinary paint for brushing. It can be made by taking American dry filler and white keg lead, equal parts by weight and making a thick paste by adding equal parts of japan and rubbing varnish, thinning with turpentine. The coat is applied lengthwise of the panel, and the paint brushed out quickly and evenly. The second coat is applied across the panel and the others in an alternate direction. From four to five coats are generally applied and at least 24 hours should elapse between each coat.

The next coat is termed the guide coat because it is rubbed off when obtaining the level surface. It is made of rough stuff colored with yellow ochre and thinned with turpentine. The rubbing process is performed with a brick of rotten stone or pumice and the stone must have a true surface. Fill a pail with water and dip the stone into it from time to time. Wash off the surface with a sponge, and in rubbing use a steady, straight out and return movement. Keep the surface well supplied with water and do not use too much pressure. Remove the guide coat but do not cut too deeply into the coats of rough stuff. Wash carefully and allow 24 hours to elapse before sandpapering with No. 00 paper.

Dust the body very carefully before applying the groundwork. The selection of the color requires careful consideration as some tints are difficult to apply; in fact, many professional painters are unable to apply certain colors with success. Dark colors such as Brewster green, black and dark browns are easily applied and cover well. The number of coats will depend upon the color and any dealer in paints will advise as to the number required. It is important that the colors be allowed to dry hard and 24 hours is a safe rule. Two-inch camel hair or mottler brushes are employed.

Following the color coats come two of color varnish and two or three of rubbing. The varnish comes ready for use and its makers supply complete directions as to the time required for it to harden properly. The surfacing or rubbing of varnish requires experience but a sufficient knowledge of the work may be obtained by visiting some paint shop and watching the operation. A practice indulged in by some owners who paint their cars is to apply the rubbing varnish and engage some painter to do the rubbing and final varnishing. Generally such an arrangement can be made with a painter to do the work on his spare time. This will assure a good job and the owner can learn how the work is accomplished.

For rubbing varnish one will require two clean pails filled with soft water to which a little soda is added, some good sponges, chamois, rubbing pads and a small quantity of 0 or 00 pulverized pumice. The pads come in varying sizes and thicknesses. Dip the pad in water, then into the pumice and apply to the surface. Rub lightly at first and in one direction. Use the sponge and plenty of water to remove the pumice from the surface and be careful not to cut through the varnish. The object of the rubbing is to provide a foundation for the following coat and to make it grip. After completing the rubbing, wash thoroughly and chamois the surface. This is important. The final coat of rubbing need not be rubbed as thoroughly as the preceding coats.

In applying the final coat or finishing varnish, it like the preceding coats should be flowed on, not painted. Apply the varnish liberally, then wipe up the surplus with the brush. Draw the brush over the edge of the varnish cup to remove the surplus. The coat must be uniform and not so thick that it will run and form little ridges or hills. The final coat should be allowed to stand at least a week and the temperature of the drying room should be even and warm. It should be borne in mind that varnish hardens from the outside.

All dirt and grease must be removed from the chassis before painting else a condition known as pitting will result. Clean with gasoline, then wash thoroughly, using plenty of water. Allow the paint to dry before sandpapering. Dust very carefully before applying the coat of lead which is made up of three parts white keg lead, one part raw linseed oil, four parts turpentine and a little lampblack to obtain a light gray color. This coat will dry in 24 hours after which it is puttied and glazed as with the body. Allow 24 hours to elapse, then sandpaper and apply the color. Generally one coat of color varnish and one of rubbing varnish will suffice before the final coat. Striping is done after the final coat of rubbing and will require the services of the professional.

The room in which the painting is done should be well lighted and heated and free from dust. The northeast corner of the building is preferable, and before applying the varnish the temperature of the room should be at least 80 degrees. The varnish and body or chassis should be warm. Place the varnish near the source of heat and have it thoroughly warm so that it will flow easily. Do not allow anyone except yourself in the room when varnishing and move cautiously so not to stir up any existing dust.

After completing the work do not be anxious to note if the varnish be dry by placing the finger or hand on it. More or less oil secretions will be deposited and absorbed by the varnish, ruining the finish. If you must test for hardness, use the back of the hand and be sure it is clean. Do not be in too great a hurry to place the car in service and avoid taking it out on muddy days during the first few days of use if you would avoid spotting. Spotting is caused by capillary attraction of the drv mud extracting the oil from the varnish. City mud is full of ammonia, destructive to the luster of the varnish. Do not be disappointed if after completing a touch up and varnish job that it appears to be full of fine cracks. Varnish will not fill these indentations which are largely due to the paint being cracked. Do not attempt to hasten the drying of the varnish by spraying with cold water as it only hardens the outside and the varnish is likely to soften again when exposed to the sun.

Drive on the Throttle.

Slow down when possible by means of the throttle, and not by means of the brakes. If you keep your eyes open, and do not rush wildly along the roads, you will hardly ever have to touch your brakes, inasmuch as the opening and closing of the throttle will regulate your speed. Use of the brakes means wear and tear of mechanism and tires; use of the throttle means gentle action.

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ELECTRIC STARTING SYSTEMS.

Their Care and Upkeep and Why They Often Fail to Do Their Work.

From J. N. Bagley, Nebraska.—With a low test of gasoline, cold weather, etc., car cranking is a little difficult under normal conditions, and where the engine requires an unusual amount of cranking the draw on the storage battery is such that it is but a short time until it will fail to start the car. To begin with, the car should not be cranked with the starter on a cold, raw morning, but the hand crank should be used instead, for most people do not do much pleasure driving in bad cold weather and the amount of driving for business in most cases is not sufficient to keep the battery in prime condition. For instance, Brown uses his car to drive a mile to his business and leaves it stand the balance of the day in the cold. It will start hard and the amount of current taken from the battery to start will more than offset the current placed back into the battery in the mile or so driving. The result is in a very short time the battery is exhausted. Now Brown drives the car to the service station and is advised that the battery is in a run down condition and at this time he begins to condemn the starting system, when he himself was to blame. He should give a little time to the study of the system and the limit of its usefulness.

The writer has known of batteries standing up and doing good service for two continuous years

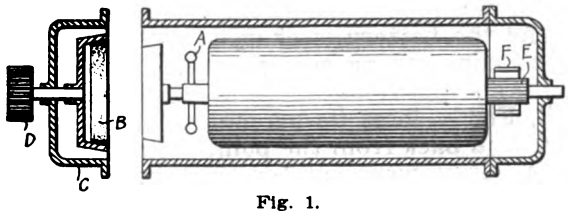


Fig. 1.

without ever being removed from the car. This was not due to any particular make of battery, but simply a matter of the owner caring for the battery as well as the system. This man never uses his starter on a cold morning but instead has a can of gas which he uses to prime the engine before cranking by hand. Then, again, when he is not using the car in cold weather he goes out two or three times a week and cranks the motor and lets it run to recruit the battery. Once every week he examines the solution in the battery to ascertain if the plates are well covered, and if they are not he has a small supply to add to it. This fellow has success with his battery and when spring comes it works as well as when it went into winter, while his neighbor must spend some of his hard-earned cash for a new battery before he can use his starting and lighting system. The generator and the starting motor should be taken from the car before cold weather begins and the two machines carefully cleaned and overhauled by a competent repair man, as this will add much to the long life and satisfaction of the system. During the summer months when the roads are dusty quite a little dust will find its way to the different delicate parts and this should be removed not less than once a season.

Every generator should be kept in such condition that it generates when the engine is running, and to do this there are a few things which should be looked to occasionally. In Fig. 1 we have a generator which is supplied with a clutch, B. This clutch is necessary to allow the regulation of speed, as the governor, A, disconnects the driving member from the driven. At D we have the driving sprocket which drives the machine, but as the speed increases to such an extent that the amperage would be too

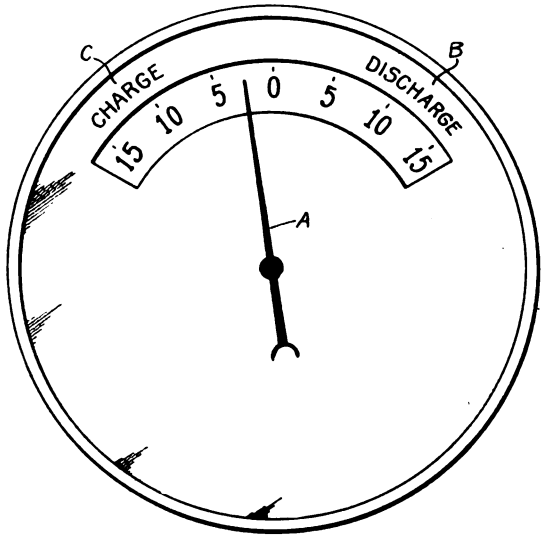
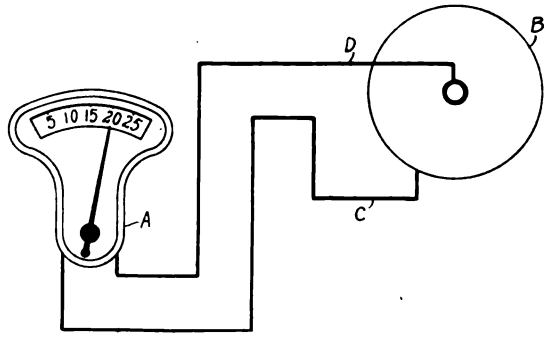


Fig. 2.

high for the battery, the balls, A, release the pressure on the lined plate, B, and the driven member, E, slows up and remains so until the speed of the engine drops to normal, when it again begins to drive. This lining on the clutch, B, should be replaced with a new one every season at least, for when it gets worn close it is a difficult matter to control the output of the generator. The speed at which the ball governor, A, will work will depend on the adjustment of the governor back and forth on the shaft to which it is fastened, as this is the adjustment which controls the output of the generator to the battery. This fact is known by the ammeter on the dash. The brushes, F, should be cleaned occasionally and replaced with new if necessary as they collect the current and through the wires fastened to them it is conveyed to the battery.



Around the entire working parts is a cast iron shell, C, which should be cleaned occasionally as dirt collects inside and will get into the governor as well as the brushes. This will aid in cutting the commutator, E, and it will be necessary to have it trued up in the lathe. The commutator is made up of segments of copper insulated from one another with mica and in case it is turned in a lathe, care should be taken that none of the metal from one segment connects the segment next to it, and to make sure that none of the metal remains, go carefully over

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each insulation partition and clean it thoroughly. In case one is not familiar with the workings of the generator it is a good plan to take it to some one who understands it, and in case there is no one in the immediate vicinity capable of doing the work it is a good plan to send it to the nearest service station. In case the latter is done, make a diagram of the connection so that in replacing the generator all wires will be in place.

In order to know what the generator is doing the little ammeter on the dash can be consulted and note the reading when the engine is running. When the car is running very slow the generator will not generate current enough to operate the relay, consequently the ammeter will not show anything, but as the engine is speeded up to say a speed of about 8 to 10 miles an hour, the indicating hand, A, in Fig. 2, should show about 8 amperes on the charge side, C, of the instrument, and as the speed is increased to say 20 miles it should show about 15. As the speed of the car is increased to say 30 miles, the hand should not read off the board, but if it does the charging rate is too high and the governor should be released a trifle and the same test repeated. Now with all the lights turned on and the car running at a speed of say 15 miles to the hour the ammeter

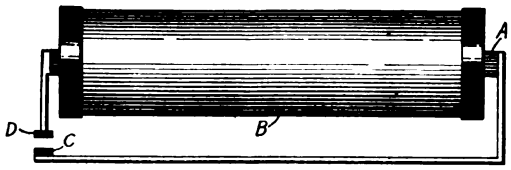


Fig. 4.

should still read on the charge side about 5 amperes, but when the car stops and the lights are still on, the hand, A, will change sides and read from 7 to 10 on the discharge side, B, of the instrument. In case the ammeter would read to the discharge as soon as the motor was started it would indicate that the wires on the back of the instrument need changing, as many times happens in replacing the wiring.

Now in case one of the lights fails to light there are but few things that could be out of order, as shown in Fig. 3. The bulb might be burnt out or a fuse blown, and in either case it is an easy matter to tell. Take an ammeter or a voltmeter, and remove the bulb from the setting, D, in the reflector, B, attach wires from the instrument and note if the current is coming up to the contact point at the reflector. In case the instrument, A, shows that the current comes up the trouble is with the socket or the lamp bulb. Try a new lamp as a first resort, and in case it still does not light examine the contacts that bear against those on the lamp. The wires, D, C, can be placed to correspond to the wiring system as shown. In case no current comes to the socket, take wires, D, C, and go to the fuse block and test the fuse. Do not test the storage battery with the ammeter as the ordinary ammeter would be worthless the instant the connection was made as the amperage of the battery is very high. To test the storage battery the proper instrument to use is the hydrometer, which will show the density of the solution, and by the test of the solution the exact condition of the battery can be had at all times. When the battery is fully charged it will give a reading of about 1,350, and when it is in a run-down condition it will show a reading of 1,100 or less. The battery should not be allowed to stand in a run-down condition as it will prove injurious to the plates. As soon as the battery shows a weakness it is a wise plan to have it charged and the generator examined to see that it is giving the proper current to the battery. In case the battery is in a good healthy condition and it needs charging it can be charged with the generator very quickly if the generator is working, by not using the starter for a time and the lights very sparingly. Batteries are all good batteries when given a fair chance, but any

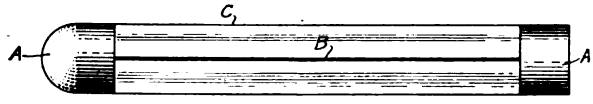


Fig. 5.

battery abused will give unsatisfactory service no matter on what car it is placed.

The "relay," as we call it, or some may call it the magnet cut-out, or magnetic regulator, is a little device which cuts out and in the current from the generator to the battery. For instance, if the generator is not running fast enough to give a current stronger than that already in the battery there would be little gained by connecting, as the current would flow in the opposite direction and the battery would be run down instead of being built up. This instrument fills this gap and when the generator has speed sufficient to offset the stored up current in the battery, the core of the little coil becomes magnetized, pulling the arm over which closes the circuit and the battery is charged so long as the current remains strong enough to keep the points intact. As soon as the speed drops down the core in coil B, Fig. 4, loses its magnetism at A, letting the arm, C, fall back from the point, D, and the circuit is broken. If it were not for this the current stored would all flow back through the generator as soon as the machine was stopped and in a very short time the battery would be exhausted. The regulator coil, B, carries the armature current and through this winding the core around which it is wound controls the flow to the battery.

The fuse shown in Fig. 5 is a little tube containing a thread of soft metal and in case a direct short

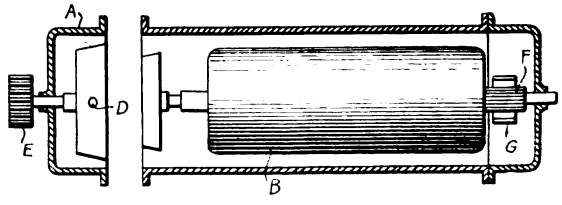


Fig. 6.

would occur in the system the heat would melt the little metal thread and break the connection and stop the flow until the trouble could be remedied. If it were not for this fuse some part of the winding in the generator would very likely be burned up and possibly necessitate a very expensive repair. One should always have at hand a quantity of fuse wire and never use any old wire or the entire system may be ruined. This, Fig. 5, consists of a small transparent tube through which fuse wire, B, is passed and made secure to the two ends, A, and these ends in turn are made fast to the wires leading from the battery to the light, etc. When a fuse is melted it

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can be seen through the transparent tube, C, as usually they are blackened to some extent.

In Fig. 6 we have a generator very similar to the one described in Fig. 1, save the governor, which is adjusted through the hold of the clutch plate, D, and can be adjusted without taking the machine apart. The driving sprocket, E, is exactly the same, and the parts, B, G, F, are constructed alike and the entire machine is enclosed in a metal shell, A. The clutch cover, A, can be removed from the main frame to repair the governor or clutch without dismantling the machine, or the back part of the shell can be removed to get at the brushes or clean the commutator, F, which should be done occasionally. There are many makes of generators but all are constructed along principles described and are easily understood.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1729 Carburetor Trouble.

From Alvin P. Kraetsch, Wisconsin.—I have a little trouble with my Imperial automobile. In running idle it pops in the exhaust, but in pulling it doesn't miss or pop in the exhaust pipe. When I have run idle for a time and then stop the engine, it seems that the carburetor is choked with gasoline. If I cut down the gasoline so that the car runs smoothly when running idle, then it will miss in pulling. What is the trouble?

Reply.—Popping in the exhaust is a result of missed explosions, caused by imperfect carburetion or ignition. If the mixture is too rich the exhaust will be very smoky. Too lean a mixture may be caused by air leaks between the inlet valve stems and their guides, these leaks not affecting ordinary running, but when the throttle is nearly closed as when idling sufficient air may enter there, or even around the butterfly throttle valve stem to reduce the velocity of the air through the fixed air passage past the vaporizing nozzle to such a point that the air does not completely vaporize or pulverize the heavy gasoline. The result in such cases is that the mixture is too lean until a considerable amount of fuel accumulates in the inlet manifold, and then is drawn into the cylinders in excessive amounts. Too large a carburetor, or one whose fixed air opening is perhaps of the proper area for the motor when new, or when using much lighter gasoline than now commonly procurable, would give you similar results to what you are now expriencing, and in addition would also cause hard starting. We are considerably handicapped in replying to this inquiry not knowing the make and model of your carburetor, or the year's model of your car.

1730 Three Good Questions.

From Wm. Wilson, Illinois.—1—Is it true that a Ford motor will run from five to ten revolutions on a prime? That is to say, the gasoline being shut off, the carburetor not feeding any gas whatever. I always thought that any gas in a cylinder, regardless of amount, would all explode on the first firing point, but perhaps I'm wrong. 2—Why is it that kerosene is not recommended for winter use in the cooling system exclusively? I have been asked that question and see no reason whatever why it could not be used, but I thought it better to consult more learned individuals before recommending. 3—The pressure in the tires should be increased as the weather grows colder should it not?

Reply.—1—There is always more or less gasoline in the float chamber of the carburetor and with this to help the priming charge such results as you describe would not be unusual. With all four cylinders primed and the mixture fairly perfect it would take two complete revolutions before all cylinders would have an opportunity to fire, and with these explosions occurring regularly during two revolutions it would not be unusual for the engine to make several more before stopping. If again the mixture were too rich in say, two cylinders, it should be possible to get two revolutions or more from explosions in two cylinders and more revolutions from explosions in the others when the mixture gets sufficient air to explode therein. 2—Kerosene has too low a boiling point, for one principal reason. For another it would soon dissolve the rubber hose connections to the radiator. 3—Temperature changes necessitate very slight, if any, variations in tire pressures. Our advice is for you to follow absolutely the suggestions of the manufacturers of your tires.

1731 No Known Injury.

From C. F. Showalter, Iowa.—I have a Cadillac, 1912 model, and wish to know if there is any danger to the car to run it after the battery has been taken off. There seems to be a difference of opinion in this regard.

Reply.—We do not know of any possible danger of injury to the car or motor as a direct result of running with the storage battery removed.

1732 A Metallic Click.

From E. C. Thompson, Kansas.—I own a Glide 36-42, 1914 model. It has a model L Schebler carburetor and a Westinghouse electric ignition, lighting and starting system, with generator and storage battery. It runs very well, but it has for some time developed a kind of metallic click in one cylinder, and at rare occasions in two cylinders, but only when the gasoline feed is half or more than half open and the engine is on a pull. If I lessen the feed or open it wide, it stops the click, but it also lessens the power of the engine. Will it damage the engine or give bad results? I have examined the pistons and rings and the engine in general. In fact, the engine runs very nice and smooth otherwise. Please give cause as well as remedy.

Reply.—The slight click may be the result of what is known as a piston slap, or it may be due to pre-

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ignition. Unless it grows worse this symptom should not alarm you. If you desire to cure it you will first have to locate it definitely, and if found to result from a piston slap you should have a new piston in this cylinder. A physician's stethoscope is frequently used to discover in which cylinder a click occurs. Shortcircuiting the plugs, one after the other, will sometimes locate the troublesome cylinder.

1733 **Several and Sundry Inquiries.**

From Roy R. Kiefer, Indiana.—1—Do you advise the use of shock absorbers? 2—What do you mean by the priming pin? 3—Which rims cut the tires most, common clincher or straight edge? 4—Do you advise the use of Neverleak piston rings? 5—Is there a body oil or polish on the market that will not spoil the paint and glossy finish, but preserve it? If there is, name the one you prefer. 6—Does a valve-in-the-head motor give more power than an engine with an L head motor? 7—If it does how much of each is called 40 H. P.? Here is a question concerning which please give me all the advice and information you can: 8—Do you advise the use of iron clasps to cover a tire? 9—Will they preserve the tire to a great extent? 10—Does a tire covered with steel ride as easily, or about as easy, as without the steel cover? 11—Do they make any annoying noise when on a pavement? 12—Do they skid and slide more than a rubber tire? 13—Will they rust and rot or spoil the outer casing? 14—Does a tire covered with steel absorb the road shock as well, or about as well, as without steel cover? 15—Do you advise them for rough country roads, or rough pavements? 16—If you don't advise the steel cover, tell me of one you prefer. 17—What is the cause of an automobile running in a ditch, or side of the road, when running over a dog? Is it that the driver doesn't hold the wheel fast enough, or would it do the same if he held his wheel in the same position? 18—Please explain fully. 19—Is the Silent Knight motor, which the Overland Company use, a success? Do they last as long as with the common valves? 20—Can you tell me how much horsepower Ralph De Palma's German Mercedes Special was, which he used at the last 500 mile race at Indianapolis? 21—Which make and whose auto racer had the greatest horsepower at the last 500 mile race at Indianapolis and how many H. P. was it? 22—What size tires should a car have weighing 3,100 pounds without passengers? 23—Is the Eagle Macomber motor, which is a rotating motor made by the Eagle-Macomber Car Co., Chicago, Ill., a success? 24—Is it a long-lived motor and powerful for its size? 25—Do you think it safe and profitable to invest for shares in that company? 26—Do you think their rotary motor gives as good or better service as a common motor? If not, explain why. 27—Does the Ford Motor Car Co. make a tractor with the same style and type engine as they use in their automobile? 28—How many H. P. is the Ford tractor and what is the price of it?

Reply.—1—It depends upon the car, the use to which it is put, and the roads over which it must travel. We advise their use in most cases. 2—Sometimes it means a small rod for pushing the carburetor float down to admit more gasoline. 3—We should say the clincher, although neither will cut the tire if it be properly inflated. 4—Yes, we favor piston rings that do not leak. 5—Yes, there are several. If we were to mention the one we prefer it might be an injury to some other one just as good. 6—Valves are placed in the cylinders in various ways and in various places, and this is fairly conclusive proof that engineers do not agree as to which position is best. Valves in the head are usually considered among the best. 7—We don't quite understand you. 8—Yes, for some uses on the ground of economy. 9—Yes. 10—No. 11—Not annoying to those who possess normal nerves. 12—No. 13—No. 14—No. 15—Yes, if long wear of tires is the object. 16—The one you refer to is a good one. 17 and 18—The dog being a somewhat lively animal until the wheel has passed over him, he sometimes pulls one way and sometimes another, and this may have more effect on the car than if the dog were a dead weight, but if the driver holds his wheel fast enough he will not necessarily run into the ditch. 19—Yes, to both questions, may be a good answer for a brief one. 20—The horsepower is uncertain; the cylinder displacement was 270.9 cubic inches. 21—The Dusenburg had the greatest cylinder displacement or 299 cubic inches, and one car in that race had an engine of but 103 cubic inches. 22—Four and one-half inches. 23—We have no reason to doubt it but it might be a good idea for you to write to the manufacturers themselves for further information. 24—We do not know. 25—We could not say. 26—This can be answered like the other two we are unable to answer. 27—No, not yet. 28—It is not yet announced.

1734 **A Missing Cylinder.**

From O. M., Missouri.—I have a 1914 Model Ford. The car has run about 10,000 miles, but I have run the machine only about 1,000 miles. I am having trouble with cylinder No. 2. At times it misses badly. Then if I take out the spark plug and clean it, it works fine again for 50 or 75 miles. Then I have the same trouble again. I put in a new spark plug and used the old one again, but the trouble remains. Now what do you think is at fault? Some tell me that there might be a broken piston ring. Others say that cannot be the case because the compression seems about alike in all four cylinders. Some tell me a Mosler Spit-Fire spark plug would cure the evil. Some tell me the trouble is in the coil unit, and I am inclined to believe that the latter is the cause of the trouble. I have taken out that coil unit and one of the other ones and connected each one with a dry battery, but the vibrators of No. 2 will not hum as keenly as those of another unit. If the coil unit is at fault how can it be remedied?

Reply.—If missing explosions in the number two cylinder can be cured by cleaning the spark plug we should consider it conclusive evidence that the spark coil unit for that cylinder was in proper working condition. If any further evidence were desired we would change the units, wiring the number two unit to ignite number three. You could easily change the units if of the removable unit type, or you could simply change the two primary coil connections at the same time changing the connections of the two secondary wires to the plugs. You understand that this changing should be the same both in the wires from the timer to the coil and from the coil to the plugs. If the missing is due to oil leaking past the piston in this cylinder, as it most probably is, it is caused by broken or worn piston rings, a badly worn or poorly fitting piston or a scored cylinder. If the

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last you may have to have this cylinder reground and a new piston and rings fitted. If you decide to try new spark plugs be sure and get Ford type, rather than the regular construction. You will probably have to take the engine apart to discover the cause of the trouble.

1735 **Valve Trouble.**

From C. A. Walter, Kansas.—1—We have a Hupmobile, 40 H. P., which has been driven 5,000 miles. It is a 1915 model, bought in June, 1915. About a month ago it was driven 40 miles through the mud and came in missing on one cylinder. After going over all the wiring and plugs, I found the trouble in one of the valves. One of the push rods had gotten so tight that the valve wouldn't close. In changing it I found the lock nuts perfectly tight and they didn't look as if they had ever moved. Last week the trouble came back but in two push rods this time and they were also tight. Now I would like to ask if you can explain this trouble. I have seen valves get loose and cause trouble but I never saw them get tight before, and especially on a new car. I am sure the push rods didn't lengthen, but what else could have caused it. 2—Please state in your next number the non-freezing of calcium chloride in the evaporation. Does the calcium chloride evaporate faster than water like alcohol, and in the adding of lost solution, what portion should be added.

Reply.—1—The push rods of course cannot lengthen, and it is a rare thing for the lock and adjusting nuts to loosen. Exhaust valve stems do lengthen when they are hot, and the valves themselves do wear and pound down into their seats, bringing the end of the valve stems closer to the adjusting nuts. If you will go over your valves when the engine is hot you will be able to observe that adjustments have to be made occasionally. There should be the thickness of a visiting card between the valve stem ends and the adjustment nuts when the motor is hot. 2—Add rain water only to replace that lost from evaporation, and water and calcium chloride to replace any which leaks out, using the same proportion as when the radiator was originally filled. The calcium chloride does not evaporate. It also increases the boiling point, while alcohol reduces it.

1736 **The Cadillac 8.**

From Chas. F. Isola, New Hampshire.—1—I would like to know if the generator in the Cadillac, 8-cylinder, model 1915 car, gives a direct or alternating current. 2—Do all dynamos and generators give a direct or alternating current? 3—Is it the way they are wired which makes them give either a direct or alternating current? 4—Is the starting motor and generator combined or are they separate systems in the 1915, 8-cylinder, Cadillac? 5—How is question 4 wired, if they are not separate systems? 6—I was told, at one time, that there was an automobile school in New York, or somewhere, which admits scholars to their garage and gives them actual practice in machine and garage work. Do you have in mind any such school? 7—What are the best spark plugs to use in the Cadillac 1915, 8-cylinder car? 8—Would porcelain plugs be better than this material, which will not crack quickly from the heat, such as the Bosch plugs are made of?

Reply.—1—Direct. All generators used for combined starting and lighting, or starting, lighting and ignition, in which current is sometimes furnished from electrc accumulators or so-called storage batteries, are of the direct current type. 2—Every dynamo, generator or magneto has necessarily to be either of the alternating or direct type. 3—It is not the method of wiring which distinguishes one type from the other, but the method of design and construction. All direct current magnetos, or generators have commutators and brushes, while alternating current machines use stationary windings and rotors which alternate the current flow four times during each complete revolution of the rotor, or have shuttle or H-shaped wound armatures which give two alternations during each complete revolution of the armature. Direct current machines give or use the current always in the same direction while one-half the time the flow is in one direction and one-half in the opposite. 4—They are two entirely separate units. 5—In systems operating with a single unit the three-cell battery containers are wired in series for charging, and in parallel for operating the generator as a motor. The double unit system employs less battery than the single unit. 6—There are schools which advertise this feature, but we do not know how much experience and actual practice is permitted. Owners of cars could hardly wish to have amateurs make repairs. We would hardly care to recommend any school advertising this feature without first satisfying ourselves that real practice is permitted, and to what extent. While it takes several years to educate a machinist, we hardly see how an efficient mechanician could be produced in a few weeks with no previous mechanical instruction and training. 7—It is to be presumed that the spark plugs furnished with the car are selected by the Cadillac Motor Car Co. as the very best for the ignition they use, which is manufactured for them by the Dayton Electrical Manufacturing Co., Dayton, Ohio. 8—If the plugs you are using are not giving satisfaction we advise that you take the matter up with your local Cadillac agent. The ignition of the Cadillac is by battery and not by magneto. Bosch plugs are designed for magneto ignition.

1737 **Car Slows Down or Stops.**

From S. B. Myers, Pennsylvania.—I have a car E. M. F., 1912, model Flanders 20. It has given me good service until of late it starts hard, and when it does run it will run for about a half a minute, then it will slow down and stop. When I crank it up the second time it will run O. K. It does this just in the morning when I first start it. 2—Of late it has a kind of slapping noise, worse on low gear, and some on second and high. I had the engine apart, put in eight new piston rings, cleaned out all carbon, and examined the other piston rings. The piston rings appeared all O. K., the cylinders appeared good and were not scratched. When first starting the engine the motor will cause explosion or back firing for three or four times, then that will be the last until the next morning. It does not have the pulling power to do it. Should I put in all new rings. The rings are not worn that I can see.

Reply.—1—Your motor has probably the original carburetor, one designed to properly vaporize the much lighter and more easily vaporized gasoline of three or four years ago. If this is the case you should purchase a carburetor of later model, one that

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gives you a higher velocity of the air past the vaporizing nozzle. It is also likely that air leaks have developed between the inlet valve stems and their guides, and possibly around the carburetor throttle lever, any such leak reducing the vacuum at the carburetor and lessening the air velocity. 2—The back firing on starting shows too weak a mixture, and is but another symptom of air leaks and insufficient air velocity through the carburetor.

1738 **Car Lacks Power.**

From G. H. Kaiser, Tennessee.—I have a 1912 model five passenger Hudson car which has been running well until about last May. Since then I have had a good deal of trouble with it, and the shop man seems to be unable to find the trouble except that the car was very dirty and cleaned it out some three or four times. Finally I suggested to him that I believed it was the carburetor or the magneto. He changed and repaired the magneto which seemed to help the car but I have been unable to get more than six or seven miles out of a gallon of gasoline. I told him of this trouble and he then worked on the feed valve which he said was too large. He then put in a smaller one and the car is giving no better satisfaction in that respect. It runs some better, does not clog up quite so bad and is not so hard to keep clean by running coal-oil through the carburetor. Our gasoline dealer suggested that it might be the gasoline, he said it was not as pure as it used to be on account of the large demand all over the country for gasoline, for that reason it is not as good as it was at one time and suggested that perhaps I need a new and more modern carburetor. Any enlightenment you can give me along this line will be appreciated.

Reply.—The trouble mentioned is not uncommon with old motors, particularly if they have seen considerable service and the worn parts have not been renewed. The car when new should average about 12 miles to the gallon and a loss of 50 per cent. in efficiency indicates wear. It may be that the cylinders are worn and that the compression is below normal, owing to a leakage past the rings. The valves may be in bad condition; that is, do not allow free ingress of the mixture and permit of a clean and rapid exhaust. The timing may be late, due to natural wear of the gears or the valve operating mechanism. Leakage of air on the intake stroke is a factor making for a waste of fuel as the mixture is enrichened to compensate for the extra air. Instances have been recorded where dragging brakes have contributed to low mileage to the gallon of fuel. Relative to the gasoline marketed, while the present grade is not as volatile as that of former years, it is stated that more efficiency is obtained from a gallon because more heat units are released. With old types of carburetors, especially those of the non-adjustable type, where the flow of the fuel through the spraying nozzle cannot be adjusted to meet requirements, more or less difficulty is generally experienced in obtaining a satisfactory as well as an economical mixture. It is not advisable to go to the expense of a new carburetor until a thorough examination is first made of the motor.

1739 **Timing the Simms Magneto.**

From T. M. Shaw, Connecticut.—Will you please send me instructions for timing the Simms magneto, as timed on the Maxwell car?

Reply.—Two types of magneto are employed with the Maxwell car, the model SU4 being utilized with the 1914 Maxwell and the SU4 D type with the 1915. As the model of the car was not stated, directions are given for the timing of both types, which is similar.

Assuming that the SU4 type has been removed from the motor, the first step is to crank the engine by hand until the piston of the No. 1 cylinder (that nearest the radiator) reaches top dead center of the compression stroke, or in other words, has fully completed the compression stroke which precedes the firing or impulse stroke. Next remove the dust or breaker box cover and rotate the armature shaft in the direction it operates, which can be easily determined by noting the direction taken by the driving shaft. If not sure of this point it should be ascertained before placing the piston at top dead center.

Rotate the armature until the figure 1 appears in the "sight hole" or indicating window on the distributor. This indicates that the distributor brush is in contact with the No. 1 post or segment, which terminal is connected by wire with the spark plug of the No. 1 cylinder or that on compression. With the distributor in position replace the magneto and couple it to the driving member. The high-tension wires of spark plug cables are replaced according to the firing order of the motor, which is 1-3-4-2, and according to the direction in which the distributor brush rotates which is opposite to that of the armature shaft. By connecting the posts of segments of the distributor in the following manner no trouble will be experienced: The No. 1 to No. 1 cylinder; No. 2 to No. 3 cylinder; No. 3 to No. 4 cylinder; No. 4 to No. 2 cylinder.

The model SU4 D Simms magneto is of the dual type and the current supply for starting is provided by a set of dry cells. The primary or battery current is intensified by a non-vibrating type of coil, but the same breaker mechanism and distributor are utilized. Proceed as with the SU4 magneto as the method is the same in so far as the motor is concerned. The distributor housing of the SU4 D differs from the other instrument in that it has no indictating window. Remove the distributor housing and rotate armature shaft until the distributor brush is opposite the No. 1 segment which is the lower left hand side, looking at the distributor end of the magneto. The firing order is the same as the SU4 instrument and the cables are replaced accordingly. If the car be the 1915 Maxwell employing the SU4 D magneto, care must be exercised in replacing the wires leading to the breaker box. The polarity of the dry cells must be observed; that is, the carbon or positive terminal of the group must be wired to the terminal of the dust cap and the negative or zinc terminal of the group connected to the fuse block. It would be best to obtain the wiring plan which is published in the instruction book issued by the Simms Magneto Company, East Orange, N. J. The book can be secured at any Maxwell service station.

Before completing the work it is well to examine the contact points of the breaker mechanism. If pitted or dirty, they should be cleaned, and it is advisable to measure the gap with the gauge. The gap with points fully separated should be approximately .015-inch.

If the driving gears or magneto coupling be badly worn it will be well to observe the position of the

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contact points of the breaker mechanism when timing the instrument. With the breaker housing fully retarded, the points should begin to separate when the distributor brush is making contact with the No. 1 segment. Extreme wear can sometimes be compensated for by moving the gear driving the magneto shaft a tooth ahead, but this should not be done unless the wear and lost motion warrants the change.

1740 **Balanced Crankshafts and Aluminum Pistons.**

From Fred Noon, Pennsylvania.—Will you kindly tell me in the Trouble Department, what benefit, if any, would a balanced crankshaft be on a Ford, model T motor? Are aluminum alloy pistons worth the price they cost to install them in any four or six cylinder motor?

Reply.—Counter-balanced crankshafts are employed by some manufacturers, it being stated that they are effective because they counteract the effect of the contrifugal forces, largely reduce vibration and eliminate to a great extent local distortion of the shaft. In the conventional four-cylinder motor there are, from their inherent design and construction, unbalanced forces due to inertia, which increases with the square of the speed.

Relative to the use of aluminum alloy pistons in a four or a six-cylinder motor, the cost is warranted if the car is to be used for racing or a high speed motor be desired, although it is claimed by some that they are unsuited to a cylinder larger than 3½ inches. For ordinary purposes it is doubtful if the cost of installation would pay for the benefits obtained particularly if the cylinders are worn, and must be rebored and special pistons and rings made. If oversize pistons with rings can be secured for the motor, the name of which was not mentioned, and new pistons and rings are needed, the aluminum alloy piston would be preferable to the conventional designs. The advantages of the aluminium alloy pistons have been fully described in these columns and their substitution for the iron piston is a question best settled by the owner of the car.

1741 **A Tire Problem.**

From J. L. Donovan, Washington.—One day last summer while driving home a sharp report forward, followed by a series of bumps, indicated that a front tire had blown out. Diving into my "war bags" I located a piece of soft thick leather, commonly known as "pump leather," being used for pump valves and plungers. Having no other kind of blowout patch, I inserted the piece of leather, put in a new tube, and drove merrily home. Arriving home at noon, I left the car out in the hot sun while I went to lunch. Afterward when I went to put the car away, the tire was flat. Thinking there was a leaky valve, or something of that sort, I tried to pump it up, but it wouldn't pump worth a cent. In removing the tire I discovered that the heat had boiled the grease out of the leather and there was a rim of tallow all around the edge of the patch. You can imagine the effect on the tube. The outline of the patch was shown in a line of rotten rubber about half an inch wide, through which the air whistled loud and free. I now carry rubber and canvas blowout patches, and would not recommend leather, especially soft leather in contact with the inner tubes.

Reply.—Oil and grease are rubber solvents. Your leather patch has expensively proven this to you. If you have a car with a leather faced clutch member, you probably have learned, possibly also at considerable expense, that an animal oil or grease like tallow is good for leather, and that a mineral lubricant, like gas engine oil, is about as ruinous to leather as the tallow in the leather was to your tire.

1742 **Master Vibrator.**

From A. E. B., Pennsylvania.—1—I have a Ford car, early 1915 model, which after installing a New York master vibrator, doesn't run as smoothly as before. It is all right running in high gear up to 20 m.p.h., but over that or when running in low it misses badly at times. There is no short circuit at the timer and the plugs are clean and set at 1/32 of an inch apart. 2—Why does a mixture that runs the engine at highest speed on the level cause a sharp knock when taking a hill on high gear? 3—What is the gear ratio of a Ford transmission in low and reverse. That is if the engine makes something like 800 revolutions per minute at 20 m.p.h., how many miles per hour will you be going at the same engine speed in low gear, and in reverses.

Reply.—1—If your master vibrator is not properly installed, and to our personal knowledge many are wired improperly, this would not be unusual and would account for your seeming failure to get desired results. It may be that you have not screwed the coil vibrator blades down properly on all the coils, and you may not have adjusted the master vibrator blade properly. Our advice is that you follow the manufacturers installation and operation instruction implicitly, and that in case you do not get desired results they will be glad to advise you. The New York Coil Co., manufacturers of the New York Coil, is a reputable concern, and they have thousands of their master vibrators out and giving satisfactory results. 2—Probably because of pre-ignition. The more nearly perfect the mixture the more easily ignited and the more quickly consumed. A rich mixture burns slowly and reduces the power. A poor mixture also burns slowly, as evidenced by the possibility of "back fires," caused by the incoming new charge igniting from flame remaining in the cylinder after the exhaust valve has closed. 3—The bevel pinion is provided with eleven teeth and the large gear it drives has forty teeth, consequently the driving shaft and its pinion wil make 3 7/11ths revolutions for every one of the large gear when the high speed clutch or drive is engaged. At low speed the engine crankshaft makes about ten revolutions to one of the rear wheel. You can figure out what you wish to know from this information.

1743 **Broken Crankshafts.**

From Z. F. M.,(Massachusetts.—I have had bad luck in the last few days. I have two Whitcomb mine gasoline engines, and both crankshafts are broken. I can give no reason for this breaking. The motors were in good running order, all bearings rightly adjusted, and there was no noise, knocking, or carbon in the cylinders. All experts around here have failed to give me any reason for their breaking, and the only reason I can give is an overload. The motor has been run with care. I run one myself, but was not running either at the time of the breaking. Would a small flaw in the shaft cause it? On the first one that broke I could not see anything that looked like a flaw, but in the second shaft that broke. I would call it a flaw, the shape of a half moon and

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about 1/3 of the shaft. I think an overload and a small flaw might have caused the break. Can you, or any of the readers of the Automobile Dealer and Repairer give me any reason for the breaking?

Reply.—The breaks occurred, according to your sketch, at the forward end of the rear crank pin and at the rear end of the center crank pin which accommodates the Nos. 2 and 3 connecting rods. These are structurally the weakest parts of any crankshaft, due to the torsional stresses to which it is subjected by the power stored in the flywheel, located at its further end. This crankshaft has no supporting center bearing, a construction which also necessitates a much heavier and stronger crankshaft than would one of three bearing design. Your surmise of the overload is hardly tenable, for gas engines cannot be overloaded, except they are overspeeded, without stopping them. Judging from your sketch it is our opinion that the cause of the breaks was unmechanical design resulting in a crankshaft of insufficient strength to stand the various stresses to which subjected. Too early ignition may have been a contributory cause. The crankshaft may have been weakened as a result of absence of "fillets" at the crank pin ends of sufficient size. The apparent flaw was undoubtedly due to an earlier break.

1744 **Wire Systems.**

From H. V. O'Brien, Illinois.—I have a Maxwell 25, 1915 model. I want to know if it is possible to change this single wire, resistance dimmer lighting system, over to series. That is, is there any way by which a single wire system can be made to shift from parallel to series, same as in a wire return system?

Reply.—Any single wire system can be operated in either series or parallel. If two lamps are wired in series only one, the last, should be grounded, and the voltage of the two lamps combined should be equal to the voltage of the single lamp wired as at present. If three lamps are to be wired in series the last one only should be grounded, and the voltage of each lamp should be but one-third, instead of one-half, as when two are used in series. The only difference between a grounded and wire return system is that the metal of the chassis takes the place of the wire which is used in the latter system to complete the circuit, which in both systems is metallic.

1745 **Soots and Misses.**

From E. G. Miller, Ohio.—The writer drives a 4-cylinder Maxwell Special 1912, Splitdorf low tension magneto, dash coil, start on dry batteries, Schebler Model L carburetor, fires 1-2-4-3. It misses and No. 3 cylinder soots up its plug; cannot adjust the carburetor to stop this. The other cylinders all fire clean. The compression is about the same on all cylinders and the same on battery or magnet. I take care of my own car but this floors me and our local garagemen have not been able to cure it. Tried carefully adjusting the spark gaps on all cylinders to .03 in. It runs well, pulls fine, and apparently fires regularly. When pulling the car it goes with an even steady motion and has lots of power; the skipping, however, must occur to some extent when running to soot up the plug. The irregular firing occurs more at starting and on low speeds. Will appreciate your experience and help. Have only had this trouble in the last three or four months.

Reply.—Sooting of the plug in the No. 3 cylinder may be the result of missed explosions, due to a fault in the magneto distributor, or to a leak or short circuit in the cable connecting with the plug in this cylinder, or in the plug itself. What is most probable, however, is a defective bearing between the cylinder surface and the piston rings. The cylinder may be badly scored, or the piston rings worn, broken or badly fitting. A weak or "set" exhaust valve spring is a frequent cause of missed explosions, a condition showing especially when the engine is being operated closely throttled or run at high speed, rather than when pulling on a hill on direct drive with the engine slowed and the throttle wide open. It would be but reasonable to suppose that carburetion or ignition could hardly affect the engine in the manner described, when symptoms so conclusively point to local, structural trouble. It may be that the inlet valve stem fits very loosely in its guide, although such a leak should affect, in a measure, the other cylinder of the pair.

1746 **Engine Overheats.**

From Henry Kasserman, Ohio.—I drive a Metz "22," 1916 model. The car cools properly when driving on higher speeds, but when it is driven on the lower speeds it soon overheats. It very seldom smokes at the exhaust so I concluded that the lubricating system was out of order and had several repair men examine it; but it still overheats. There is an oil pump in the lower half of the crankcase, and nothing seems to be wrong. The car is equipped with an A. W. T. carburetor which has been adjusted properly. When the motor is hot, it is hard to "turn it over." Any information you will give about this matter will be greatly appreciated.

Reply.—The ignition of all Metz cars is by Bosch fixed spark magnetos. This prevents any manual variation of the ignition timing for varying speeds. When you drop back to lower speeds your engine speed increases and the lag of the spark and the other forces present combine to make the timing too late when the engine speed is high. If you were to change the fixed timing it might be too early for slow engine speed, causing pounds due to preignition. It possibly is set a little late. Late ignition causes the fuel consumption to increase, and the burning of excess fuel as a result of too late ignition creates more heat than the radiating system will take care of. It is most probable that the overheating is primarily caused by too much gasoline as a result of late setting of the ignition, or your mixture may be too rich at high engine speed. We are not familiar with the carburetor you mention. If the motor is hard to turn over when hot as a result of its heated condition, it is not unusual. If it is a result of ignition occurring too early we do not see any remedy except to have your magneto made over by the Bosch Magneto Co., into the adjustable type.

1747 **Cadillac Questions.**

From Chas. F. Isola, New Hampshire.—If it is not asking too much I would like to have the following questions answered in regard to my 8-cylinder Cadillac, 1915, type 51. 1—Could the generator, when running, feed the ignition and lighting circuit, aside from the storage battery? 2—Would the generator keep the lights and ignition circuit going, provided the storage battery were off the car? 3—Would it be asking too much to have you give a dia-

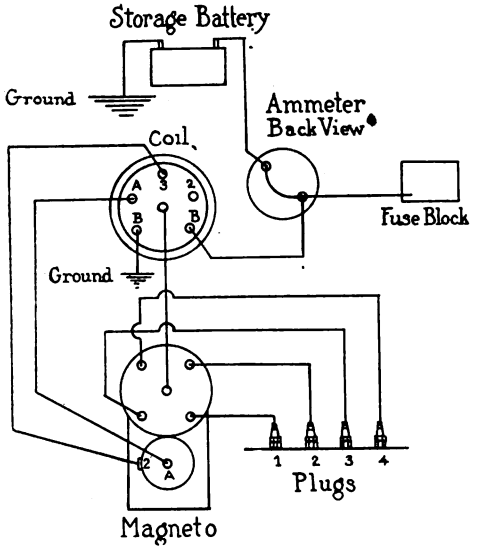
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gram (with the direction of current) of the ignition, lighting and charging battery circuits of the 8-cylinder Cadillac mentioned above?

Reply.—1—According to the instructions for the care and operation of the Cadillac 1915, eight-cylinder cars, type 51, issued by the Cadillac Motor Car Co., for the operation of the Cadillac-Delco system—No. 2—Their instruction book contains in capitals the following: "Caution. Never run the car with the storage battery disconnected or while it is off the car. Very serious damage to the motor generator may result from such action." However, we do not suppose any harm could result provided the commutator brushes were removed. Your ignition would have to be from dry cells, and you could not operate lights. 3—The wiring of this car is very complicated, as may be judged from the use of the following different colored wires, in addition to the main lead for operating the generator as a motor and the secondary cables: red, black, yellow, green, yellow with red tracer, green with oak tracer and black with oak tracer. The wiring diagram is given on page 48 of the Cadillac type 51 Instruction Book, but it does not show the current flow, except from the storage battery. The system employed is the grounded or single wire, the motor generator, lamps, timer and storage battery being all grounded.

1748 **Storage Battery Capacity.**

From J. O. Gulledge, Arkansas.—In your August number you state that "One cannot start and furnish current for ignition from the same storage battery." This seems to be contrary to my experience. I have a model 79 Overland, which came equipped with a low tension Splitdorf magneto and coil and Gray and Davis starting and lighting system. By wiring my magneto and coil as shown in the enclosed diagram I use my storage battery (which is a six volt three cell Willard battery) for lighting, starting and ignition, and I get perfect results out of the system all the way through.



Wiring Diagram.

I also wish to call your attention to the 1914 Studebaker cars and the Reo 5th. They both use the same storage battery for starting, lighting and ignition. If I am in error I would like to have you explain same in your next issue, but I certainly use no dry cells since I wired my car as shown in this diagram. The only changes I made in the wiring was to take the No. 2 wire off the No. 2 post and put it on post No. 3, and ground one of the battery posts, running a wire from the storage battery line to the other battery post, thus leaving the No. 2 post vacant.

Reply.—The storage battery can be utilized as a source of current supply for ignition, motor starting and lighting. As you say, there are several cars marketed employing such a system.

Relative to your changing the wiring of the ignition system employed on your model 79 Overland, as shown by the accompanying illustration, it can be done but it is not probable that you will obtain perfect results. Your eliminating the No. 2 wire on the transformer coil and carrying the No. 3 wire from the coil to the No. 2 post on the breaker box of the magneto, practically reverses the direction of flow of the induced or high-tension current and this grounded or secondary is discharged across the platinum points of the contact points; or in other words, it must jump the gap in order for it to get back to ground. Another factor to be considered is that the insulating material of the No. 2 post on the breaker box is subjected to the action of a high-tension current.

The Splitdorf magneto mentioned uses a parallel circuit when the instrument is supplying current for ignition. When you ground one lead of the battery and run the No. 3 post of the coil to the breaker box, a series circuit is obtained and this will cause a certain amount of lag which is due to the resistance of the armature and the primary of the coil. Therefore, at high motor speeds you will not obtain as good efficiency as with the parallel circuit.

As previously stated, you might operate the car for a considerable period without trouble, but as pointed out, the reversing of the direction or flow of the grounded induced current is not as satisfactory as when the electricity takes the path otherwise.

1749 **An Offensive Click.**

From F. G. Mayer, Ohio.—I have a Reo the 5th roadster, and the car has been run 2,400 miles. The engine is in good condition but is noisy; there being a loud metallic click or knock in the front half of the motor. I have very little carbon, have adjusted valves, and had others adjust them, have no loose play on the rocker arms, have adjusted the connecting rod bearings and main bearings, examined the piston rings and wrist pins and found everything in perfect condition. This click can be heard 30 feet away from the car and increases as the car warms up, and it then sounds like a valve plunger striking on the camshaft and gives off a ringing sound. It occurs at all speeds of the engine, whether standing or moving and at all stages of the spark. This click has developed during the last three months and seems to be getting worse. I have located it with the aid of a wire held in the teeth, to be in the No. 2 cylinder somewhere. I have taken excellent care of the car, and am annoyed very much by this noise and have been the subject of much ridicule on account of it. I would like to ask if such a noise could arise from a faulty camshaft? Can you suggest, from the above data, the cause, and a remedy? I will be very thankful if you can. I have also put in a new exhaust valve spring, without benefit.

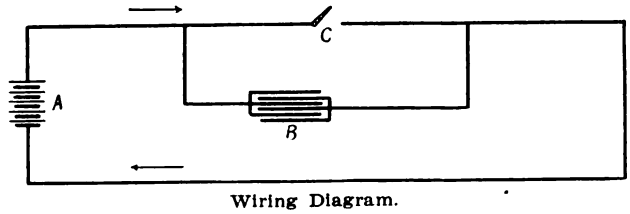
Reply.—Before appealing to us for assistance you proceeded in an exceedingly intelligent manner to

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locate the knock, which you found to be in the No. 2 cylinder. Knocks must be caused by either preignition or lost motion. From what you say we are satisfied that there probably is lost motion rather than any condition to cause preignition. In an anylytical manner we would reject any possibility of direct lost motion at the lower end of the connecting rod, but probably had you carefully examined the connecting rod cap you would have found that it had been worn slightly bell-mouthed, of larger diameter at the ends than in the center. Such a condition would conclusively prove that the hole through the piston is not exactly at right angle to the bore of the cylinder, being slightly higher in the piston at one end than at the other. When pressure comes against this piston the upper end of the connecting rod slides to the side of the piston in which the hole is higher, and on the exhaust stroke it slides to the opposite or lower side, as the centrifugal force carries the piston out from the crank pin. This condition is known as a piston slap. Your remedy is a new piston in place of the defective one. We do not know the method employed by the manufacturers of your car to machine the holes in their pistons, but we do know that trying to machine them properly by drilling operations in drilling fixtures, has cost some manufacturers a good many thousands of dollars. It was reported years ago that one automobile manufacturer in sheer desperation had been forced to machine the outside surface of pistons true with the wrist pin holes, having found it impracticable to drill or machine them accurately after the outside was finished.

1750 **Master Vibrators.**

From Harold D. Roberts, Oregon.—1—Will you please publish in the columns of your magazine a full explanation of the construction and operation of a master vibrator of the K-W type when used in connection with shunted vibrator coils? 2—Is there a condenser in the master vibrator and if so has it capacity to replace the condensers of the regular coils if one or more of them are punctured? 3—Would a punctured condenser in one of the regular coils act as a shunt across the primary circuit of



Wiring Diagram.

that coil and would the resistance of such a shunt connection be low enough to divert any appreciable amount of the current away from the primary windings?

Reply.—1—The construction and operation of the K-W master vibrator is practically the same as of all such devices, so far as principles are concerned. The description catalog of any one should give you the information you desire, but in order possibly to explain it more simply than manufacturers sometimes do, the diagram is reproduced in order to show the mission of a condenser. If the current from the battery A, is to follow the direction of the arrows, with the metallic cricuit closed at the switch C, there will be, as you probably know, a continuous current flow. If, however, the current is interrupted by opening the switch C, current will flow to the condenser B, and when the switch is again closed this current in the condenser will increase the flow just as the circuit is closed. If there were no condenser a spark would appear as the switch C is opened, but the condenser if properly functioning, prevents sparking at the switch. In the vibrating coil the vibrator is actuated by the current itself, the attraction of the armature of the vibrator blade to the core of the coil opening the circuit just as if it were operated by hand, as above described. If, however, the vibrator adjusting screw were adjusted to such a point that the vibrator blade could not move it would be impossible to break the circuit and a dozen condensers in the shunt, perfect or perforated, would have absolutely no effect. So you will observe that screwing down the adjusting screw until the blade cannot vibrate, puts the condenser out of business. It does not matter what its condition is. With all the blades screwed down until they cannot move a master vibrator put into the main primary circuit would have to have a condenser in its construction, the vibrating blade and condenser doing the work for all four coils which the separate vibrators and condensers previously performed. But supposing this master vibrator were not put into the main primary circuit, but were put, as is frequently done, in one of the four separate coil circuits, only one coil would act, and it would take four separate master vibrators to make the four coils operate. 2—Already answered. 3—You should be able to answer this in the negative if you thoroughly understand the diagram and our reply to your first query.

STORAGE BATTERIES.

Information as to Their Care, and Instructions as to Their Recharging.

BY C. P. SHATTUCK, M. E.

Efficiency with electric lighting and motor starting systems or ignition systems relying upon the storage battery as a source of current supply, depend upon the battery, and when it is considered that the current derived is due to chemical action and reaction, it is obvious that the cells must be given careful attention if satisfactory results are to be obtained. This applies particularly in the winter months when the car with electric lighting and starting is not operated as regularly as in warm weather; that is, it is not driven on long runs. Temperature has much to do with the efficiency and output of a battery. It is held that the best results are obtained at a temperature of about 70 degrees Fahrenheit. At 20 degrees below zero the output is about one-third, hence it is apparent that the cells must be maintained in a more fully charged condition in cold weather. This contention is sustained by the directions found in books dealing with the storage battery and its care.

It is not the purpose of the writer to discuss the construction of the storage battery other than to explain that the lead type consists, briefly, of positive and negative plates, separators and the jars. The positive plates comprise supporting and current conducting grids, and active material in the form of red-brown lead peroxide, while the negative plates are similar grids and a peculiar amorphous form of metallic lead known as sponge lead. During the discharge a reaction takes place, the plates absorbing sulphuric acid from the electrolyte and part of the

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lead sponge changes to lead sulphate. It is important that both of these elements be maintained in good condition with the same charging treatment, because, apparently, treatments which are beneficial to the positive are harmful to the negative, and vice versa. Conditions may be so adjusted, however, as to maintain both positive and negative in perfect shape. To keep the cells in the condition referred to it should never be fully discharged. Some authorities hold that a gravity reading of 1.100 of the electrolyte is the minimum point, but the writer contends that 1.150 will indicate that the cells are completely discharged and when in such a condition, must be recharged with care.

The work of recharging a wholly or partially discharged battery may be accomplished in several ways. The writer believes that the best method is to carry the battery to the nearest service station, especially if the battery has been in service for a considerable period and the owner has not given it the attention it requires. On the other hand, the owner can charge the cells, utilizing the generator on the car, the house or garage current or by means of a dynamo.

Before discussing the various methods a description of the hydrometer will be of value for this instrument is considered by battery experts to be the only reliable way of determining the condition of the cells, and it should be employed during the work as well as from time to time when the battery is in service.

The electrolyte or liquid in the cells of a battery is composed of a certain proportion of pure sulphuric acid and distilled water. As previously pointed out, during the discharge the plates absorb the acid, consequently the electrolyte becomes lighter or less dense as the acid is considerably heavier than water. The hydrometer is a glass tube having a rubber bulb at one end and a small tube at the other. The glass member contains the hydrometer proper which floats when the large tube is filled with the electrolyte which is withdrawn from a cell by compressing and releasing the rubber bulb. The stem of the hydrometer is graduated, the larger numbers being at the bottom and the smaller at the top. The more acid or dense the electrolyte, the higher the hydrometer will float, and the reading on the graduated stem at the point where it emerges from the solution is the specific gravity of the electrolyte. An enlarged section is shown at Fig. 1, A, showing the float resting at 1.280, and indicating that the cell is fully charged. The gravity reading is expressed in points. Thus, the difference between 1.275 and 1.300 is 25 points. When all cells are in good condition the gravity will test about the same (within 25 points) in all. Gravity above 1.200 indicates that the battery is more than half charged. Below 1.200, but above 1.150, indicates less than half charged. Gravity below 1.150 indicates that the cells are completely discharged or run down. When the gravity is about 1.150 it is very difficult to charge with ordinary driving of the car and will require separate treatment. In connection with the work of taking readings, it should be borne in mind that it should be done before adding water, for a reliable reading cannot be obtained until the water mixes with the solution which is brought about by the charging process. In charging the battery observe the following precautions:

Remove the vent plugs.

Keep solution at proper height, never allow it to get below top of plates.

Observe polarity with direct current.

Do not add acid or electrolyte to the solution.

Do not permit a naked flame near battery, its gases will ignite.

Use nothing but pure distilled water.

Keep battery clean and dry. If solution be spilled, wipe up with waste saturated with ammonia.

Keep terminals clean and bright to minimize resistance.

In taking readings, always return electrolyte to the same cell. Storage batteries may be charged from 110-volt direct current, that of the house or garage, by utilizing a bank of electric bulb or lamps for resistance, the number and candlepower depending upon the charging and finishing rate recommended by the maker of the battery. It is because of the varying conditions inherent with batteries necessitating different rates in charging that the manufacturer advises the motorist to take the battery to a service station or an exeprt. There are

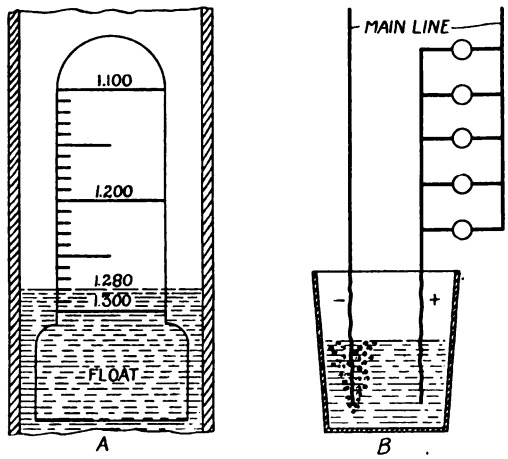


Fig. 1—Charging Storage Batteries: A, enlarged section of hydrometer with float resting at 1.280, showing that the cells are fully charged; B, ascertaining polarity of leads from source of current supply.

times when a battery requires a long, slow charge to bring it up to efficiency, as when the plates are sulphated, and then again a cell may require special treatment.

If the battery be in good condition; that is, the plates and other components, and the motorist is careful to observe the starting and finishing rates as recommended by the maker, he should be able to obtain good results. The charging rates are given on the name plate of the battery, and these rates determine the number of lamps to be used. Utilizing carbon filament lamps for resistance, the desired starting and finishing rates may be determined by figuring that a 32 candlepower lamp will give a flow of one ampere, a 16 candlepower bulb ½ an ampere and so on. For example, if an 80 ampere-hour battery has a finishing rate of five amperes, the cells will require five 32 candlepower lamps or 10 16 candlepower bulbs. To fully charge an empty battery by this method, it should be connected to the circuit for one period of 24 hours or two periods of 12, or until each cell gasses freely and shows a specific gravity reading between 1.275 and 1.300.

Fig. 2 shows the arrangement of the lamps and method utilized in charging with 110 volt direct current. Eight 16 candlepower (50 watt) carbon filament lamps are used, and the wire A is connected from one side of the source of current supply to one

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side of the bank of lamps. Another wire, B, is employed for connecting the other side of the lamps. A third wire, C, is utilized to the other pole of the lighting circuit. When the wire C is connected with the end of the wire B, the lamps should burn. A two-pole switch and two 15 ampere fuses are connected as indicated in the drawing, the functions of the fuses being to prevent the passage of too great an amperage which would injure the battery. Before attaching the wires to the battery it is highly important that the polarity of the current supply be ascertained, or in other words, the positive lead must be connected to the positive terminal of the battery and the negative to the negative. Fill a tumbler about half full of water and add a few teaspoonfuls of salt, dissolving the last named. Immerse the ends of the wires B and C in the fluid, taking care to keep them at least an inch apart. With the switch closed and current flowing, bubbles will be given off the negative wire. Another method, a similar one, is to place a small quantity of the electrolyte in a clean tumbler with a strip of lead attached to each wire, and turn on the current. In a few minutes the metal connected to the positive wire will turn brown. The diagram given herein is that recommended by Gray & Davis, Inc., for charging the battery used with its lighting and starting system when a house or a garage direct current is employed. The resistance required to obtain a flow of four amperes may be obtained by any of the following banks of lamps:

8 110 volt 16 candlepower carbon lamps.
4 110 volt 32 candlepower carbon lamps.
16 110 volt 25 watt mazda or tungsten lamps.
7 110 volt 60 watt mazda or tungsten lamps.

The charging operation should continue from 24 to 30 hours, or two periods of 15 hours each. If the voltage or pressure be 220 volts, use 16 lamps of 16 candlepower, or eight lamps of 32 candlepower and charge from 24 to 30 hours. Batteries may be charged in a shorter period, directions for which are generally marked on the battery plate, or the information can be obtained from the maker.

Fig. 3, A, is a diagram for charging a type P. S.

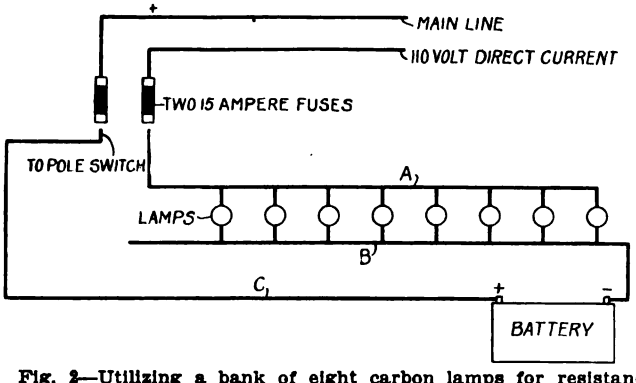


Fig. 2—Utilizing a bank of eight carbon lamps for resistance and wiring diagram including switch and fuses.

W. 68 LBA battery of 100 ampere hour capacity. For charging use five 110 volt 32 candlepower carbon filament lamps or 10 16 candlepower of the same voltage, or 13 110 volt 40 watt tungsten or 20 110 volt 25 watt tungsten bulbs. The starting rate is 12 amperes and is continued until the electrolyte in the cells gasses or bubbles freely. Then continue the charge for six hours at the finishing rate of four amperes. The reading at the completion of the charge should be between 1.275 and 1.300. If not, continue the charging at the finish rate until the specific gravity stops rising, which is generally an indication that the cells are fully charged.

The illustration at Fig. 3, B, depicts the use of a rectifier for charging a battery when the source of current supply is alternating. These rectifiers are moderate in price and a large variety is marketed. They consist of a small apparatus as shown and are connected to the source of current supply by means

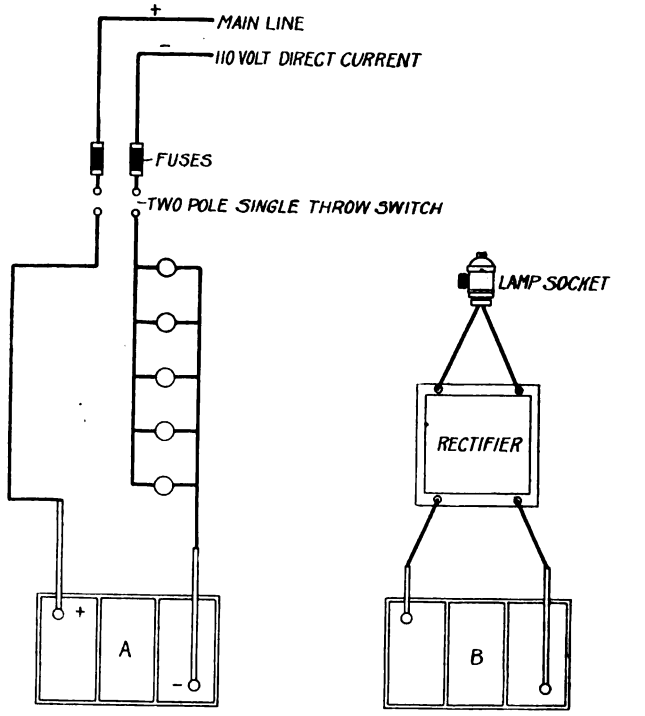


Fig. 3—Charging with a bank of five lamps at A, and use of rectifier when an alternating current is employed.

of a plug. The object of the device is to establish the polarity, which is done automatically, provided the battery is connected to the rectifier before the alternating current is turned on. In purchasing or ordering a rectifier, state the voltage and cycles, which information will be supplied by the company furnishing the house or garage current.

Relative to charging batteries from a dynamo or generator other than those on the automobile, it will be necessary to employ a sufficient resistance in the circuit to obtain the proper charging rates. If the machine be an alternating current generator a mercury arc rectifier will be necessary to convert the current into direct, but a resistance will be required; that is, if the amperage is greater than that of the charging rate. The equipment for charging should include a voltmeter and ammeter in order to measure the quantity and the pressure of the current being generated, and a switch and a fuse block to save the machine should the demands on it be too heavy.

The writer has not attempted to outline the methods for charging a battery by using the generator on the car, as this information is best obtained from the manufacturer of the lighting equipment. No directions are given for the care of the battery that is not to be in service for a considerable period as the writer believes that it should be taken to the service station and stored. For the benefit of those not familiar with the storage battery of the lead type it is explained that if it be allowed to stand for any great length of time while in a discharged con-

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dition, the plates become covered with a thin coat of sulphate of lead, a condition known to battery men as sulphated. The remedy is to take it to the expert who will give it a long slow charge of say two or three amperes, for three or four days or longer, according to conditions. From the above it will be seen that the storage battery requires careful attention, and as they are expensive and the successful operation of the lighting, starting and some ignition equipment is dependant upon them, it behooves the motorist to treat them at least intelligently.

REPAIR CHARGES.

Estimated Prices for the Labor and Not the Material.

From Newsabout Fords.—A good list for repair men:

Overhaul—	
Motor and transmission	$18.00
Motor only (or motor and transmission out of car)	14.50
Transmission	11.00
Repair—	
Burned out bearing	10.50
Main bearing knock	8.50
Put in two or more pistons	6.00
Cylinder knock	5.00
Put in two or more connecting rods or repair oil leak	5.00
Put in one new piston	5.00
Leak in crank case	5.00
Put in one connecting rod	3.75
Grind valves, clean carbon	2.75
Change transmission bands	2.50
Rebore and rebabbitt cylinder block including fittings of pistons	3.00
Rebore cylinder block only	2.00
Tighten transmission gasket cover on case, or rebush transmission	2.50
Cylinder head bolts (stripped)	2.50
Replace crank shaft starting pin	1.50
Cylinder front cover	2.00
Overhaul carburetor	2.00
Braze crank case arm only	1.50
Change cylinder head gasket	1.25
Tighten motor to frame	1.25
Commutator wire loom and brush	1.00
Assembly fly wheel only	1.00
Change carburetor	.75
Leaky door or clean crankcase	.60
Change fan pulley assembly	.60
Commutator pull rod ball joint	.50
Leaky carburetor	1.00
Overhaul rear axle or install new housing	6.00
Change rear radius rod	1.50
Replace—	
Rear spring, tie bolt or new leaf, including graphiting leaves and line up body rear spring tie bolt only	3.00
Rear spring tie bolt only	1.50
Rear axle assembly	3.00
Repair—	
Rebush system	3.00
Install universal joint	2.50
Shaft straighten	1.50
Dope leak, one side	1.00
Install brake shoes, each	1.00
Equalize emergency brakes and fit brake shoes, or repair hand brake lever quadrant	1.25
Emergency brake only	.75
Tighten universal joint	.60
Or change truss rods, each	.60
Or change brake rod supports, each	.60
Install or tighten rear spring retainer clip	.60
Rebush front axle	5.00
Repair—	
Rebush spindles (each side, $1.50)	3.00
Broken off radius rod ball cap stud	2.50
Straighten front axle	2.50
Front spring tie bolt—or new leaf, including polishing and graphiting leaves	2.00
Front spring or tie bolt—replace only	1.00
Tighten ball cap or replace radius rod	.60

Novel Way to Climb Hills.

From W. L. R., New Jersey.—I met Tom and his wife and boy on the boat, Digby, N. S., to St. John, N. B., Canada, late in August. He had his 1914 Buick touring aboard and intended taking the "Air Line" from Calais, Me., to Bangor.

The Blue Book warns about this route that at one distance there is no gasoline for ninety miles, and that houses are ten to twenty miles apart with no hotels and of course no garages.

The road is rough and extremely hilly. The Maine Automobile Association had also advised against this route. I told Tom this, but he took it. Later I met him in Massachusetts and he said the "Air Line" was all I said and more. One hill he said he could not get up, try as he would, because his tank was gravity fed and while full, that the hill was so steep the gas would not flow.

"But you did get up?" I said .

"Yes," he replied, "or I would not be here; but how did I do it?"

I knew it was improbable that any car had towed him and guessed he reversed up.

"No," said Tom, "my reverse is not as strong as my first speed. I tried that and while the gas flowed I had not sufficient power. Neither was I towed up."

I had no more guesses and Tom told me. In his car was a small drinking cup. He found an empty quart tomato can. He fastened the drinking cup in a wire sling and dipped it into his gas tank, filling the quart can and placing it on the floor of the car. Then he raised the hood and put his ten-year-old boy on the running board, telling him to dip the drinking cup into the quart can and pour gas from the cup into the carburetor.

At first the engine spluttered and missed but the boy soon learned how fast to pour. Tom ran up the hill a quart at a time, stopped, drew off another quart and went on again until he reached the summit, three quarts I think it was, and naturally much gas was wasted. He does not advise this for common use but the hint may help some fellow motorist up another hill if the small boy is handy.

New water connections are rarely tight for any length of time, when first fitted. Watch them for the first few hundred miles. This applies especially to a new car. If there is leakage, tighten just sufficiently—and only sufficiently—to stop it. If you tighten excessively at first, you simply maul the rubber, and do not ultimately prevent leakage. Therefore, tighten little by little, as required.

It is just as important to retard the spark when using a starter as when hand cranking.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, DECEMBER, 1915.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

ANOTHER WARNING.

We must once more caution our readers against paying money to traveling subscription solicitors unless absolutely assured that they are all right. There appears to be a swarm of these rascals going around the country soliciting subscriptions for our publication and others and putting the money in their pockets without reporting anything. Many of them travel in automobiles. They offer premiums and all sorts of inducements, not authorized by the publishers, for the sake of getting money. Of course, obtaining money in this way, under false pretenses, is a penal offense and is going to land some of these rascals in State's prison before a great while. We are on the track of several of them now. The best way, always, is to send your subscription through the mail to the publisher of the particular publication you want. A remittance by check or money order is always safe.

AFTER THE WAR, WHAT?

There has been and will continue to be considerable speculation as to what is going to happen after the European war, and especially as to its ultimate effect upon this country. The matter has been made the subject of lectures and comments by economists and business men, and although the conclusions drawn are not absolutely identical, the consensus of opinion seems to be that it will make hard times in this country, that we are likely to have an invasion of foreign workers and of foreign goods, and that money will be extremely scarce.

We cannot agree with any of these conclusions. Of course the extra business now being done in this country owing to the war will be wiped out, but the hundreds and perhaps thousands of millions of dollars already brought into the country for farm and other products incident to the war will still remain here, and this will be quite an addition to our national wealth and prosperity. Whether this additional wealth will compensate for the lost war business is a matter of uncertainty, but that for a number of years it may make up for it seems reasonable.

When the war is over it will have accomplished the greatest destruction of men and of property the world has ever witnessed in a given period. But it will not have destroyed money, the representative of property, to any great extent. Some money will have been burned up and some lost, but this will be a mere bagetelle compared to the whole. Yet it will have been redistributed as it has never been before. Nations that have not been at war will have some of the money of nations that have been at war, but the great mass of the people in the warring countries will probably be as well off in a material sense as they were when the war began. They had little then, but they will at least have an opportunity to work when the war is over, and this is equivalent to money. In other words, disguise it as we may, the rich will be far less rich, and the very poor far less poor.

On the other hand, not only will there be a great demand for labor to restore that property which was destroyed in the war countries, but that demand will be still further augmented owing to the lessened supply resulting from death and disablement. It is thus evident that there will be no invasion of workers to the United States; the stream of labor does not flow from countries where there is a good demand for it to a country where there is little or no demand for it, but rather the other way. Indeed, unless a good share of South American trade be permanently secured by the United States at the close of the war, this country will have all it can do to supply work for its own workers, and in our opinion the drift of labor will flow into the European war countries rather than away from them.

Contrary to the usual conclusion, whether a country be poor or rich, labor will always be prosperous when the demand for it is greater than the supply, and it will never be prosperous, no matter how rich the country, when the supply of it is greater than the demand. Look at England, for instance, the richest country on the face of the globe before the war, and yet labor there was about as poorly paid as in any country in the world. Great as England undoubtedly is in the things that make for high civilization, this war is teaching her the lesson that if the interests of the workers are not considered in times of peace, the workers will not be likely to consider the interests of their country in time of war. And this is a lesson our own country may well heed.

Nor do we look for an influx of cheap foreign goods when the war is over, and largely for the reasons stated, namely: Such countries will for a time have enough to do to rehabilitate themselves and the scarcity of labor there will add to the cost of production, thus making competition with this country more difficult than before the war. But later on, when things there attain their normal state, we shall need something more than the "tariff for revenue" law of 1913 to protect the American wage-worker.

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CAUSE OF PRICE CUTTING.

The address of J. C. Thorpe at a convention of the Ohio garage men, which will be found on another page, is well worth reading, whether one owns a garage or not. It is worth a passing thought that although 25 years ago the "evil of price cutting" was scarcely ever mentioned or considered, to-day it is almost a universal theme among all business men. Whence this change of opinion?

It is due to the fact that 50 years ago—and possibly it holds good even as late as 25 years ago—price cutting was not an evil because it scarcely existed, having been unnecessary, while to-day it is undoubtedly a great evil. Why now and not then?

Simply because of the marvellous increase in industrial productive capacity. When no more of a thing can be produced than the people want or need to consume, there is never any price cutting. All will be sold that can be produced without cutting prices. But just as soon as production outstrips consumption, price-cutting is as sure to follow as night follows day.

If there are two automobile or accessory dealers in a town, and each has a bigger stock than he can dispose of at maintained prices, while two or three times a week a manufacturer's salesman calls upon him and urges him to buy more, quite likely at a large reduction from former prices—simply because the manufacturer himself finds he can produce more than he can sell—the temptation of the accessory dealer to cut rates can hardly be overcome. The only thing that will prevent it is a dealers' association forbidding price reductions.

Such is the situation, and in considering it business men would do well to distinguish cause from effect. Instead of trying to stimulate over-consumption by the ruinous plan of price-cutting, they should head off the trouble at its source, and take steps to reduce production to the point of the consumptive demand.

How are you going to do it? some one asks. In reply we state this is not the occasion to go into that. Having pointed out the cause of the price-cutting evil—an evil which business men are now admitting and crying out against—the remedy is less difficult than may be imagined.

But whether the cure be easy or hard, it would be amusing if it were not discouraging to note the efforts made to cure it by the means of "greater efficiency." Having been confronted by an evil that is solely due to too much efficiency, the idea of curing it by still greater efficiency reflects little credit upon the business thinkers and economists of the present day.

CAR STARTERS.

It is not by any means a positive fact that electric starting and lighting will be a permanent and universal accessory of the automobile. True, it might be, if owners and drivers of cars were considerate and careful, but as a rule they are not. Not long ago no engineer would have dreamed that a battery could be made weighing, say, about 30 pounds, and about a cubic foot in size, that would give the discharge of a horse power and not be completely ruined.

Yet a good many drivers take their cars out on a cold morning, when carburetion is difficult and simply keep the starter pedal down until the beat of the engine is heard. Of course this is liable to ruin the battery and is pretty sure to injure it, if the mandates of the battery manufacturers are worth anything. Few car owners, indeed, take the trouble to carefully read and digest the printed instructions which usually do and always should accompany the electric self starting and lighting systems. Or, reading them, they do so not until they have spoiled the battery by its misuse.

In our opinion some sort of a spring or pneumatic starting system is the only one fit for the heedless driver or car owner. Even then, he will expect the starter to work when he himeslf could not start the car with the crank to save his life.

UNJUST DISCRIMINATION.

Just why a special tax on automobiles and gasoline should be considered to secure additional revenue is beyond ordinary comprehension. It is proposed to place a tax of about 10 per cent. ad valorem on all automobiles manufactured, the ad valorem to be based on the manufacturers' costs. This would yield $38,000,000 a year. The argument advanced in favor of this tax is that the automobile manufacturing business is "very profitable" and that as business must bear part of the burden the automobile business should bear it on the ground that it is best able to stand it. The tax proposed on gasoline is two cents a gallon.

But why tax automobiles any more than horse-drawn vehicles? Why tax gasoline any more than, say, cottolene? It is true that in some instances automobile manufacturers have made big profits, but the automobile grave-yard is abnormally big for a new industry, and many of the headstones represent untimely deaths. Quite likely the returns from the entire investment in this gigantic business has not been two per cent. a year. It has been a case where "many are called but few are chosen."

Of course these proposed taxes will fall entirely upon the car owners, most of whom are of moderate means, and quite a large proportion could under no circumstances afford to indulge in the luxury of horses and horse-drawn vehicles.

Thus the idea of having the tax fall upon wealth alone will not be accomplished, nor could it be with all the wisdom of a regiment of Solomons. And here again we must remind our law-makers that it is not their business to either consider the rich or the poor except as it promotes the public welfare, which is the goal of all legislation.

GARAGE VENTILATION.

As we understand it—and surely there is no possibility of too clear information upon the subject—there are two kinds of dangerous gases incident to running the automobile, carbon dioxide and carbon monoxide. Carbon dioxide is a non-supporter of life, and although not in the strict sense a "poisonous" gas, to remain in an atmosphere of it for any length of time would be likely to prove fatal. Thus it is that to stay in the vicinity of the exhaust even for a little while, and where it cannot be dissipated quickly by the air, as it is a very heavy gas, causes headache or faintness.

Carbon dioxide and steam are the normal products of the fuel combustion. Carbon monoxide it appears is the product of incomplete combustion, and is far more fatal in its effects.

The lesson is easy and simple. It is that an engine should not be run more than a few minutes in a

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closed garage. If it is necessary to run it longer than that, some means should be provided for "airing out" the garage, and this is not as easy as if the gas to be got rid of were not heavier than air. And, by the way, it is as important that a garage be as well ventilated as a dwelling.

PROTECTION BY FREE TRADE.

It appears that the new British finance bill provides a duty of 33 per cent. on pleasure automobiles, motorcycles and accessories. It does not apply to commercial cars simply because that country needs for war purposes all the cars it can get of that kind.

The fact calls for no comment save that it indicates that despite the misuse of the term, protection may mean either tariff duties or free trade. The main purpose of all nations is to protect themselves, and if tariff duties serve that purpose, then they are levied, while if free trade or the absence of such duties best conserves the public welfare, then that form of protection is adopted.

England has been a free trade country simply because that principle has best promoted the public welfare there, and the most ardent believer in tariff duties for this country will not attempt to dispute the soundness of the policy—for that country.

But when her interests are best promoted by tariff duties, England promptly levies them. The free trade policy is just as selfish as the protective policy; the object of each is to protect the home interests, and the policy that might protect one country would ruin another.

AMERICA FIRST.

It is about time to call a halt to the slanderous reports that the American people are little else than "dollar chasers" and "dollar worshippers." Although the dollar is doubtless rated at too high a value among all nationalities, there is no place on earth that it is thought less of in comparison to other things than right here among the American people, and when we speak of the American people we do not mean hyphenated Americans of any sort.

The remarkable thriftiness of our freign-born residents was recently shown in a way of a report of the postal savings banks of Chicago, forty-seven in all, which showed that nearly three-fourths of the total deposits of $3,267,532 were made by them. It is a fact, moreover, that our foreign-born residents will thrive and grow rich on incomes upon which native Americans will half starve.

We are for the American people, their customs, their goods, their ways of living, their ideals and their business and intellectual honor, first, last and all the time.

We are for American schools and churches, and for American tolerance and benevolence. They are superior to those of any nation or civilization on this broad earth.

If there are any in the country who hold different ideas, the gates swing open as wide outwardly for them to depart for some other country as they opened inwardly to them when they came here.

A MANUFACTURER'S MISTAKE.

Car manufacturers make a mistake by referring inquiring owners of their cars to their own salesmen, when such inquiries are in relation to either the care, operation or mechanism of their own product.

We have in mind one case where the owner of a car wrote to the manufacturer for information in relation to its lubrication but he was politely referred to the agent who sold it to him.

Now there may have been several good reasons why the owner of the car did not wish to consult such an authority or lack of authority. It may not have been convenient, the owner may not have had confidence in the knowledge of the salesman, or he may have purchased the car second hand. In any case, the information should have been given promptly from the factory.

A FAVOR ASKED.

We are anxious to increase our subscription list materially during the year 1916. Will our readers help us do this? Any reader who recommends the Automobile Dealer and Repairer to friends owning cars will be conferring upon them perhaps more of a benefit than upon us. The dollar we get for a subscription does not afford much, if any, profit, but the car owner who reads our paper regularly for a year is sure to be greatly benefited, in many ways. We want to ask our readers therefore to each send us one new subscriber, or more if he wants to. Each present subscriber of the Automobile Dealer and Repairer who will send us one new subscriber with a dollar will have his own subscription extended for three months, and the new subscriber will get the benefit of our special offer to new subscribers only, of fifteen months for a dollar. Now let us all pull together for a little while, and see what can be done.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Blanket Becomes Entangled in Pedals.—A man was instantly killed at Allentown, Pa., when a high wind blew the blanket in the way of the pedals so they became entangled and caused the driver to lose control of his car. One of the occupants was thrown out and sustained a fractured skull from which he died.

Road Hidden by Hedge Fence.—Three persons were painfully injured, one perhaps fatally, at Oswego, Kan., when two cars collided at cross roads. The cars were hidden from each other by a high hedge fence and on account of the strong wind the warning signals were not heard.

Charged by a Bull.—A driver, near Prophetstown, Ill., met on the road an unruly bull. The driver slowed down, which seemed to be what the bull wanted, and when the car came within the right distance the bull hit the fender and nearly overturned the auto. The fender of the car was badly demoralized, but the man was glad to escape with his life.

Lights Obscured by Dense Smoke.—It was impossible to see the lights from two machines caused by dense smoke from burning leaves, near Rock Falls, Ill., until they crashed into each other. Two men were thrown from one of the cars and badly injured, and a woman and a man were thrown from the other. The woman received a badly cut face. The tragic part of the accident was that a woman who witnessed it fainted and was seized with heart failure and died almost instantly.

Raced with a Train.—One woman was killed and another woman and a man were painfully injured when their car was struck by a passenger train near

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Chenoa, Ill. The train came up behind them and it is stated they raced with it for some distance and outdistanced it. They were so far ahead that they assumed it was safe to cross, and as the automobile mounted the center of the tracks the engine died. The train struck the car and scattered the occupants in all directions.

Blinding Lights Cause Accident.—At Lincoln, Neb., a woman was killed when her husband who was driving the car became blinded by the bright lights on an approaching automobile. The car dashed off a bridge into the water and overturned, pinning the occupants beneath. It is stated that had the occupants of the car that caused the accident stopped and rendered assistance the woman's life could have been saved, but she was drowned beneath the car. Her husband succeeded in dragging himself out.

Caused by a Coughing Spell.—A driver lost control of his car at Delaware, Ohio, when he was seized with a spell of coughing and leaned over the fender to expectorate. The car glided into a ditch and finally turned turtle. One man sustained a gash across the jaw but the other escaped injury.

While Receiving Instructions.—At West Liberty, Ia., a woman was killed while learning to drive a car which her husband had recently purchased. A tire blew out and the machine skidded off the road and overturned in the ditch. The woman was caught under the steering wheel and crushed beneath the heavy car. Both her skull and chest were terribly crushed.

While Cleaning the Engine.—While cleaning the engine of an automobile of which he had charge, a young man at Cleveland, Ohio, was caught in a trap of flame and burned to death. He was lying under the machine when the explosion occurred but just what caused the explosion could not be determined. Blazing from head to foot he rolled from under the auto down a driveway and people rushed to his aid, but he was so badly burned that recovery was impossible.

Blinding Light Causes Trouble.—A heavy car with blinding lights going at a high rate of speed and occupying the entire road at Monticello, Ia., caused a driver at that particular place to pull clear out of the road to avoid a collision. In doing so he struck the bridge railing. A young man who was with him was cut about the head by glass from the broken windshield.

Flagman's Signal Causes Accident.—When a flagman stationed at a railroad crossing at Madison, Wis., signalled to an automobile party to come ahead, the driver found himself in a network of tracks and several freight cars bearing down upon him. The flagman frantically waved them back, and the driver by speeding up his machine succeeded in saving the life of his wife and himself, but the machine was struck by a box car and badly damaged.

At a Dangerous Crossing.—Near Leroy, Ill., two men were killed and a young lady and man injured when a collision occurred at a crossing, the view of the roads from either direction being almost impossible.

Driver Turned to Look.—An automobile struck a telephone pole, near Geneva, Ill., when the driver turned to look back. One woman occupant of the car was hurled through the windshield and received a broken jaw and possibly a fractured skull. It is stated that two women in the rear seat asked: "Why don't you say something?" and the driver turned to answer.

Excessive Speed.—In an attempt to make a short turn in Sioux City, So. Dak., an automobile collided with a trolley wire pole. The driver was caught behind the steering wheel of the machine with such crushing force that he was badly injured internally and died shortly after the accident. The other occupant of the car was seriously hurt and is in the hospital.

Surrendered Wheel to Inexperienced Driver.—One young man was killed and four other occupants were injured when a car driven by a young lady turned turtle near Streator, Ill. The party was on a pleasure trip and the young man who was killed, and who was a capable driver, had driven the machine until just before the accident, when his young lady companion took the wheel. It is said she attempted to turn from a lower to a higher road and the machine became overbalanced and toppled over.

Brakes Bothered.—Near Elgin, Ill., it is presumed that the driver in attempting to stop the car became bothered with the brakes with the result that the car stopped dead on the railway track. It was struck squarely, the occupants hurled thirty feet and the machine was totally wrecked. Two women and two men were killed.

At a Sharp Turn.—One man was instantly killed another fatally crushed and five others injured near Conneaut, Ohio, when the automobile in which they were riding was wrecked. They were going at a high rate of speed and the driver did not observe a sharp turn. The car struck the curb and turned completely over.

Bulldog Causes Accident.—A dog ran out and grabbed the wheel of an automobile that was passing at Davenport, Ia., and caused the driver to lose control of the steering wheel. The machine ran up on to the curb into a baby carriage, crashed into a house and smashed up against a tree. The child and nurse were bruised somewhat and the dog was run over and killed by the machine.

While Walking on the Sidewalk.—Three women were injured, two of them seriously, at Milwaukee, Wis., when they were knocked down by an automobile and dragged about thirty feet. The car that caused the accident was coming at a rapid rate and tried to pass a car in front. As there was no room to pass at that point he drove his car onto the sidewalk, striking the women and smashing the axle of the other car.

An Exhibition of So-Called Skill.—A driver near Fairmont, Minn., who wished to let people know he had a car, when directly opposite a man and woman who were driving a team, opened the cut-out and frightened the team so that the occupants of the carriage were thrown out and injured.

Autos Cost $1,000,000,000 Yearly.

Here are some statistical extracts from Reginald L. Foster's "I Am King Auto:"

Automobiling costs the United States $1,080,000,000 annually.

To run 2,000,000 cars a year takes 1,000,000,000 gallons of gas worth $130,000,000. (Here's where John D. and the Standard Oil smile expansively.)

Twenty million additional gallons of lubricating oil costs $8,000,000 a year.

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Tires? Twelve million of them wear out every twelve months, and use up another $192,000,000, figuring tires at only $16 each, a low average.

Automobile accessories—allowing $50 to a car—calls for an outlay of $100,000,000 annually.

Garage expense, $50 a year for each car, eats up another $100,000,000 in one year.

Figuring $50 for each car (if economical repairing is done) and still another $100,000,000 is spent.

Added up, it totals $630,000,000—doesn't it? Some money!

There were 600,000 new automobiles bought last year, costing all the way from $375 up to $10,000, some costing even more.

Call the total roughly $450,000,000.

Now add it all up—just $1,080,000,000 for automobiling.

A thousand millions spent on king auto!

Farmers own 70,000 cars in little old New York State, by gum!

Corn-blessed Kansas has 50,00—averaging in 1914 a machine to every eighth family.

One town of only 200 population in the champion farm state of them all, Iowa, has 77 licensed machines (and $3,000,000 in the village savings banks).

Two millions of cars! One to every fifty people in these United States, seventeen for every railway locomotive, twenty-eight for every passenger coach.

Ford Car Speed Changing.

In coming down from high to slow speed on a hill do not let the engine race. Close the throttle just before you push the pedal forward, so that when you reach free-engine point the engine will be only just comfortably turning over. Engage slow speed, and then gradually open the throttle as far as is necessary to carry you comfortably on. Do not try to rush a hill on slow speed. If you race the engine between high and slow speed, you will engage slow speed with a jerk that will mean discomfort for all in the car—to say nothing of the engine itself.

In picking up high speed you let the pedal come back from slow, close the throttle a little, and the clutch will then take hold "sweetly." You ought not to jump forward with a bound. If there is the slightest disinclination on the part of the clutch to take up the load, slip it, by pressing the clutch pedal slightly forward again, going right forward into slow speed once more, if both car and engine have lost most of their momentum. It ought to shock your mechanical sense to feel the engine laboring in the effort to pick up the clutch. Another point—not so important. Retard the spark slightly when picking up the high speed, advancing it as you get way on.

How He Found the Trouble.

From H. B. Hill, Illinois.—Three years ago I bought a second-hand car and had my first experience with it. This old machine has a history that would interest every reader of the Automobile Dealer and Repairer, and is now in good running order after many thousands of miles and will make many more with the usual care which any car needs to keep it going. I will relate a circumstance which may help a brother. I put a new magneto and coil, a dual ignition system, on about two years ago, and all was well for a good while and then the battery side of the system failed. I put in new cells and traced all the wiring but no spark. I wrote the maker of the magneto about my trouble and was advised to send it to their service station for repairs. They were also very kind to me to send me their descriptive circular and instructions for installing and operating. And in fact when I studied their illustrations and instructions I fixed the thing myself. I have learned long ago that most of these troubles are some little simple thing. I found my trouble in the switch. One time it was the fault of the maker. In attaching the switch assembly to the coil it was not set square with the terminals, which are imbedded in the bakelite of the coil housing. When the battery was switched on the lever would turn barely far enough for the corners of the connections to touch. While on the magneto side it would lap over farther than necessary. So I gave the switch assembly a little turn in the direction of the battery side and my trouble ended. You see that when the switch was new and tight it would hold firm enough to make a very good connection, but it soon became loose enough to drop away from the terminal and break the circuit. I hope this may assist some one in solving their ignition trouble.

Two Cycle Engines.

From N. G. Near, New York.—In connection with Charles E. Duryea's rejoinder, page 36 of the November issue, I am inclined to argue against him on his claims for greater efficiency for the two-cycle engine. I have tested two and four cycle engines in testing laboratories and invariably the four-cycle engine shows greater economy in fuel consumption. It has been shown mathematically that the four-cycle engine should be more efficient, and it is.

Two-cycle engines "work," true enough. They are simpler than the four-cycle, they cost less, they weigh less per horse power, etc.; but it has been found thus far that it is more economical in the end to pay a little more for the four-cycle type. I disagree with his last two sentences, which read:

"About that same time people will also ask why we should muss around with water and radiators when the air finally must absorb the heat anyhow and when the air-cooled cars are holding all records for economy and efficiency? The only answer is PREJUDICE."

I do not think it is prejudice which calls for water cooling. In steam engine power plants, for instance, condensers are invariably cooled with water and not with air. In many cases "air finally absorbs the heat anyhow," even in power plants, but the water must first be sprayed into the air in order that its radiating surface may be made as large as possible to bring the temperature of the water down to the proper point again.

Air is not so good for cooling "intense heat" as is water. That is a well-known engineering fact. Water is a better conductor of heat. Put your hand in air that has a temperature of 32 degrees Fahrenheit and it wont' feel so very cold. Then put your hand in water of the same temperature and it will feel cold. Why? Because water is the best conductor.

Cleaning the Ford Crankcase.

Either run the front of the car up a steepish bank or lift well up with the jack under middle of front axle. Then stop the engine. The result will be that most of the oil will drip towards the lower transmission cover, whence it can be drained by screwing

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out the drain plug you will see in the crankcase cover.

A more thorough way is this: Tilt the car, as described above, and stop the engine. Then pour in through the breather pipe a gallon of kerosene. Then turn the starting-handle vigorously for some minutes—the longer the better. Then open the drain plug as described above. The sluicing with the kerosene has a very cleansing effect, though the efflux is correspondingly more filthy. Let the kerosene drain away till no more drips. You do not want your next charge of lubricating oil diluted with kerosene. It is not a bad thing to leave the engine dripping all night, replacing the plug, and pouring in a new charge of oil next morning.

If you want to be very thorough, remove the lower transmission cover after the kerosene has dripped out, and wipe off with a rag all the dirt you will find deposited in the sumps in the cover. (The sumps are the three shallow depressions.) There is another sump just inside the crankcase itself—not removable with the cover—which should also be wiped out. Generally, quite a little deposit of dirt will be found in each of the four sumps.

The removal of the lower transmission cover is, however, not essential, providing you tilt the front of the car up well. If you do not, the dirt will be trapped by the sumps, and so will not run out of the hole when you remove the plug.

In replacing the plug, screw up as tightly as you can. If there is leakage here, you will lose oil on the road without knowing it, and that would be very serious. A big-end bearing might easily run through loss of oil.

Protection from a Cold Draft.

From E. C. McCall, New Jersey.—In the 1915 Ford cars there is quite a gap between the windshield and the top. This produces a draught which is very uncomfortable when driving on cold stormy days with the top up. I made a filler for this space from an old tire cover. One edge of this tire cover contains a light steel band about ¼-in. wide, sewn inside the cloth. Back of this edge are a number of

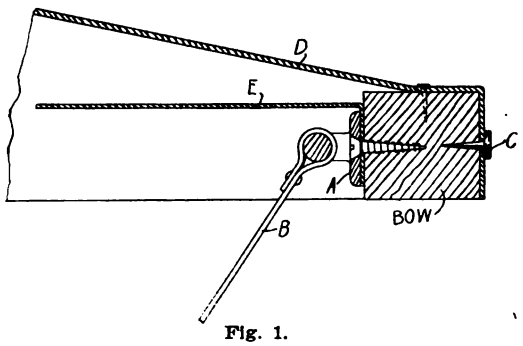


Fig. 1.

"glove" fasteners. These are meant to press into "knobs" which are attached to the other edge of the tire cover, thus holding the cover in position around the spare tire.

First of all, fold the top down. Then take out the screws which fasten the two small iron brackets, A, as in Fig. 1, to which are fastened the leather strap B, which hold the top in position. These are the two short straps with hooks at their outer ends which fasten to the windshield when the top is up.

Then carefully remove the black headed nails, C, which fasten the leather strip around the front of the top bow, also the small tacks which fasten the top material D, to the front bow.

Stretch the tire cover E, across the bow, fastening it at each side of the bow by means of the iron brackets A, taking care that the leather side of the tire cover will face downwards when the top is up and that the edge with the steel inside shall stretch across the top of the windshield E, as shown in Fig. 2. Pull as tight as possible before putting in the screws. Fasten the tire cover to what is the top side, G, of the front bow when the top is up, by means of tacks. Before doing this, cut off the sur-

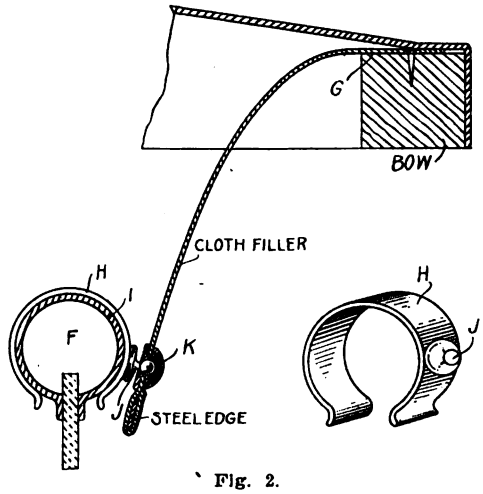


Fig. 2.

plus cloth of the old tire cover, making it fit all around the front edge of the bow. Put back the top material carefully. Make or buy four brass clips, H, which clamp around the upper bar, I, of the windshield.

From the tire cover cut out four "knobs," J, mentioned in the first part of this article and solder them firmly to the brass clips, H, as shown. Arrange the clips on the windshield so that they come opposite to the "glove fasteners," K.

When the top is up, push the fasteners into contact with the "knobs" on the clips and you will find that very little wind or rain can blow through at this point, nor will the filler interfere with the side curtains or the leather straps which hold the top in position.

Care of Batteries.

From E. G. Miller, Ohio.—We read with interest your paper and note the increasing number of storage battery problems that are being put up to you. We have the Willard Service Station for Warren, Ohio, and repair and recharge 90 per cent. of the batteries in this county. The greatest difficulty with the battery question is to get the average car driver to understand and properly care for his battery. We are trying to educate our customers to realize that while they have a big giant in a little box, yet he must be fed and cared for in a proper way, if they expect to get work from him. We have had storage batteries brought to us that had been filled with a solution of sal-ammoniac, one with muriatic acid, and another (the battery was almost exhausted), so the man put a wire across the terminals; and time and again batteries are brought in that have been reversed by some careless fellow in recharging. Battery cranking is a great convenience. I don't suppose the pleasure car will ever be without it, but the car user must realize by expensive experience if

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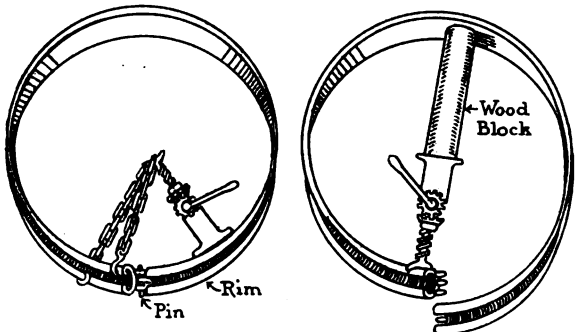
in no other way, that his battery is a costly part of the car and must be carefully used, intelligently repaired, and recharged when that is necessary. We give free distilled water and free battery inspection and (hydrometer test) to all car owners.

Just a Woman's Way of Thinking.

From Mrs. G. G. Conley, New Jersey.—I was reading the last number of your magazine with pleasure and thinking it was one of the best, when I came to the article about "Women Drivers." It was bad enough for a judge to say "women are unfit to drive an automobile." You took exception to that. Further on you said you never saw an automobile coming with a woman driver, but you have a feeling of apprehension. Now that is not the way to feel. I have a drive to our farm, 22 miles each way, and I get very much annoyed. The road is very much traveled, and a good part of the way it is very narrow. I have a fear of a smash-up or of going off the awful side and back, just because the men drivers crowd a woman off. They keep to the smooth road piece. True, they may calculate within a few inches, but who wants to take that risk? I do not blame the farmers for taking advantage of having a heavy wagon, to give the automobiles all that ought to come to them. Two wrongs do not make a right, I know. The Ford owners, as a rule, cut in and pass in ahead at places. They think they have a car to beat anything.

For Tight Fitting Rims.

From W. J. Baker, Ohio.—A few months ago you had an article regarding using a screw jack to force a tight fitting rim on a wheel, which I find very



To seperate Rim To bring Rim together

useful. My rims go on the front wheels very easily, but I always had a great deal of trouble, hard work and long time consumed in getting the rims on rear wheels, but thanks to the tip published in your journal, I can now get the rims on without difficulty. Some of your subscribers may have had trouble in both separating and getting together split rims, especially if they are similar to the "Kelsey Split Rim," the two ends of which are made like an ordinary door hinge, with three eyes on each end, through which a locking pin goes. After considerable study and experimenting I devised a scheme for pulling the two ends of the rim apart. I use a screw jack, placing a chain over top of the jack. The chain is provided with a hook at each end which hooks over the two edges of the rim, and no matter how badly the casing is rusted to the rim, by use of a jack one gets an even pull on both sides of the rim and the latter comes apart very easily. For getting the rim together again and the eyes on each end of the rim interlocked, place the jack on a piece of wood and a few movements of the jack handle will force the inside end of the rim into place. I send you a crude drawing, which together with my explanation, will make the modus operandi understandable.



CONDUCTED BY M. KEITH DUNHAM, OXY-ACETYLENE ENGINEER, 50 CHURCH STREET, NEW YORK.

Readers are requested to state their questions clearly and fully, but as concisely as possible. It is hoped the information given will be of general interest as well as of value to each inquirer.

Housing Welding.

From George S. Hathaway, Illinois.—I have had a number of Ford drive-shaft housings to weld but have had trouble in the weld cracking when cooling. I can't seem to locate the trouble, as I am careful in letting the weld cool slowly.

Answer.—Usually a break of this character occurs in the tubing, just where it enters the malleable housing. In assembling this, the manufacturers rivet the housing to the tube and then braze it. If you will note the break carefully, you will probably see the brass of the brazing material is either in the break or in close proximity to it. Now steel melts at around 2,500; the zinc of the brass volatilizes, i. e., it turns into a gas at a very much lower temperature than this and it is this fact which prevents making a successful weld, as the steel must be free from impurities. Never attempt to weld iron or steel which has been brazed unless you can get all the brazing material cleaned away before starting to weld—something usually impossible.

In breaks of the character you describe, I would suggest that you cut off the tube back two or three inches from the break and weld on a new piece of tubing, which may be seamless tubing of approximately the same gauge or extra heavy wrought iron pipe; then remove the broken small piece from the housing and re-rivet and braze into the housing the end you have welded on to the tube or instead of riveting you may bore out the holes in the housing a larger size, slip the tube in and make a bond by brazing the tube to the housing with tobin bronze, through the old rivet holes in the housing which you have enlarged.

E. D. Lovejoy, Maine.—I have had a welding outfit for over a year and on some work have been very successful but I have a great deal of trouble with contraction cracks. I don't seem to be able to tell whether or not an article must be heated before it is welded. Is there any rule in this respect I can follow?

Answer.—Simply remember that cold metal must occupy a smaller space than hot metal—therefore, study the break to see if there is an opportunity for at least one end to expand and contract freely, that is, that it is not attached to or a part of the article. A lug on a crank case or a crankshaft or a front axle are examples of where no preheating is necessary to prevent contraction cracks. Breaks in the body of a crankcase, in the water jacket of a cylinder, etc., require preheating for the reason that when the weld cools the case will be distorted or will break, simply because the area you have heated by

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welding must be a smaller area when it is cold. So to offset this, we warm all sections which are to be affected and so expand them all over; then in cooling they cool and contract equally.

This isn't a hard and fast rule but it is the only one which the student of welding should recognize until he thoroughly understands expansion and contraction. Sometimes it is possible to overcome contraction strains by the use of wet cloths, thus limiting the stress to a small section; sometimes by bending or cutting, but these methods should not be employed until the reasons are understood.

It is necessary to treat each repair job individually, as hardly any two are alike. A little forethought will usually result in saving the necessity of second guesses.

Crank Shaft Welding, Etc.

From Frank Erxleben, Indiana.—Your letter was very interesting, and one thing you seem to have grasped much better than your earlier correspondence indicated—expansion and contraction. I fully agree with you as to the futility of depending upon V blocks to prevent contraction. It can't be done. At best they are a help in lining up and this is as much as they should be expected to do in the line of crankshaft welding.

Now about your filler rod for crankshaft welding and your statement that Norway iron will not make a strong weld. As a matter of fact, Norway iron should not be used on crankshafts but as near as possible, a rod of the same material as the shaft. Norway iron is very ductile, that is it bends easily, but its tensile strength is low. Because a crankshaft must stand a constant series of strains and remain straight and true, just the opposite is necessary. This strength is obtained by a higher carbon content, by the addition of alloys such as nickel, vanadium, etc. The thing which will bother the welder the most is the carbon content and where this is extremely high the steel is practically unweldable, due to the burning of the metal and the absorption of gases, making it porous. But this is a condition very rarely met with in crankshafts and as a rule good welders can handle crankshafts and be quite certain of their results. Your trouble seems to be lack of experience, though it may be impure gases or a poor welding torch or lack of self-confidence. But don't consider a thing impossible if the other fellow is doing it every day—and it's a pretty good plan not to even if he isn't, for the impossible of to-day is the commercial success of to-morrow.

To argue that an acetylene weld made upon a shaft is as strong as the original was (if it was free from imperfections) would be foolish. The shaft is heat treated, forged, etc., and the weld is simply a casting. The strength of the weld, if there is no chance to reinforce by adding more metal, will probably be from 80 to 90 per cent. as compared with the original metal but in 99 times in 100, this is strong enough. Here is a case where theory and practice clash, for in the former instance, if the shaft was not strong enough to hold and the weld is weaker than the shaft, it would seem the height of foolishness to depend upon the weld, but how many shafts did you ever see broken except through an accident? Perhaps the bearing burned out, timing may have been wrong, connecting rod let go or the wrist pin break or just possibly perhaps there may have been a crack in the shaft. Crank shafts are built much stronger than they really need to be, if nothing goes wrong. Engineers call this condition "the factor of safety." The weld merely reduces this factor and for all practical purposes, crankshaft welding, if properly executed, is perfectly feasible.

You say in your letter "you can't puddle the job long enough to combine the metals." Don't ever try to puddle steel with a welding torch. You can puddle aluminum and cast iron but never steel—not and have any strength left in the metal. To do this you would have to use a tip much too large for the thickness of the metal and the result would be burnt, porous metal. Steel is sluggish, it solidifies almost instantly the flame is removed (unlike cast iron) and the operator must use care to see that the metal is thoroughly fused by a circular motion of the torch or a zig-zag one of the rod, not allowing the flame to remain one instant longer than is necessary to effect the bond between the rod and the weld.

If you believe in hammering the weld, be careful that you do so at the welding heat. Personally I do not think it necessary or advisable and it is very likely to distort the shaft to such an extent as to prevent truing up. See answer above regarding text book.

Welding Cast Iron.

From E. Baumann, New Jersey.—Could you give me some advice as to welding cast iron? It seems that when I weld it, my weld does not hold, although I get my metal flowing before I apply my filling rod. The weld, when it breaks, looks to have a shine to it. Is this the fault of poor flux or do I not get my metal flowing enough? I have good luck with steel and aluminum. Also let me know if there is a good welding instruction book on the market.

Reply.—Your trouble may come from several causes but I hardly think that the flux is responsible and I would try a few other sources first before changing the flux. Remember that the welding rod must be of a special alloy, high in silicon, to effect a successful cast iron weld. If you use any old casting as a filler, the weld would be extremely brittle and have a bright appearance such as you describe; therefore, be careful of the welding rod and purchase it only from reputable acetylene welding supply houses. Next be careful that your weld cools slowly—by this I mean that before you start welding, the casting, or at least that part of it around the weld, should be at a red heat, the weld executed whlle it is still hot and then the casting placed back in the preheating fire or allowed to cool in ashes, asbestos, mica or some good non-conductor. If it cools suddenly, the weld will be brittle and have a silvery appearance. So you see that the two principle things to look out for are a good welding rod and slow cooling. Failure on your part to observe either or both of these conditions will result in a brittle weld. It might also be well to add that unlike steel welding, the end of the blue cone of the welding flame must not come in contact with the metal but be held a little distance away, varying with the thickness of the metal. The practice of allowing this cone to penetrate the molten mass would result in hard spots but would hardly be responsible for the conditions you state.

"Autogenous Welding," by Granjon and Rosemberg, is a text book translated from the French. While some portions of it are devoted to subjects which would be of no help to you, the authors have

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made a deep study of the subject and it is full of information to the man who really is in earnest to get to the bottom of this fascinating and profitable business. But I warn you that it requires real study to understand and not merely a cursory reading. The price is I believe $2.80 and perhaps the publishers of this magazine can get it for you if you ask them.

Some Welding Hints.

I know of no better Christmas present you can make yourself than an oxy-acetylene welding outfit —if you have not already done so.

No other shop equipment will pay for itself so quickly, if intelligently handled. It's one of the biggest ads, if you produce good work with it. A garage or repair shop must be in a position to give service—the owner of an automobile wants to use it, to-day and to-morrow and all the time—and a welding outfit helps materially to keep the car going.

It will straighten that broken frame without the necessity of tearing the car down. It will not only weld all broken parts but will build up worn ones—it's fine for babbitting and simply by the addition of a copper tube, you can burn the carbon out of the cylinders. No garage can well afford to be without a welding apparatus.

Choose it carefully, using the same horse sense you would in the purchase of a car. Some automobiles are sold without equipment—so are some welding apparatus. Others come complete with speedometer and tools and electric equipment. Some welding apparatus are sold with the same ideas in mind. So in the purchase of the welding equipment, read the specifications carefully, the first consideration being SAFETY. Price does not always govern quality. An apparatus may be low in this respect and high in manufacturing ideals or it may be very high in price and very poor in quality. Yet "bargains" in mechanical apparatus as a rule are a pretty costly investment for the user. There probably is a happy medium of price where the manufacturer may sell you a good outfit, give you good service and still maintain a fair profit and this is the type of equipment most suitable for the automobile repair man.

If You Have an Outfit.

If a welding apparatus is already a part of your shop equipment, look it over, with a view of finding out if you are getting out of it the results you should; and if you are ready to use it to the best advantage in overhauling.

Are the regulators in good condition? Remember that SAFETY FIRST demands that the oxygen regulator especially is in good working order; since its failure to operate properly may result in a serious accident. With the valve on the tank open, does the hand on the dial of the low pressure gauge creep ten or fifteen or maybe twenty-five pounds? If it does, this is a sure indication that the seat is damaged and needs attention. If you understand its construction and have new seats, you may renew this yourself, being careful that no oil or grease gets inside the regulator. If you don't understand the regulator, send it back to the manufacturer for repairs.

Is this regulator equipped with a high pressure gauge to indicate the tank pressure? If it isn't, get one, and be certain to get the best for quality is especially to be desired in this instance. It's a nuisance not to know when the tank is getting empty or to know how much gas you have used on a job. The high pressure gauge keeps you advised. Without it, you can simply guess.

Are you using lighting cylinders for the acetylene supply? Don't. The gas costs considerably more and a steel weld is likely to be very weak, especially if the metal is heavy. Make arrangements to secure the regular welding cylinder or if you must use lighting cylinders, connect three or four on a mainfold. Space is too limited to go into details regarding this feature but many good welds have been spoiled because the operator used lighting cylinders and inasmuch as welding cylinders may be easily secured and the gas cost considerably less in this form than in lighting cylinders, this fact alone should prohibit the use of lighting cylinders.

Look over the hose, especially where it is clamped to the regulator or torch connections. Be sure that it is tight and unbroken. If you use ordinary wire, instead of hose clamps, be sure that the hose isn't cut. There have been serious accidents due to the hose breaking—don't lose sight of SAFETY FIRST.

See that you have a proper range of interchangeable tips, to insure welding thin as well as heavy metal. If the tips are burned or ragged, get new ones—good welding is impossible with tips which are not in good condition.

If the torch flashes,—that is, if the gases burn back to the mixing chamber easily—return it to the manufacturer for repairs. Modern developments in the construction of a welding torch make this practically impossible.

Make sure that you are properly equipped—that you have a welding table, made from angle irons or gas pipe, welded together, with a fire brick top—that you have on hand a sufficient supply of welding rods, purchased from a reputable supply house, the proper fluxes, etc. Good welding may only be obtained with good welding materials and it is poor economy to purchase the cheapest in this case, when the best in the long run is the lowest in price.

Workmanship is the most important of all. Practice, practice and practice—not on your customer's job, but on scrap material. Don't figure that a thing is impossible until you know. And don't conclude that the other fellow's experience is necessarily final. He may have succeeded in welding something through luck and then described his luck for your benefit or he may have fallen down and because of his limited experience, stated that because he couldn't do it, it was impossible.

Oxy-acetylene welding requires "heady" work. If you are capable of diagnosing the troubles of the various parts of an automobile, you surely have the brain to master welding difficulties. Perhaps you need elemental knowledge and if you do, get it through your trades paper.

The Fan Belt.

If you find yourself with your fan belt broken, and have no spare one, there is no harm in driving without the belt if the weather is cool, and you drive slowly, so that the water does not boil, and if, further, you stop if it does boil, and give it time to cool. In cold weather you can drive without the fan altogether. Indeed, when it is freezing, you often get more power and better running by doing so.

A small compass placed where is it easily accessible, serves to keep one posted as to the direction traveled.

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LATHE TOOLS.

Things That Will Permit of a Fairly Wide Range of Work.

It is generally the custom of the small repair shop to send certain pieces of work outside. The greater part of this work could be successfully handled and profitably if the shop equipment included the necessary special machinery, but much of the work can

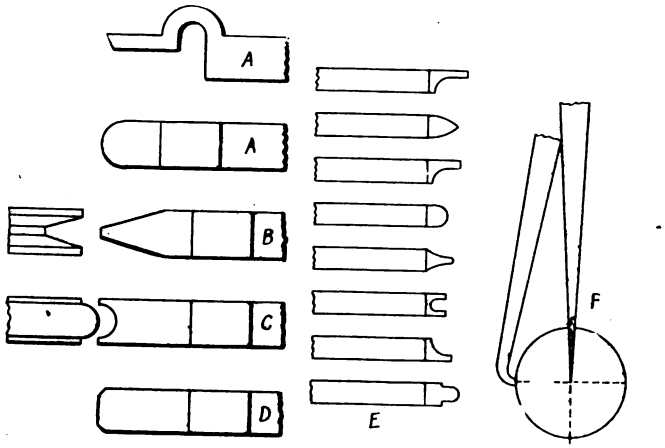


Fig. 1—Useful tools for the lathe including a spring tool for radius work, finishing pulley, bead forming, finishing iron castings, cutters, etc., and tool for centering cylindrical work.

be accomplished with simple home-made tools. There are many special tools which may be utilized with the lathe, and these are very handy, especially when old cars are being overhauled, and which require a new part that cannot be secured, requiring a pattern, casting and subsequent machining.

The accompanying illustrations show a number of lathe appliances that can be made and will permit of a fairly wide range of work. Those shown at Fig. 1 are the external type of cutters and several of them are decidedly superior to the ordinary slide rest tools, particularly the appliance shown at A, which can be used in radius work, such as turning flywheels, hubs, flanges, etc. The usual method is

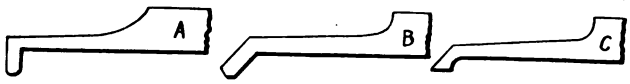


Fig. 2—Home-made lathe appliances: A, internal boring tool; B, finishing tool; C, for roughing out castings.

to rough out nearly to size and finish with a spring tool. An instrument for centering this as well as other cylindrical work is illustrated at F. The tool shown at B will prove handy when turning a groove in a pulley and it can be employed for similar work. The tool at C is useful where beading is required.

The tool at D will facilitate the work when facing a casting. If a cast iron disc, four inches in diameter, and having a bored hole, is to be trued up and polished on one of its sides, it would be bored while in the chuck and then faced up for polishing. The usual way is to finish some castings with hand scrapers, made from worn out flat, smooth files, the teeth of which on both sides have been ground away and the end of the work finished square.

A bar of square steel or iron is clamped in the slide rest, with one end projecting about four inches, at right angles to the lathe centers, and close to the work to be scraped. The file is securely fitted into a handle, then held with the right hand, the other resting on the steel bar in the rest. It is suggested that a piece of leather be placed under the scraper, when being used, to prevent chattering of the tool. The tool is presented squarely to the rotating work until a fine surface is obtained, after which it can be polished easily with emery cloth and oil. This tool can be used in place of a scraper and will accomplish the work much faster than for ordinary turning, and by taking a light cut it should leave nearly a polished surface. The lathe should be run a trifle faster than with ordinary turning.

For boring in cast or mild steel the tool shown at Fig. 2, A, will prove handy while the one shown at B will be found to be useful in finishing the bore when cast iron is being worked. When machining cast iron, if the piece has a cored hole, it is advisable to displace as much of the core sand as possible before trimming out the interior. Frequently it is difficult to get below the skin of the metal, as it quickly takes off the cutting edge of the tool. This trouble may be overcome by first facing up the casting, then employing a boring tool shaped like that illustrated at C. The front of this tool is started into the clean metal on the face side of the work, and as it progresses by means of the hand of mechanical feed, it will break away the hard skin of the casting, facilitating the boring work.

A holder for the tools described is shown at D, Fig. 3. It is constructed from a piece of ½-inch

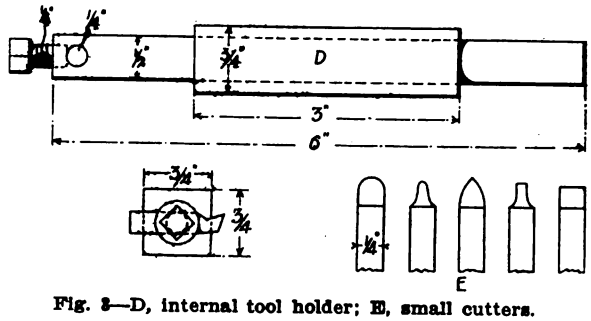


Fig. 3—D, internal tool holder; E, small cutters.

round cast steel about six inches long. A ¼-inch hole is drilled through the metal to take the cutters shown at E. These are made of ¼-inch round steel and are secured or held in place by a ¼-inch set screw. The holder is constructed from a three-inch piece of ¾-inch square mild steel which is drilled through its length and the aperture finished up with a reamer. To enable clamping to the tool bar in the

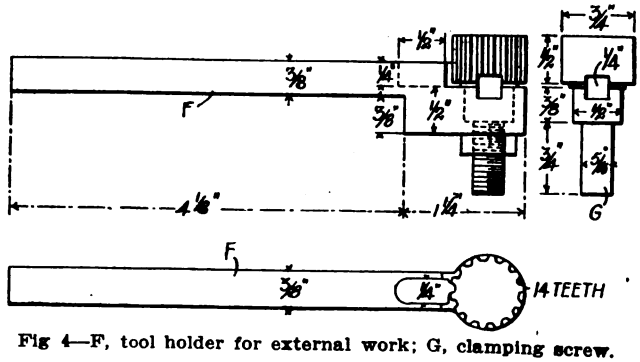


Fig 4—F, tool holder for external work; G, clamping screw.

slide rest, make a longitudinal saw cut. The work when completed should be case hardened.

The tool shown at F, Fig. 4, is a forging and is employed for external work. A 5/16-inch diameter hole is drilled through at one end and enlarged to ½-inch diameter, to within ⅛-inch of the bottom. The bolt used for holding the tool is shown at G and

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is constructed from mild or cast steel and is case hardened. A 5/16-inch thread is cut for ¾ of an inch, and the bolt above the thread is turned to ½-inch diameter and is ⅜-inch long. The overall dimensions of the head is ¾-inch, and 15 teeth are cut around the circumference. To take the square tools shown at Fig. 1, E, a hole ¼-inch is drilled through the center of the holder bolt and filed to take the tools mentioned. When the bolt is placed its teeth engage with the points filed on the holder, and this prevents it from turning when tightening the nut. The combination can be swivelled to any desired angle.

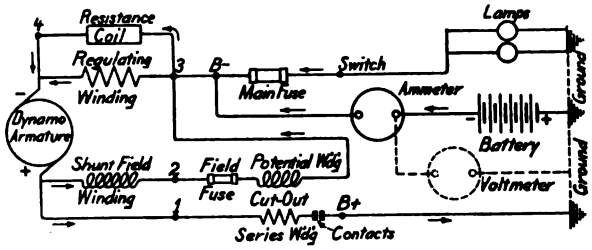
NEW LIGHTING SYSTEM.

An Electric Outfit That Is Fool Proof and Needs Little Attention.

The Bosch Standard Lighting System, which is now ready for the market, is an efficient, high class product designed to meet all lighting needs on the modern motor cars and motor boats. In producing this system, there has been no effort to meet any previously determined low price and the result is that a purchaser may now obtain for his car an outfit that, while it may appear just a little better than seems necessary, is, in fact, worthy of his entire confidence. The value is unusual and beyond question. The importance of the foregoing can not be overestimated, for to-day the average car owner knows little about the workings of electrical systems, and what is more he does not wish to know; he desires service, and therefore the selection of a good lighting system is of paramount importance.

The modern motor car depends much upon its electrical system—if that be inadequate, unreliable or troublesome, the car becomes a bore and a nuisance until additional expenditures overcome the difficulties.

The Bosch Standard Lighting System is intended primarily for automobile and motor boat service, and consists essentially of but four units, namely, a dynamo, a storage battery, a control box, and a switch.



Circuit Diagram of Bosch Standard Lighting System.

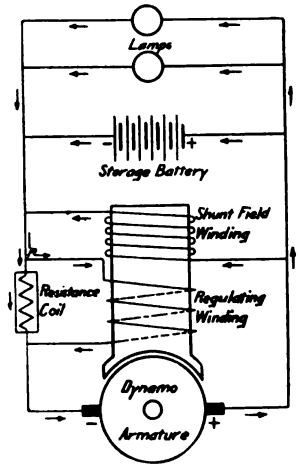


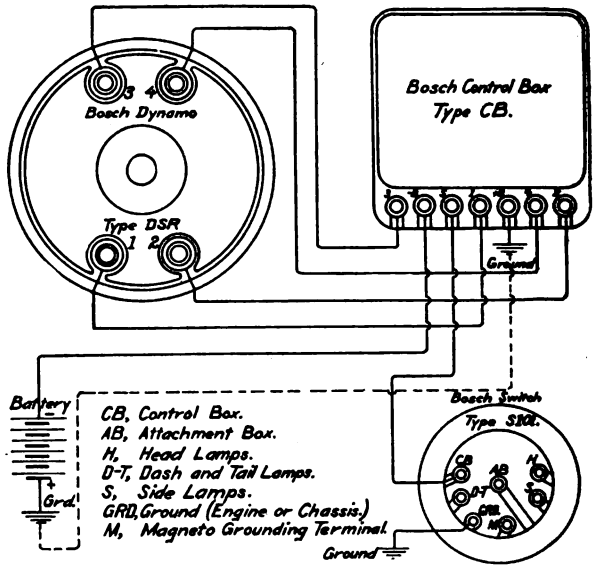
Diagram showing current flow and principle of operation of Bosch Standard Lighting System.

The Bosch Standard Dynamos.

The dynamo is supplied in two sizes, the larger designated, type "DSR 3", and the smaller, type "DSR 103"; the former is rated at 100 watts, and the latter at 80 watts. Aside from the difference in size, however, the types are practically identical, and both are intended to operate in connection with six cell, commonly known as 12-volt, storage batteries.

The type "DSR 3" is designed for operation either at engine speed or at one and one-half times engine speed, and is regularly furnished with through drive. Thus this type of dynamo may be driven direct from the pump shaft on four and six-cylinder engines and, if desired, may be employed to drive a magneto, pump, etc., connected in tandem therewith, as shown in the illustration.

The type "DSR 103" is furnished with end drive only, and is designed to be driven at two and one-half or three times engine speed. This is what is known as the fan type dynamo, and can be mounted directly in front of the first cylinder, using a common drive for dynamo and cooling fan, or it may be mounted to the side of the first cylinder and used with a three point drive, that is, from crankshaft to dynamo to fan, the same drive answering for both the dynamo and the cooling fan. The dynamo drive may be either by gear, coupling, chain, or of belting.



Wiring Diagram of the Complete System. There is no tangle of wires and every terminal is plainly marked so connections can easily be made.

Diagrams of the

Bosch Standard Lighting System

Dynamo Construction.

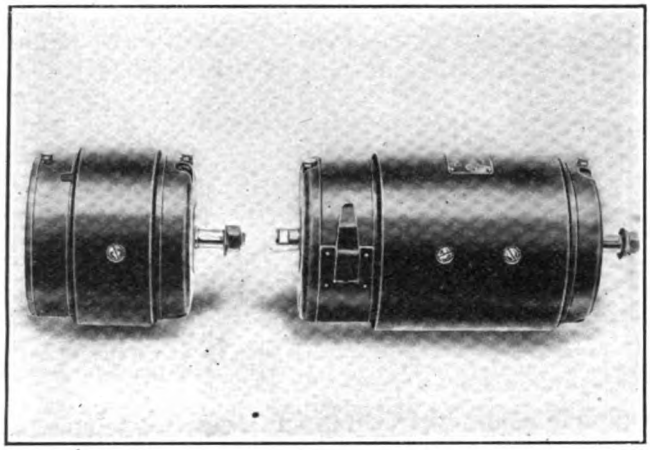
The housing is of seamless steel tubing. To this tubing the two end caps are secured by means of two bolts extending the length of the dynamo on the inside of the housing; when the two bolts are drawn up, the end caps fit the housing so snugly as to make the entire dynamo practically dust-tight, oilproof and waterproof.

The two pole shoes are located diametrically op-

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posite each other, and are secured to the inner surface of the dynamo housing. Both the shunt field and regulating windings are in one form, and are so arranged that they practically encircle the armature; this arrangement tends to counteract armature reaction, with the result that it is possible to obtain sparkless commutation, or, in other words, to eliminate almost entirely the burning of the commutator and brushes.

The armature is of the laminated type, and as it

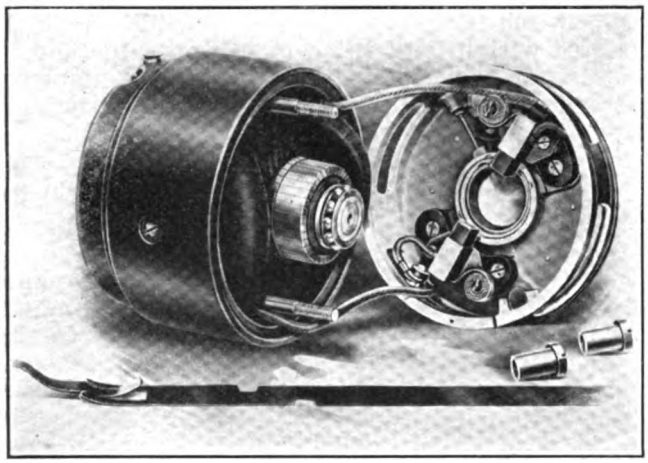


The two styles of dynamo used. The smaller, frequently referred to as the fan type dynamo, is known as type "DSR 103"; the larger, as type "DSR 3".

rotates on large ball bearings at each end, very little lubrication or attention is required.

The two brushholders are mounted upon, and insulated from, the commutator end cap. Each of the brushholders carries a large current collecting brush, designed to afford maximum life; the brushes are held against the surface of the commutator by strong flat coiled springs.

The four external connections are placed in the



Showing how readily the entire workings of the fan type dynamo, "DSR 103", can be brought to view. This accessibility is an important feature.

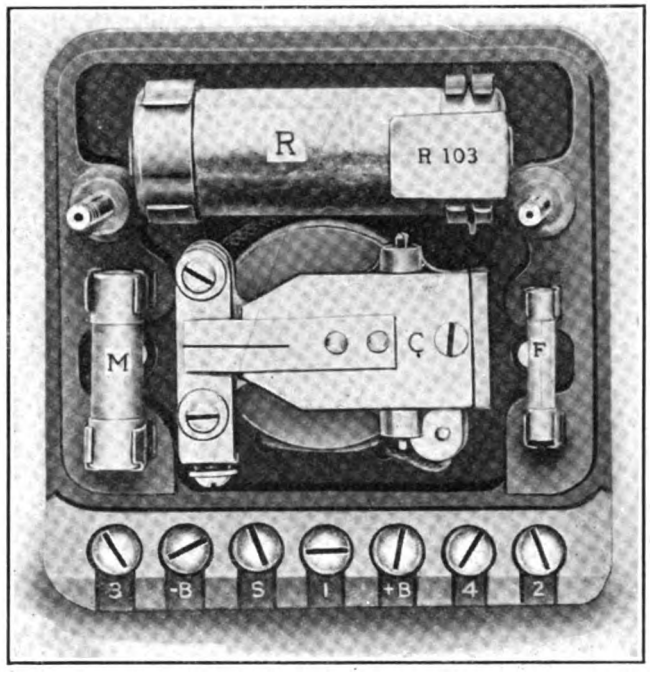
shaft end cap of the dynamo, and insulated therefrom, and are so arranged that they are most accessible. The dynamo terminals are numbered "1" to "4" to facilitate the wiring of the dynamo in accordance with the diagram shown.

The opening in the commutator end of the dynamo is enclosed by a recently perfected garter cover with a special catch, which allows of the commutator and brushes being easily and quickly exposed for the purpose of inspection and cleaning.

Principal of Operation.

In automobile lighting the problem is to supply a system which, irrespective of the wide range of operating speeds, will deliver an output capable of maintaining the battery at its most efficient point, and also carry the car electrical load, namely, the current consumed by the head, side, dash, and tail lights.

Dynamos which are adaptable to automobile lighting, have certain characteristics which have to be dealt with in order to make them operate satisfactorily at the varying speeds at which they are driven. One characteristic in particular which must be controlled is that the higher the speed at which the dynamo is driven, the higher rises the voltage that is generated, and this in turn means a higher current output. The rising voltage characteristic is due to what is called the shunt field excitation, and in order to control this feature, it is necessary either to vary the resistance of the shunt field circuit, or



Bosch Standard Lighting System Control Box. Type "CB 101", with cover removed, C, cut-out; F, field fuse; M, main fuse; R, resistance coil.

to introduce a counteracting or damping effect upon the magnetic lines created by the shunt field.

It is possible to use many different methods in order to attain the desired result. The Bosch way of controlling the dynamo output is to do so automatically by means of a second winding on the field poles, this winding to be so arranged in relation to the shunt field winding that when a current is allowed to flow through, it has a regulating effect on the lines of force created by the shunt field winding. The result is that the dynamo output is held at a practically constant value, regardless of the varying speeds at which the dynamo may be driven.

With this method of regulation it is possible to keep the battery condition always as it should be, inasmuch as the voltage of the system is determined by the battery, and when current is drawn from the battery, due to using the starting motor, or burning the lights when the engine is at a standstill, there is a corresponding decrease in voltage, and as the controlling resistance is proportioned to the current output, it will allow of a sufficient current flowing into

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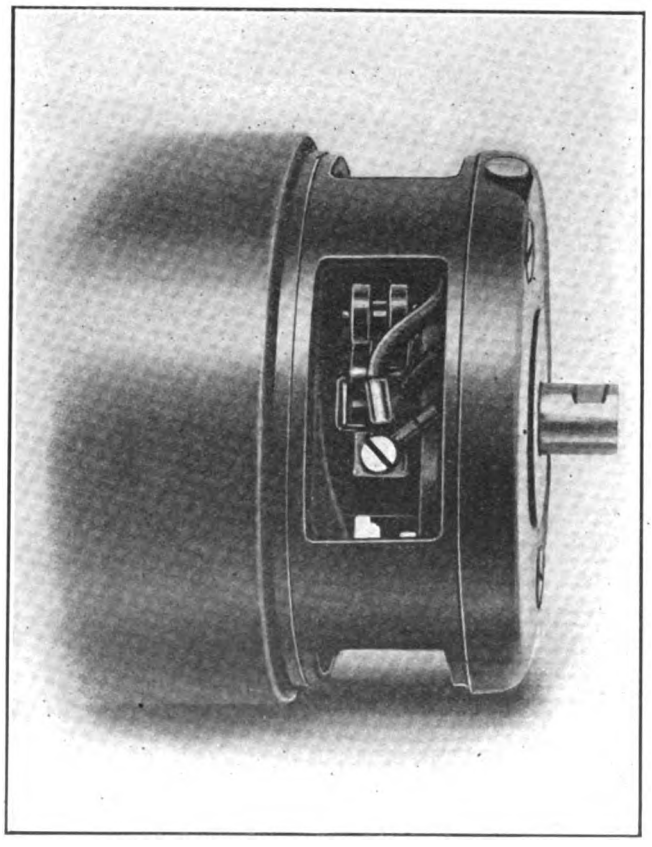
the battery to charge the latter to its most efficient operating state. It is also possible to carry the full lamp load of the car without assistance from the battery, the design of the dynamo being such that it delivers sufficient average current to take care of the lamps even when driving at slow speed. Practically the only call upon the battery is when the starter is operated, or when the lights are used with the car at a standstill.

The Control Box.

The control box, type "CB 101", is intended for mounting on the engine side of the dash, or in any other place equally convenient for the purpose of inspection on the part of the operator. Incorporated in the control box are the automatic cut-out, the resistance coil, the main fuse, and the field fuse.

As regards the automatic cut-out, this is provided for the purpose of automatically connecting the dynamo to the battery when the dynamo voltage is at a value sufficient to cause the battery to charge, and automatically disconnecting the dynamo from the battery when the dynamo voltage drops below that necessary for charging.

The field fuse is intended to protect the dynamo



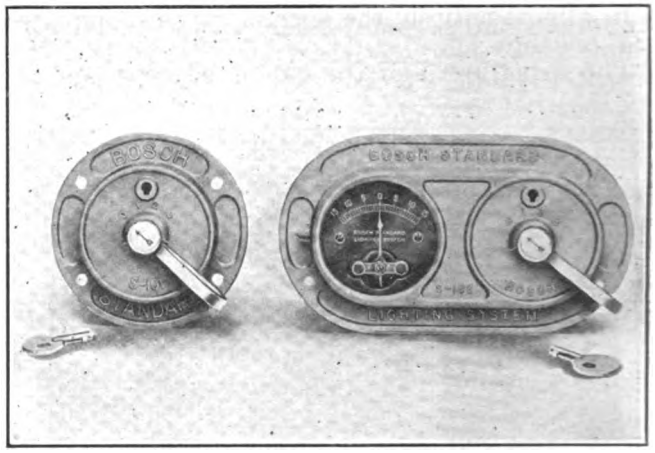
The dynamo permits quick and easy access to the brushes and commutator; a spring band encircles the so-called "business end" and is easily removed.

when, through accident, one of the cables connected to the battery becomes disconnected, this in turn causing an abnormal rise in voltage at the dynamo terminals; under such conditions, the rise in voltage of the dynamo causes the field fuse to melt or "blow", thus opening the field circuit and resulting in the dynamo ceasing to generate.

The terminals are so placed that they are readily accessible for the purpose of making connections or inspections, and each is plainly marked to indicate the respective dynamo, battery or switch terminal with which it is to be connected.

The Switch.

Two styles of switch are provided for use, one designated type "S 101", the other known as type "S



The two styles of switch which can be supplied. Type "S 101" is without ammeter; type "S 102" is with ammeter. Both switches incorporate a locking device.

102" and combining switch and ammeter in one unit. The ammeter affords a visual indication of whether or not the entire system is operating properly, and the inclusion of this very useful unit in all lighting systems is strongly recommended.

Both switches are provided with a locking arrangement. The switch may be locked and the key removed in any of the four switch positions, and as the magneto also is controlled by the "S 101" and "S 102" switches, the removal of the key in the "Off" position of either switch locks the ignition also, thus forestalling all possibility of unauthorized use of the car.

The switching combinations are such that it is possible to meet all driving conditions. Both the "S 101" switch and the "S 102" switch should be mounted within easy reach of the operator and, in the case of the combination switch and ammeter, this should be so placed that the meter may be readily seen at all times.

For convenience in making connections, all terminals are placed at the back of the switch and are lettered as shown in the wiring diagram.

The Battery.

For use with the "DSR" types of Bosch Dynamo, the battery should be of the six cell, commonly known as 12-volt type, and for average requirements should be 50 ampere hour capacity.

The battery may be supplied by the user himself, or if desired, suitable batteries will be furnished by the Bosch Magneto Company upon request.

As previously mentioned, all terminals of the various units are numbered and lettered, thus making the wiring so simple that it is possible for even a novice to make the proper connections without difficulty. The extreme simplicity of the connections between units can be noted by reference to the accompanying wiring diagram.

The connections from the switches to the current consuming units are equally simple, and as readily understood as those between the main units themselves; the connections are tabulated in the wiring diagram.

In order to assure maximum protection for the

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connections between the dynamo, control box, battery and switch, as well as for the connections between the lamps and other current consuming units, it is recommended that rust-proof armored cable be used. Such cable may be obtained from the Bosch Magneto Company.

All accessories to the lighting system, such as attachment box, lamps, etc., may be supplied by the user to suit his individual tastes. However, the Bosch Magneto Company is prepared when requested to furnish all requisites to complete the lighting system—attachment box, lamps, cable, terminals, etc.,—and details regarding such accessories will be gladly furnished to those interested, upon request.

The entire system is so designed, and all Bosch units so substantially constructed, that aside from periodic oiling of the dynamo bearings and inspection of the battery cells, very little attention is required.

CAR DRIVING.

Address of Francis M. Hugo Before the New York Y. M. C. A. Auto School.

It is not too much to say that the future of motoring largely depends upon the behavior of motorists and their drivers toward the public. As fewer owners of large touring machines drive their own cars nowadays in proportion to the number driven than used to be the case, it is, therefore, mainly the behavior of their drivers on the road that is important. The subject of the training of the motorman is consequently worth much attention.

For the past few years, those who drive motor cars for the wages have been called "chauffeurs," a word against which a protest should always be made on the double ground of etymology and nationality. To begin with, the word in reality means "stoker." On the footplate of a French locomotive the driver is called a "mecanicien," while the fireman is designated as the "chauffeur." In the case of motor cars propelled by steam, the word "chauffeur" may thus be held to be remotely correct, but on the ordinary car propelled by the internal combustion engine or by electric power, there is no sense in the term.

The motorman, as he will, therefore, be called, is very often the subject of much discussion and sometimes of irrational abuse. Of course, there are black sheep in his profession, as in every other, but one is glad to place on record that black sheep were far more numerous five years ago than they are now. No one who observes without prejudice the behavior of motor car drivers in New York City and elsewhere can help being struck with the careful way in which private motor cars are now driven, the neatness and cleanliness of the men themselves and the vast improvement which has taken place in their general manners. Formerly, it was thought to be the highest mark of the profession that a motorman should be dirty in every respect, and a greasy cap, black hands and face, oily clothes and as a rule a half smoked dirty cigarette in the side of the mouth, combined with a contemptuous scowl at every passerby, was not an uncommon sight.

This state of things, however, has changed for the better. Occasionally a specimen of the old type of driver is met with, and even now the habit of cigarette smoking when in charge of a car is supposed, by the younger and less intelligent men of the profession, to confer an air of knowledge coupled with disdain. In course of time this form of swagger will die out also. The manners, moreover, of many motormen to their employers and to their fellows have not in the past been all that could be desired, but as stated before their general behavior is markedly improving, and it must be remembered that, with all their faults, motormen are greatly superior in intelligence to most of their predecessors.

It need hardly be noted here that much depends upon the way the motorman has been trained. When automobiling was just beginning the only person available who even half knew the somewhat complicated machine of the early days was the mechanic trained for a few months in the shop where the car had been manufactured. He was master of the situation because he alone had a working knowledge of its parts. No one in those days thought for one moment of a motorman from the viewpoint of good driving. The owner of the car, above all, desired to possess a good mechanic, for breakdowns were numerous and varied and half of the expenses of motoring were necessitated by renewals of parts or adjustments due to ordinary wear and tear. Nowadays, serious or even insignificant breakdowns are rare, and there is hardly a first-class make of car in the market which will not run many thousands of miles without anything being necessary in the way of repairs and adjustments. Those which are necessary are, moreover, of the simplest kind. There is no longer, therefore, the same necessity for the motorman to be what is called a really good mechanic, so long as he understands the general principle on which the engine works and the arrangement of the gears.

The majority of motor car owners have, therefore, changed in their requirements. They do not want a man who is primarily a skilled mechanic, but they do ask for a skillful driver, and in this wise alteration in the chief qualification demanded lies a good deal of the reason for the great change which has taken place in the behavior of the motorman in the city and out of it. It may be remarked that an excellent mechanic is not necessarily a good driver, though he may be so in certain cases. What is required in the driver besides the general knowledge of the machinery is a knowledge of the customs and courtesies of the road and the habits of traffic, the possession of the qualities of alertness, foresight and consideration for others. Above all, he should have a temperate frame of mind, an abstinence not only from drunkenness, but drinking in any but a most moderate sense. The driver of an ordinary wagon is conspicuous by his ignorance of the way to drive and his want of consideration of other traffic. He is the most persistent moving obstruction which exists. The motor car driver on the other hand, has to be the best driver on the highway if he is to drive without offense to the public and danger to them and himself, for he has to conduct a vehicle which is more valuable than any other and far and away more speedy though more handy and, therefore, which meets and overtakes other vehicles many times more rapidly. In addition to these, he has to consider other dangers of the road to which other vehicles are not so liable and which come from the construction of its surface.

The complete motorman should have a working knowledge of the different materials of which roads are made, of their comparative tendency to cause skidding, and of the perils which arise from badly

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laid street car tracks. He must know and continually practice the courtesies of the road and learn its manners and customs. He must be observant and realize that children hanging on the rear of wagons are liable to drop off suddenly and run across his path. He must be on the lookout for pedestrians, stupid, drunk or deaf, for wagons on the wrong side of dangerous corners, and to be prepared to find vehicles in charge of sleepy drivers who will often do the wrong act on awakening. It will, therefore, be seen that the motorman to be really good has to be the best driver on the road and that the standard demanded must necessarily be high. He must possess exceptional qualities as compared with the horse driver. The question is, therefore, all important what are the best methods of training such a man.

There is no doubt that many of the schools which are teaching elementary mechanics to the would-be motorman are excellent in their way. But there are many which are nothing but frauds. Reports have frequently been made to the State where a man has complained bitterly of having put down $25 or $50 in return for which nothing but most elementary instruction has been given and this often in the worse possible way. There has been no teaching in traffic rules or on the road, or, if given, so little as to be no use. But at other places pains are taken, and, by diagrams in the class room and practical teaching on the road much has been taught.

There are nowadays handbooks galore which teach the construction, repair, the common faults and likely failings of the gasoline engine from A to Z. The mechanical side may, therefore, be said to have been amply provided for.

But this is only the less important, though necessary, part of the training of the modern motorman. What is really needed is that some school should teach manners on the road and the habits of traffic, in short, train its men for the road. There should also be problems of difficult but ordinary situations in traffic set in a written examination, the correct solution of which would be obligatory before the motorman could be said to be properly trained. It is not, perhaps, easy to see at first how this sort of tuition can be given on the present scale of fees, but in the future the schools which devote a large part of their attention to teaching the rules of the road and its customs and courtesies will assuredly turn out the best class of drivers, who will be in the greatest demand.

The habits of horse drawn vehicles should be studied. It is a liberal education to make a journey, for instance, on the top of a Fifth Avenue motor bus and watch the way in which the driver takes his unwieldy vehicle through the streets of New York. Other bus drivers also are rapidly becoming his equal and let it be acknowledged that nothing but the hard school of practical everyday experience in the New York City streets, assisted by police supervision and the fear of dismissal for carelessness or accident, could produce such able drivers.

Again, the expert taxicab driver might be taken as an example of a faster class of motor traffic. The would-be first-class motorman when being trained would thus have the experience of horse vehicles and pedestrians, and have noted carefully what usually happens and have tried to understand their point of view. This is one of the first steps which should be taken in training the driver of the swift mechanical vehicle. Then example might be given of the proper way to drive cars around corners, both right-handed and lefthanded, and the best manner of attacking and surmounting steep gradients or negotiating high bridges. Driving at night should also be practiced and prospective drivers should learn to distinguish the faint glow on the road ahead which designates the presence of a motorcycle and other signs denoting persons or vehicles. Map reading should also be a part of his instruction.

And there is yet one other thing which the motor driving school should inculcate, though it could not technically teach the motorman, that is, good manners to his employer and his employer's friends. To be rough and rude is a disgrace to any class and it is the mark of a man who is either not certain of himself or is afflicted with an innate bad temper. It is not, and never can be, a sign of superiority. A respectful and civil attitude not only makes the path of life easier, but is in itself a strong recommendation. Little things which do not at first seem to matter, and are merely more in the nature of courtesy than servile attentions, should be observed. A civil salute when the owner first addresses the motorman, the readiness to help in any little matter, such as carrying a bag to the station, or the thought of a rug to cover the lap and similar little courtesies are the sign of the man who, if considerate in these little matters, is likely to be considerate in others more important. It also establishes him firmly in the estimation of his employer.

To sum up, the perfect motorman, though he should possess as much knowledge of mechanics as possible, should, above all, be a considerate driver, well versed in the manners and courtesies of the road and the habits of traffic. And in addition, he should try to be well-mannered, as more and more car owners are becoming convinced that, besides knowledge, "Manners make the Motorman."

THE NEW YORK SHOW.

It Will Be Bigger and Better This Year Than Ever Before.

The Grand Central Palace has been forced to yield its last inch of space to accommodate the sixteenth national automobile show which is to be held there during the week of December 31 to January 8, under the auspices of the National Automobile Chamber of Commerce.

For several years past the demand for exhibition space has increased and this year the pressure was even greater than ever before. Despite this fact Manager S. A. Miles was able to allot space satisfactorily to each exhibitor.

In every way will the forthcoming show be bigger and better than any of its predecessors. It is an uncontrovertible and well known fact that manufacturers who display their products at the national shows are the representative makers of cars and accessories of this country and their goods can be relied upon. In all there will be 69 exhibits of cars and 215 exhibits of accessories at the Grand Central Palace show.

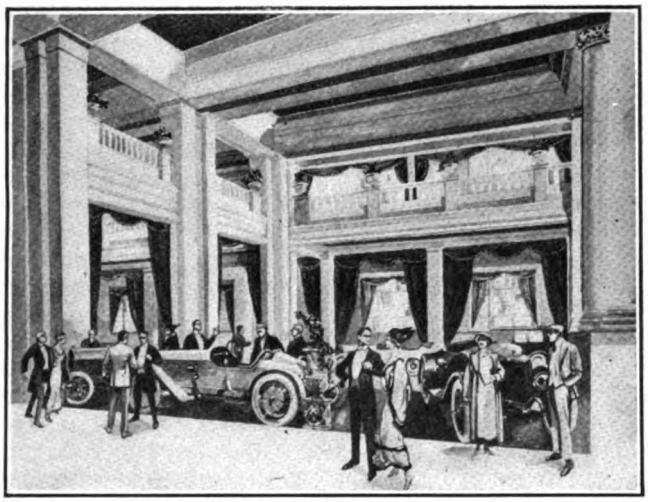
The show will be replete with new ideas in mechanical construction and body designs, for never before in the history of the automobile has mechanical progress been so great, and never before have body designs been so varied. With a number of makers building twelve and eight cylinder cars and others offering improvements in sixes and fours the public

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will have a great variety of types and designs to choose from.

The advent of the twelve cylinder car as a commercial proposition and at a reasonable price is no doubt a big event of the year and in addition to this the increasing number of eights listed for 1916 serves to emphasize the growing popularity and possibly the real merit of what may be termed the multi-cylinder type of motor. Both the four and six cylinder types of motors will be much in evidence and those who favor these types will find much to interest their mechanical minds.

Having passed through the days when the single cylinder developed into the double cylinder, and later became the familiar four-cylinder type, then increased to six, and more recently the eight and twelve cylinders; having been through the mill of various sorts of transmissions, several kinds of ignition, and numberless other vital things, the car of 1916 represents the most remarkable mechanical development in two decades. The best brains of the world are at the command of the buyer, and they produce for him such a structure as was not thought



Sectional View of Decorated Interior.

possible when the industry started. Splendid factories of which the majority are fitted with the best designed and most modern machinery ceaselessly grind out parts that for exactness, proportion and quality of material never have been seen before. They are built in such a way that they last much longer. The upkeep and repair expense is less to the buyer, so that he not only gets more for his money in the intial investment, but he is the one who gains in the matter of upkeep.

While it is true that the demand for steel, copper, iron and other materials to be made into munitions has raised the price of raw material and brought about conditions making it difficult for motor car manufacturers to secure delivery of the raw and partly machined material, nevertheless such remarkable strides have been made in other directions that this extra expense is more than compensated. In increasing their outputs and installing modern and labor-saving machinery in their factories, manufacturers have been able to produce better cars or better parts at lower cost, even though the cost of the raw product has come somewhat higher. The parts makers are able to deliver complete assemblies to makers of assembled cars far more expeditiously, much cheaper, and of better quality in many cases than heretofore. Never in the world's history has there been such a popularizing of a complicated structure as that which the automobile industry has given us, and never before has such a multitude of improvements been crowded into a few short years and even a few short months.

The setting for the cars, parts and accessories at each automobile show of recent years has evoked considerable comment among visitors. For this year's show an original setting, quite different from that of other years, has been conceived by Manager Miles who says that the interior of the building is to be the "Palace of Motoria." Motoria is the goddess who watches over the destinies of the automobile industry, and she has been visualized in statuary and has graced a number of automobile shows in the past.

The goddess is a shapely girl, standing aloft with hands outstretched upon a steering wheel, her flowing draperies blowing in the breezes. The Palace, to be dedicated to such a goddess, cannot be adorned too attractively. Hence considerable pains are being taken to make the "Palace of Motoria" just as it should be.

The only criticism of the automobile shows of recent years has been that there is always "too much to see." The same will be true this year, but there will be more to see that is new and interesting than ever before.

THE GARAGE BUSINESS.

Address of J. C. Thorpe Before a Convention of Ohio Garage Men.

We are engaged in an important part of a great industry. The automobile business stands third in point of the value of manufactured products in the United States. It has developed in the short period of fifteen years from an infant in swaddling clothes, with a questionable future, to a fullgrown business, full of life and attractiveness. There are five million people, one-twentieth of our country's population, directly dependent upon the motor car and allied interests. Nearly 50 per cent. of the output of our machine tool works, in which we all have great pride, is absorbed by the automobile industry.

There are registered now in the United States something over two million motor drawn vehicles. Very roughly speaking, if we assume that there are five people who are served by each one of these vehicles, one-tenth of the population of the United States is directly interested in the automobile. Doesn't it appear that the economic administration of the affairs of such a business as this needs the most careful business methods in vogue in other lines of business? It seems to me there is no room for reasonable doubt in that respect.

I wonder if we can have a proper pride in our own part of this business, however large or small it may be, if we have to tolerate conditions which justify at least in a measure the term "the automobile game." Have you ever searched your own mind for evidence of your guilt when you hear some man say, as we often do hear, that the garage man is a thief and a robber and the automobile dealers a bunch of crooks?

Business Responsibility.

Listen. There is just one reason for the present unsatisfactory conditions in our part of the automo-

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bile business, and that is that the men interested in the garage business, as well as the automobile dealers, have not lived up to their responsibility as citizens in the business world. Now then we have not given enough of our time, of our brains and of our energies to promoting a state of good health in this business. We have all been too selfish to see that the efforts we may put forth from time to time to benefit the other fellow will eventually benefit us. There has been an entire absence of the spirit of co-operation among competitors that characterizes every other successful business in this country.

I doubt whether there is any business you or I could mention that is marked by such economic loss and waste as is the part that the garage man and the automobile dealer has in the automobile business. I maintain that it is up to us to provide a solution for the problems presented. That solution must be fair to the public, to our customers, to our competitors and to ourselves. There is just one answer and that is the co-operation among competitors. It is true in every other line of business. It must be true in ours.

We must realize that by organization we can accomplish more and place our business on a higher and more dignified plane than by any other means whatever.

A Bit Ashamed.

You know I like to think about this particular thing—the dignity of our business. Every single man of you, as well as myself, engaged in the retail end of the automobile business and the public garage business, has an opportunity for public service thot does not come to every merchant, and, you know, as I look back over my experience in the automobile business, I even feel a little bit ashamed of myself that I will sit around and listen to complaints that are entirely unjust and listen to criticism of the garage business in general which you and I know is not true and sort of apologize for our business itself. It is all dead wrong, and I will tell you, fellows, the more we can stiffen up our backbone the more we can see our opportunities for public service and the more we appreciate the importance of organization in our business the sooner you and I will come to the point where we have a pleasant and profitable business.

Legitimate Prices.

There are here, I doubt not, men who have had previous experience in trade association organization of some sort. If you have discussed with your neighboring competitor the advisability of organizing a trade association, what has been the first plank you are going to nail down in the platform of that organization? Price maintenance.

In the beginning of association work you forget all the other things that are really of greater importance, because that price proposition will solve itself as sure as can be. But isn't it true that that particular thing, the question of price maintenance, has inspired more discussion in automobile trade associations than any other one thing. That too is all wrong, because of two factors. In the first place, a legitimate profit is necessary for permanence in any business. We won't disagree about that, will we? Therefore, the man who makes a practice of cutting prices is just following out a steady course that will result in his elimination from the business he is engaged in, so we don't have to worry about that.

The other important factor is there isn't one single fellow who has red blood and got any real stuff in him but what resents the attempt of any business man or bunch of business men to dictate to him what he shall do with respect to selling the stuff he buys and has for sale. I maintain that problem will solve itself and it ought to be put in the background as far as trade associations are concerned, and if the proper course of education is pursued, upon a good sound policy, the time is going to come and make money fast for the man who has kept his prices so he can make a living for himself. The men that keep their prices up are making money and are a credit to the business in the greater interest of good business.

Get Them All In.

Every man in your community who is legitimately engaged in the automobile business, whether giving away stuff or selling it at a proper price, ought to be a member of the trade association, and by that statement I can see from the expression on your faces I am laying myself open to a lot of criticism, but you will agree with me if you look the thing squarely in the face and see what the results are going to be. The solution of nearly all the problems that are presented in our business depends upon a carefully thought out educational policy. You have got to show the man what the advantages of organization are; you have got to show him what the evils of price cutting are; not, "if you don't do certain things we are going to kick you out or boycott your business," which is going to result in your home town having all of these men, or supposed men, in the automobile business.

In promoting the trade association work, there are a lot of problems that are presented that you have all thought about. There is the curbstone dealer, the sort of an agent of the factory that comes into a locality or town and comes in and sells a car in a ward or voting precinct and goes to the next ward and next precinct and makes another sale. There is the insurance man and real estate man who does not have the price of a car and wants to buy an automobile at dealers' rates and represents himself as a candidate for an agency and buys a car at dealers' prices. There is the banker that goes to the factory and represents himself to be the most influential man in his community and if they will sell him a car at the dealers' discount he knows where he can sell half a dozen more. All those things you and I face every day. The solution of every single problem lies in this one great big word "organization," and paradoxical as it may seem, co-operation among competitors.

The Curbstone Dealer.

Now, I want to ask you this question. Those men of you who are selling automobiles know pretty well the character of the men of the sales organization of your factory. Suppose a strong representative bunch of men in the State of Ohio get together and agree to form a State automobile trade association. You won't find business men administering the affairs of a factory who will disregard the protest of Ohio State Garage Owners' Association and won't submit to them with respect to their policy in selling cars. The factory is in the business as a permanent thing. They are not going to jeopardize their chances for future business by neglecting a protest from the Ohio State Automobile Association. Will that help to cure the curbstone proposition? The

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reason there has been nothing done before is because there has been no organization.

Now, what about credits and collections? I have repeatedly had men in our place of business, driving through say from New York to California, and just outside of town they blow out a tire, and it is the second one they have had that day and they have no other and they don't want to spend their spare change to buy a tire because of the possibility of future demands made upon it. What are you going to do about that man's check?

Local Organization.

I know of one local association where this system is in effect: Mr. Dead-Beat comes along and runs a car into a garage and his bill amounts to $272—a good deal of money—and he drives his car out and by reason of good argument he has his account put on the books. He can't make a settlement where his overhauling was done and he has to have something else done, and he runs into another garage and has $15 worth of work done and has that put on the books, and keeps that up until he owes all the garages. Then he starts out by paying $10 to the fellow he owes $272 to and gets $15 worth more of work done. I bet there isn't a man in this meeting who hasn't seen this thing worked out in that way. In this association I am thinking of right now, the secretary has arranged a report of the men whose account is sixty days old, where settlement is not made and where it is impossible to collect the amount of the bill. All right. The car appears in another garage and the fellow knows he isn't going to get his money and will have to put the account on the book, and he calls up the secretary of the association and the secretary reports he is 60 days behind in his account at another garage. "All right," the garage man says, "Mr. Dead-Beat, you go over to the garage around the corner and pay your bill and then run your car in my shop and I will do your work for you and be mighty glad to do it." The possible economy in a local credit business is unlimited in that respect. The question of credit and collection can be handled in a local trade association with the greatest of satisfaction.

Legislation.

What about this great subject of legislation? Our good brother, the mayor, this morning hit upon a subject that is mighty near to most of us—the garage lien law. There is nothing about a garage lien law that is not legitimate. There is no reason why the garage man operating a repair shop should not be protected as any other man who does a similar service. I wonder how many of you would be willing to spend $5 a year per capita dues, if there could be passed a garage lien law; then after that bill was 60 days old you could reach out and hold them for 60 days, and, if necessary, sell it for the bill? Would you spend the $5?

What about the federal tax? I have in my pocket a letter that just came in yesterday's mail. From what I can learn Indianapolis is asking me to submit data in respect to our local business, which can be used by the National Automobile Chamber of Commerce in fighting the movement to place a dollar a horsepower tax by the Federal Government on automobiles. Is it worth while for us to take notice of the possibilities of organization that can fight that, or is it better for about three men in the State of Ohio to write letters to their representatives and ask them to fight that bill?

Time for Announcing Cars.

How many of the men here this morning sell automobiles? (Nearly every hand went up.) You men who are selling automobiles will appreciate this particular thing. Can you conceive of a more ridiculous situation than this: One factory announced a 1916 car in May and sold its output in October, 1915? Is there anything more foolish than for us to get out a set of circular letters to our customers, calling their attention to the fact that there is to be a national automobile show and make a bluff of going to Chicago to see automobiles that we have been selling for eight months? Is there anything that brings about a greater financial loss and greater conflict among the buyers as well as the sellers of automobiles than the fact that during the months of the year when nobody is buying cars the factories are insisting the dealers take shipments of cars and borrow the money to finance that question, store the cars in their garages when they could just as well get $6 or $8 a month storage for that space? Is there anything more ridiculous than that? Next May, June and July when he wants cars he hasn't anything to sell. Production is at the point of minimum sales. There is absolutely nothing in the world to justify it.

I think, perhaps, we all realize the reason for present conditions, brought about by some concerns who thought that by announcing a model six months in advance they could get a lot of business. We must admit they got away with it, because a man would say: "I am not going to buy your 1911 car when I can get a 1912 car instead, which is a year ahead," and they got away with a large amount of business and compelled even the substantial builders of automobiles to follow them in that respect, until at the present time we face the most chaotic condition in the merchandising of automobiles. There is no other business in the world that is characterized by such conditions as that.

Storage Rates.

These things are in rather irregular order perhaps, but there is the question of rate equalization for garages. In Urbana and Champaign, Ill., you can store your car during the winter for from $2.50 a month up to $8.50. The man who gets $2.50 thinks he is making easy money and forgets it costs him $3 to have that car in there. I submit that the public is fair enough in their consideration of payments affecting the automboile business, if we are fair on our side. Is there any objection to the organization of a body of men in any community to solve such problems as storage rates, to cut the cost of mechanic's labor to the point of being a profit without robbing the public? When a man comes in we can show him just exactly how many hours have been put on that car if he asks to have his bills presented. There isn't any one fellow that can possibly solve all those problems.

Used Cars.

Then there comes up the question of the proper allowances on used cars. I don't know how many of you men have seen the recent issue of the report of used car prices, but there is at present a very strong movement on foot to solve the used car problem. In our local association it has resulted in a great deal of benefit because the fellows are beginning to realize and appreciate that you cannot do but one thing and that is make a reasonable allow-

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ance upon any used car which will give you a margin of profit and pay you for overhauling the old car. This trade report, which you all should see if you haven't, has been a substantial guide for all trades that have been made in the last six months at least in our community.

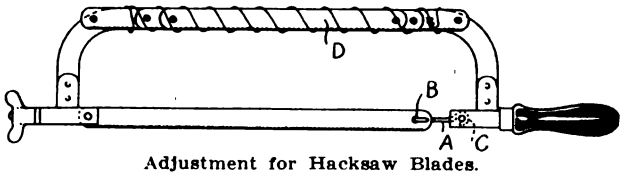
Freight Rates.

I wonder how many of us know that we are paying proper and equalized transportation charges on the stuff that we are getting. I wonder if we are all dead sure that the material that is being shipped to us from the automobile factory, etc., is properly classified and we are paying the lowest possible freight rates. I have know recently of some surprising benefits that have been secured by the study of freight classification and conferences between automobile men and freight agents. A protest which comes from an organized body of men to change classifications will be listened to and has been listened to in the experience of the last year or so, that I have known of.

How many of you men who raised your hands a while ago indicating that you are selling cars know just exactly what you are going to do if a customer comes and tells you that you are not doing as you agreed to before you sold his car? The interchange of ideas affecting the service warranted, and the adopting of a standard of service warranted, within the association, is a thing I hope to see accomplished.

Hacksaw Blades.

Hacksaw blades come in sizes from 6 to 12 inches inclusive and if one possess an adjustable frame,



Adjustment for Hacksaw Blades.

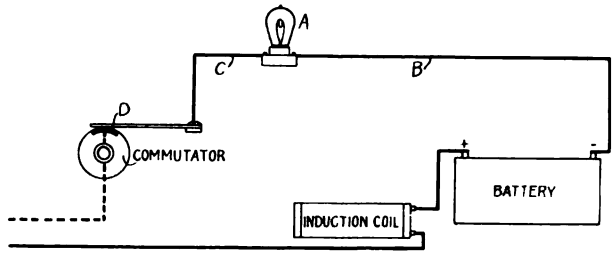
various sizes can be utilized. If, however, you find you have an 8-inch blade and a 10-inch non-adjustable frame, and cannot obtain the proper size blade, the suggestion shown in the accompanying illustration will be of service. It consists of taking a piece of stiff wire, A, that will pass through the eye, B, of the blade and bending the wire into a hook shape as shown at C. One end is bent at right angles to the other. Insert the hook in the eye of the blade and eye of the handle of the frame and tighten in the usual manner. If one carries a hacksaw in his tool kit, extra blades, D, can be easily carried by wiring them to the top of the saw frame as illustrated.

The Oakland Oiling System.

From C. T. B. Nevius, New Jersey.—I notice your inquiry No. 1708. I own an Oakland 42, 1913, and have had the same trouble as friend Davis. If his oiling system is the same as mine he will find the trouble at the sight oil dropper, which shows the oil dropping before it goes to the engine. If he will loosen the pipe that leads to the dropper (the dropper is located in my car just to the right of the carburetor under the hood) and then unscrew the top of the dropper he will find a small needle hole where the oil drops through. This hole becomes stopped with lint, etc., and completely stops the flow of oil and fills up the sight feed on the instrument board. A number of times I have found my dropper clogged so that I could hardly work the lint out.

Wire Testing.

From C. H. Kenyon, Connecticut.—In relation to your wire testing diagram from commutator to the battery. I am not looking for an argument, but the drawing given in your October issue would be mis-



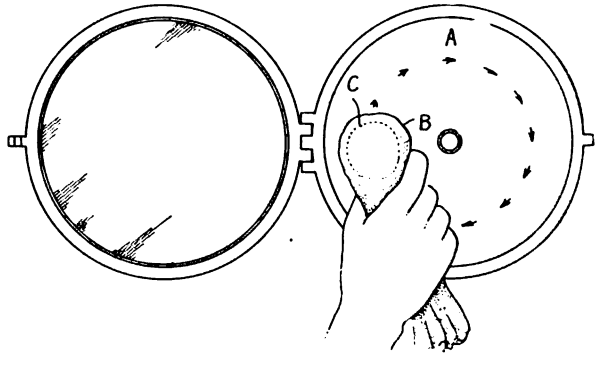
leading to a beginner. The enclosed sketch, would, I think, be plainer and would enable the lamp A to light.

Cleaning Lamps.

Much of the efficiency of the electric or parabola lamp depends upon the cleanliness of the reflectors. As a rule the reflectors are silver plated and highly polished. They require different treatment from the gas headlights as the latter are of glass and are not as easily scratched. If the electric headlight becomes dirty, do not wipe it, but employ a stream of cold water to displace the dust or dirt and permit the surface to dry by the air.

If the reflectors, A, becomes dull after continued service they can be partially restored by using a soft chamois, B, with red rouge or crocus. This material should be used sparingly, and the chamois must be soft as well as free from wrinkles. Place a wad of cotton, C, about the size of an egg within the chamois. This will afford a smooth surface for wiping.

When properly used crocus will not scratch the silver plate. Moisten the chamois with alcohol, then apply the crocus to the chamois. Press very lightly



Cleaning the Reflectors.

and wipe with a rotary motion as shown by the arrows in the accompanying sketch. The object of employing a rotary motion is to prevent polishing marks.

The commencement of ignition should be as near the center of the mass of vapor in the combustion chamber as possible. To secure this use as long spark plugs as possible without coming in contact with the top of the piston.

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NEW AND INTERESTING THINGS IN MOTORDOM

Speedometer Parts for Repair Shops.

Many jobbers, dealers and repair shop proprietors who read this publication are likely to be interested in the line of speedometer parts which is manufactured by the Ogden Manufacturing Co., Columbus, Ind. Their line includes speedometer parts, swivel joints, flexible shafts and fibre gears for every speedometer on the market. Their goods are of superior quality, and the prices are low. Readers are urged to correspond with this company if needing goods of this description.

Description of Model "T" Magneto.

The Model "T" Magneto is the latest development in ignition by The K-W Ignition Company, Cleveland. This magneto is of the true high tension type and is being built in 2, 3, 4, 6, 8, 10 and 12 cylinder models, and in each case, only one distributor plate is used. The 2, 4 and 8 cylinder models operate at engine speed; the 3, 6 and 12 cylinder at one and one-half times engine speed, and the 10 cylinder at one and one-fourth times engine speed. This is made possible by the construction of all K-W Tension Magnetos, which furnish four sparks per revolution. The circuit breaker is unusually fast and tests have been made up to 18,000 sparks per minute without missing, which is equivalent to operating a 12 cylinder, 4 cycle motor at 3,000 R. P. M.

The construction is up to the well known K-W standard in both material and workmanship and the same guarantee applies on the Model "T" as on all other models. The Model "T" Magneto has been designed so as to conform with all standard dimensions and has been made as nearly waterproof as it is possible to make a high tension magneto. The well known K-W inductor principle is used in this model, which with stationary windings and revolving rotor allows a spark of great intensity at as low a speed as 60 R. P. M., besides the advantage of no moving wires, connections or commutator. This model will be furnished also equipped with an Impulse Starter to aid in starting slow moving engines, which cannot be thrown over compression easily. The Impulse Starter mechanism holds the rotor in a stationary position until the firing point is reached, and when released is driven ahead with a rush, furnishing as hot a spark as though the engine was running full speed, and is automatically tripped out at any speed from 50 to 250 R. P. M.

The Auburn Six.

This is a six-cylinder car of very high quality, which is offered to the public at the low retail price of $1,050. The specifications of this car, which is known as the Model 6-38, are as follows: Six cylinder; 3x5 cantilever springs; electric lighted and started; spacious tonneau and driving compartment; 34x4 tires; 120-inch wheel base; completely equipped; made in three and five passenger models. For those wanting a somewhat more luxurious car, the same company makes the Model 6-40A which retails for $1,375. This is a six cylinder; 3½x5; cantilever springs; electric lighted and started; luxuriously roomy tonneau and driving compartment; folding auxiliary seats; 35x4½ tires; completely equipped; two and seven passenger models. The same company also makes a four cylinder car, Model 4-38, which retails for only $985, although the specifications are in many respects similar to the higher priced cars. For catalog and full particulars write to the Auburn Automobile Co., Auburn, Ind.

An Automobile Record Book.

It is a very important thing for every car owner to keep a record of purchases, repair bills, gasoline bills, tire repairs and other expenses connected with the running of his car; also to keep a record of mileage and the various trips made. An excellent book for keeping such a record is The Universal Automobile Record Book, and a sample of this book will be sent for 25c post paid by the originator of it, Eugene Mathews, Clifton Forge, Va., and no doubt many of our readers will wish to obtain a sample copy on such favorable terms.

New Enterprise at Joliet.

W. O. Dayton, chief engineer of the New Era Engineering Co., of Joliet, Ill., has resigned his position and has organized a company for the manufacture of light automobile chassis and light worm axles for domestic and export trade.

Premier Automatic Electric Vulcanizer.

With the Premier Vulcanizer the electric circuit is automatically opened by a thermostatic cut-out, which is just as positive in operation as a thermometer or any of the best controlled fire sprinkling devices now on the market, which all depend upon the alloy fusable at a certain temperature, reaching the melting point.

With this patented automatic temperature control, it is impossible to overcure or burn the repair, as the electric current is automatically cut off entirely the very instant the vulcanizer attains the correct amount of heat to properly vulcanize the repair.

The Premier is very simple in operation and a great time saver. After the tube or casing is prepared and the device clamped on, the button is pressed and then the operator is free to work on another job as when the repair is completed the electric current is automatically cut off and the vulcanizer cools off.

The Premier is small and compact and as it weighs approximately two pounds, it is not a burden to carry in the tool compartment but is always ready to put a patch on an inner tube and to heal cuts in casings while new, which means much toward saving blowouts and cutting down tire expense. The Premier Automatic Electric Vulcanizer is also furnished with approved type connecting cords and connectors and a separate base for holding the vulcanizer when not in use. This model has been approved by the National Board of Underwriters and sells complete for $5. Its great advantage is the fact that it reduces the fire risk for garages and shops in which it is used.

Johnson's Cleaner and Prepared Wax.

So that our readers may be made familiar with the appearance of the packages, we show herewith a correct representation of a can of Johnson's Prepared Wax, also of a can of Johnson's Cleaner for automobiles. These articles have been extensively advertised, and they are of such merit that enormous sales have been secured on them throughout the United States. While Johnson's Prepared Wax may be already familiar to our readers, Johnson's Cleaner is a comparatively new article. It is a motor car cleaner that cleans, just as Johnson's Prepared Wax is an automobile polish that really polishes with least effort and permanent results. Johnson's Cleaner quickly removes spots, stains, scum and surface scratches that ordinary soap and water will not touch, and Johnson's Prepared Wax "sheds water like a duck's back," and makes a wash last four weeks, and is guaranteed not to gather the dust. The manufacturers offer to send a sample can of Johnson's Cleaner





if you will use the coupon attached to their advertisement and send them ten cents, or if you will send twenty cents for combination outfit they will send you one sample can each of Johnson's Cleaner and of Johnson's Prepared Wax, but it is necessary to use the coupon attached to their advertisement, so that they can identify the source of the inquiry for samples. Address all communications or inquiries direct to S. C. Johnson & Son, Racine, Wis.

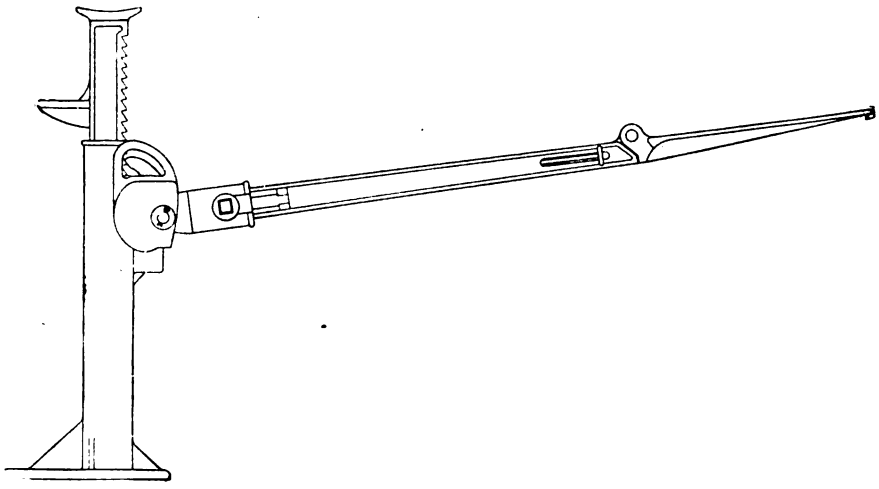
Test Your Electric Apparatus.

The Wheatstone bridge will do it, and James F. Hobart of 1702 Lockwood Street, Indianapolis, Ind., will send, for $3, drawings and instructions for making one.

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Hartford Auto Jack.

The Hartford Auto Jack is regularly specified on a number of high-grade cars as stock, factory equipment. Its great power and ease of manipulation, under the heaviest loads, is due to the gear combination employed. The manipulation of the handle operates by means of a ratchet, a pinion meshing with a large gear, the movement of the latter being directly communicated to a pinion engaging the rack on the moving upright. The entire mechanism is wholly enclosed in metal castings highly finished in black enamel. The bearings throughout are of generous size, carefully fitted, and freely lubricated by grease held within the casing. A trip is provided by means of which the action of the ratchet is reversed, so that the load can be either lifted or lowered by the same movement of the handle. The Hartford Jack is



Powerful and Quick Acting.

finely finished in black enamel, and is packed in a stout canvas bag, so that it will not be marred in the tool-box. It is listed at $6.50. This Jack is manufactured by the Hartford Suspension, 143 Morgan Street, Jersey City, N. J.

Ahlberg Bearing Company.

Announcement comes of the opening of the Minneapolis branch of the Ahlberg Bearing Company; the new store being located at 936 Marquette Avenue. Mr. W. C. Bender, sales manager, who just returned from the twin cities, states that the northwestern territory will be handled from this new branch in charge of Mr. L. J. Bohan.

The Ahlberg Bearing Company of Chicago during the past nine years has consistently enlarged its organization and scope, now having branches in New York, Boston, Detroit, Cleveland, St. Louis, Los Angeles and Minneapolis.

It is possible for the customer to receive immediate service at any of these branches where he may obtain for his worn out bearings a reground bearing of any type or make, guaranteed equal to new, paying about one-fifth of the price of a new bearing.

The Brown Spring Oiler.

The Brown System of spring oiling should interest every car owner, dealer and repairmen. Dealers who will act as agents for the Brown System will be backed up by extensive advertising, and if you undertake the sale of this specialty, the manufacturers will advertise you as the Brown System Man. This system is entirely automatic. No spreading of leaves is necessary, no jacking up the car, no tools are needed and no hard work. Lubricating the springs by this system removes rust, takes out squeaks, makes the care ride easy, and lessens spring breakage. The Brown System will be exhibted at the New York Automobile Show in Space D 106-107, and in the Chicago Automobile Show in 98 Coliseum Gallery. For full particulars write direct to the Brown Spring Oiler Co., 6525 Carnegie Avenue, Cleveland, Ohio.

Invitation to Visiting Dealers.

There will be a large number of dealers in New York city during the annual Automobile Show, and the Times Square Auto Co., whose warerooms are located at the southwest corner of 56th Street and Broadway, has issued an urgent invitation to these dealers to visit their store while they are in the metropolis. This house is a very large one, and carries an absolutely complete line of automobile accessories. Within thirteen years of their business history they have been obliged to move five times to larger Broadway quarters, and they are now located in a plant having over 200,000 square feet of floor space, with an institution almost equally as large on Michigan Avenue, Chicago. They have also opened up a new branch recently at Kansas City, Mo., where they will take care of their large southwestern trade. Everything imaginable in the auto accessory line is carried in stock by this house and a visit to their warerooms will be found extremely interesting.

Limousine Tops for Ford Cars.

Many of our readers who are owners of Ford cars will be interested in the announcement made by the Wadsworth Manufacturing Co., of Detroit, Mich., in regard to their Wadsworth all-season limousine for Ford cars. This top will make a Ford car warm and snug in the winter, and it is also cool and comfortable for summer use. It fits flush to the body of the car with no overhang, and there is positively no rattle or squeak. It is finished of the same material which is used in upholstering the car. The glass doors and panels are easily removed if desired, and a set of curtains used in their place. Get full details from your dealer or, better still, write direct to the manufacturers for an illustrated catalog. The same top is manufactured for application to Cadillac, Studebaker, Overland, Reo, Dodge, Maxwell, Buick, Hudson and Chalmers cars. Be sure to address all inquiries to the Wadsworth Manufacturing Co., 1308 Jefferson Avenue, Detroit, Mich.

An Oil That Flows Freely at Zero.

Car owners who intend to drive their cars throughout the winter will be intensely interested in the advertisement which appears in this issue from the Gulf Refining Company, of Pittsburgh, Pa. They call attention to the fact that the Supreme Auto Oil, which is a product of their refinery, flows freely at zero, which is a feature of great importance. It is the custom of many car owners to shift from a heavier oil to a lighter oil in the winter, but there is an element of risk in doing this, as a great many of the light motor oils thin out to such an extent from engine heat that they are no better lubricants than kerosene, but Supreme Auto Oil is guaranteed to give sufficient lubrication, and it contains no paraffine to thicken under low temperatures. Write for free booklet containing illustrated charts of Engine Details, Tire and Gasoline Records, and hints on lubricating, and address all inquiries for this valuable booklet to the Gulf Refining Company, Department 1880 Frick Annex, Pittsburgh, Pa.

Tuthill Titanic Springs.

These springs will be exhibited at the Chicago Show, second floor of the Coliseum Annex, Booths Nos. 156 and 157. They are guaranteed forever against center breakage. Dealers made a nice profit on spring replacements during the past season by handling these springs. Write for the name of the nearest Tuthill spring distributor who carries a stock of these springs, so that you can order in large or small quantities. Get full particulars from the Tuthill Spring Co., 758 Polk Street, Chicago, Ill.

The Niswander Tire Rim Remover.

This tool does away with all troubles in changing rims on your automobile tires. With it a tire rim can be changed in two minutes. It expands the rim as well as contracts it, and the spring hooks are so arranged that the harder the pull, the tighter they grip the rim in either operation. This tool can be purchased from any dealer at $3, but if your dealer does not have them, the appliance may be obtained by prepaid parcel post if you will send $3 to the Niswander Manufacturing Co., Quincy, Ill.

Detroit Batteries for Dealers.

It will surprise many of our readers to learn that there are more than one million batteries sold at retail each year in this country to automobile owners, and the dealer who does not sell batteries is losing a very important item of trade. One great advantage in handling the Detroit batteries is that they are made for every car, and every make of starter on the entire list, and these batteries are regular equipment on Argo, Crow, Mecca, Moore, Monitor, Niagara, Princess, Denby Truck, Disco Ford Starters, and many others. The manufacturers have an extraordinary proposition to make to every live dealer in the United States. Early requests for terri-

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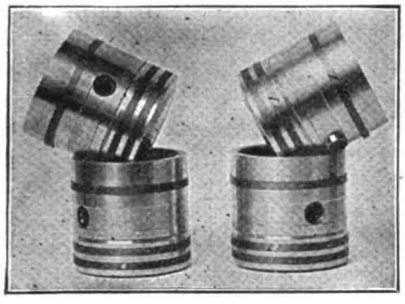
tory will be given the preference. Write at once for full particulars to the Detroit Battery Co., Detroit, Mich.

Halladay Bumpers and Flexlevers for Ford Cars.

The line of bumpers made by the L. P. Halladay Company of Streator, Ill., is an unusually complete one. They make several different styles, fitting all the standard makes of cars. These bumpers will stand the most severe shock and they are made of specially heat treated stock. The bars can be straightened if bent, and they are handsomely finished in black japan, polished brass, or buffed nickel plate. The same company makes the Celebrated Flexlevers for Ford cars, which may be attached to the front or rear wheels of the Ford car or both. It is said that these Flexlevers will make a Ford car ride as easy as most luxurious and expensive cars. They can be attached in 30 minutes without removing the wheels and they are sold on 30 days trial, and guaranteed for the life of the car. In writing to the L. P. Halladay Company at Streator, Ill., address, Dept. D, and ask for catalog and circulars.

Special Alloy Pistons.

Butler's Special Alloy Pistons weigh about 35% that of the cast iron piston. This reduction in weight automatically reduces the inertia force about 65%. A further reduction can be made by lightening the weight of the piston pin



Butler Pistons.

and connection rod in proportion to the reduced load carried, making a total reduction in inertia force of approximately 75%. With this great reduction of vibratory forces, we find in fitting about 60 different make motors, the average four cylinder motor ran very quiet and with little vibration, had more power, better get away and developed less trouble. The riding qualities were greatly improved. Owing to the high thermal conductivity of our alloy, practically fourteen that of cast iron, carbon deposits are small and valves do not require grinding as often. Our pistons are moulded in metal chill on special chilled soft sand core, which allows the core to crush in cooling of the casting. By this method we gain in malleability, hardness and strength, and eliminate the "growing" of pistons in use, as the outside of the piston is denser than the inside surface. It requires more metal and labor to make this style piston, than by the die cast process. After months of actual road tests we have found this type of piston to give the best all around results. The difficulties experienced with piston side slap and the pumping of oil has been eliminated by special design for average speed up to 50 miles per hour. We find it impossible to make a motor free from piston slap in running slowly and having sufficient clearance for extreme high speeds. In points of economy we find the aluminum alloy piston in every test has given more miles per gallon of gasoline and oil. Also the extra clearance is an advantage in cranking a cold motor for it requires less power.

A Scientific Oil Packing Piston Ring.

There are so many good piston rings on the market that this subject is a rather confusing one to many buyers, but we desire to call special attention to the No-Leak-O Scientific Oil Packing Piston Ring for which the manufacturers claim the following advantages. The rings are concentric, giving an even tension and all around fit. The oil grooves afford perfect lubrication, giving less friction and long life to the ring. The grooves control the oil and carbon and oil troubles are eliminated. The surface of the center ring is unpolished and fits quickly to glassy hardness. The polished sides give a close fit with free movement. The skin of the casting is left on, giving permanent resiliency and a perfect fit. The manufacturers claim that with this piston ring the engine will generate more power, use less oil and less gasoline on account of the reduced friction, and repair bills will also be reduced. Write for folder, asking for special trial offer. Distributors are wanted, considerable good territory being still open. Address all inquiries to the Automobile Accessories Co., 816 West North Avenue, Baltimore, Md.

Townsend Grease Gun.

A good grease gun is an exceedingly handy article in any garage, and the Townsend Grease Gun, manufactured by S. P. Townsend & Co., Orange, N. J., is highly recommended. This gun can be taken apart and filled easily and conveniently, and it is also easy to keep clean, and is easy of operation. To use this grease gun it is only necessary to fill it with a steel paddle, which goes with the gun. Then slip the inner tube into the outer one, secure with the cap and turn the handle. You can load and shoot a pound of grease in a minute and not a particle will get on your hands or clothing. The advantages of such a device are too obvious to need comment, and it would probably be to your advantage to correspond direct with the manufacturers, who will be glad to furnish full information.

Parry Manufacturing Company to Make Trailers.

The Parry Manufacturing Company of Indianapolis, Ind., one of the largest carriage manufacturing plants in the world, which has devoted its immense factory to the production of horse-drawn vehicles for over a third of a century, has now announced the manufacture of automobile trailers, commercial bodies and tops, and the chief activities of the company in the line of commercial bodies will be directed toward designs for the Ford chassis, although the facilities of the plant are such that the company contemplates going after large contracts for commercial bodies to be used on other cars as well. The trailers which this company is building, comprise two models, a two-wheeler and a four-wheeler. One prominent feature of the Parry Trailer is the manner in which the connection is made. The hitch is a convenient adaptation of the Bradley Couplers and permits of a straight-pull on both ends of the axle which adapts itself to the motion of the rear axle of the car, making the most practical form of trailer attachment.

To Revolutionize Storage Battery Making.

Wright Rapid-Fire Storage Battery Co. of 96 Market Street, Poughkeepsie, N. Y., is making a storage battery that all manufacturers are striving to do but so far have been only partially successful. With the use of a special process in the making, this company has made it possible to give the consumer something at moderate cost that will give more power than many of the high priced batteries now in use. Some of the claims for this battery are, the plates do not sulphate, or buckle, it will yield a larger proportion of charging current than other batteries, plates have longer life on account of a special process in the making as shown by tests, retains its charge longer than other batteries, has a lower internal resistance proved by the high discharge rate, and most important of all, it has a discharge rate of more than double that of any other of like weight.

Crane's Patent Wheel and Gear Puller.

This is an extremely handy device in any repair shop or garage. It is a useful tool for removing auto wheels, fly wheels, transmission and shaft gears, commutators, sprockets, collars, couplings, etc., and it is made with a New Combination Hook and Extension Arms and Screw, with inserted Tempered Tool Steel Point. This device is fully guaranteed, and it is made in various shapes and sizes, adapted for different kinds of work. Write for circular "D" to the Crane Puller Company, 54 Lake Street, Arlington, Mass.

Starting, Lighting and Ignition for Ford Cars.

The Westinghouse Electric and Manufacturing Co. have commenced shipments of their starting, lighting and ignition equipments for Ford cars. For several months they have directed their efforts in designing and testing and manufacturing, and they now have a large stock from which to make immediate shipment. They announce that this system is free from the driving chain and sprocket troubles heretofore generally experienced. The perfected equipment includes a silent chain of double previous chain strength, special compensating sprockets and easily adjusted mounting brackets. We understand that this system will be exhibited at the New York and Chicago automobile shows. Address your inquiries to the Westinghouse Electric and Manufacturing Co. (Automobile Equipment Dept.), Shadyside Works, Pittsburgh, Pa., or information may be obtained from the branch agencies of this company which are listed in their advertisement in this issue of our magazine.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

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A New Easyon Chain.

The Leather Tire Goods Company of Niagara Falls, N. Y., announce that they are bringing out a new size of Easyon Chain especially for Fords and other small cars. They will be called size 3½ and will fit 3 or 3½ inch tires and sell at $2.60 per set of eight. The second size, called 4½, will fit 4 or 4½ inch tires and sell at $3.50 per set, and the larger size, called 5½, will fit 5 or 5½ inch



tires and sell at $4.50 per set. Each set is packed in a small bag suitable for carrying in a car. Easyon Chains fasten to the spokes with leather-covered fasteners having snaps at each end for holding and adjusting the cross chains. They can be applied in a moment and are absolutely needed so as to prevent any danger of getting stuck on the road.



Display for Dealers.

Easyon Chains will be sent on approval to any part of the United States or Canada on receipt of the above prices. We illustrate the chains as applied to the tire, also display stand furnished to dealers for showing these chains.

Welding and Cutting.

This work is published by the McGraw-Hill Book Company, 239 West 39th Street, New York, has 139 pages, numerous illustrations, and sells for $1. The author has been a teacher in the schools where the subject is treated in Germany and the book is written from this standpoint. But it is well done, on the whole. The range of welding technique is so wide that a thorough study of the process requires extensive research which makes great demands on the time of the reader. This book will be welcome to the works engineer, to the foreman, and to the practical autogenous welder. In it the most important elements of the process are placed together in an easily available manner, and it is a faithful companion and a reliable adviser in connection with the various questions arising in practice.

Springfield Body Company.

The demand of automobile buyers for the "Springfield" type of car is emphasized by the announcement that a new concern called the Springfield Body Company has been incorporated with a capitalization of $1,000,000 to take over the business of the Springfield Metal Body Company, of Springfield, Mass.

About a year ago W. L. Fry, president of the new corporation, became interested in the old company. At that time the general public was just beginning to realize that an enclosed car was a great luxury in the winter time and to grumble about the high price of limousine bodies. Manufacturers were quick to recognize this demand and all sorts of cheap, makeshift winter tops appeared on the market..

The convertible body made by this company is one of the most popular on the market and is being used by some of the biggest automobile concerns in the country. The Studebaker, Maxwell, Chandler, Mitchell and Paige-Detroit companies all furnish Springfield convertible bodies as regular equipment on their cars.

The Stalit Heating Plug.

This is an electrical device designed to make automobiling pleasant under all weather conditions, because it eliminates the disagreeable trouble of starting a cold motor. With this plug the hard work of cranking a cold engine becomes child's play, for it dispenses with the difficulty of priming the cylinders and tickling the carburetor. This is a friend in need to any winter motorist, and it is within the reach of all, as it sells for only $2.25. For circular with full particulars write to the manufacturers, Geo. Staats & Co., 252 Lorimer Street, Brooklyn, N. Y.

A Good Air Compressor for Repair Shops.

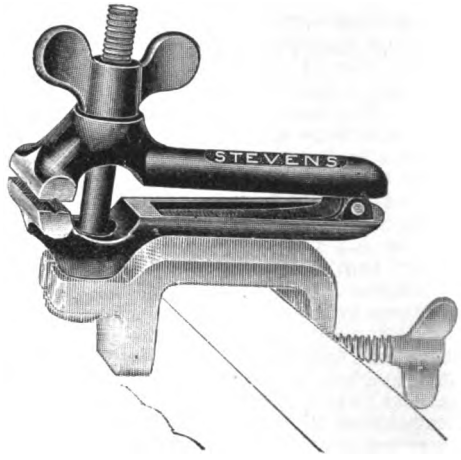
The Au-To Air Compressor is described by the manufacturers as a machine that puts the "air" in "repair shop." It furnishes air for every purpose from inflated tires to cleaning inaccessible parts of an engine, and the air can be provided at any pressure up to 300 pounds and in quantities as desired. This compressor is small in size and price, but large in capacity. It is all metal, air cooled, simple and practically fool-proof. It takes up very little floor space, is light in weight and is guaranteed to do the work required of it. For prices and full particulars write to the Au-To Compressor Co., Dept. 62, Wilmington, Ohio.

Hurry Orders a Specialty.

Repairmen who are in a hurry for anything in automobile forgings, hardware or trimmings should send their orders to John A. Gifford & Son, 25 Park Place, and 22 Murray Street, New York City. This is one of the oldest and most reliable houses in New York, having been engaged in the sale of vehicle hardware and trimmings for more than half a century. They carry a large stock of supplies of every description and make a specialty of filling large or small orders with the utmost promptness.

Stevens Hand Vise.

We illustrate an exceedingly useful hand device for repair men, and also to car owners who look after their own machines. One of the many emergencies in which the device saves time and annoyance is in the ease and convenience of replacing a bent or twisted locking ring on a Quick Demountable Rim. With the use of this hand vise one end of the ring can be clamped to the rim, allowing a quick setting in place of the entire

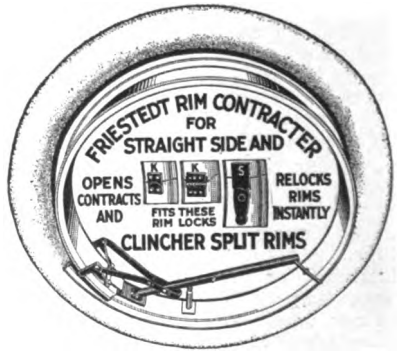


Vise in Use.

ring with very little effort, and, of course, there are many other uses for this vise in working around a car. It is strongly made of drop forged steel, 4 inches long over all, jaws hardened, 1⅛ inch wide, opening to 1¼ inch. The jaws are kept open by means of a C spring, housed in grooves within each side, and a wide wing nut allows an extra firm grip. The tool has a neatly lacquered finish, and it should be in the kit of every car owner and a great many of these vises can be used to advantage in garages.

The Friestedt Rim Contractor.

This wonderful invention for quick tire changes is illustrated herewith. It makes changing the tire as easy by the roadside as it is in the garage. Anyone who has put on tires will understand how this tool works by studying the illustra-

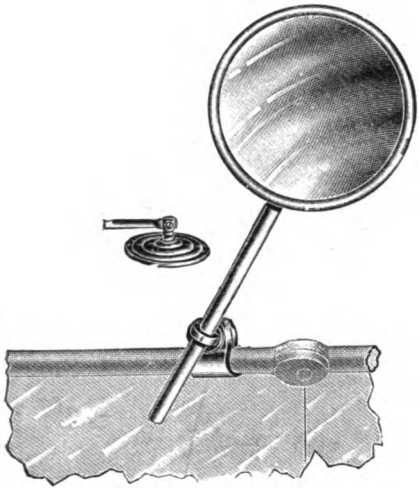


tion. It opens, contracts and re-locks rims instantly and this rim contractor may be used on straight side and clincher split demountable rims instantly and without clamps to adjust nor bolts to tighten. It is a fast, powerful and effective tool which will save the motorist care, time, worry and profanity. This device will be exhibited in the New York Automobile Show in space D-8, fourth floor, and in the Chicago Automobile Show in space 9-B, Coliseum basement. Readers who are interested should write for prices and full particulars direct to the Friestedt Rim Contractor Co., 2934-2938 West Lake Street, Chicago, Ill.

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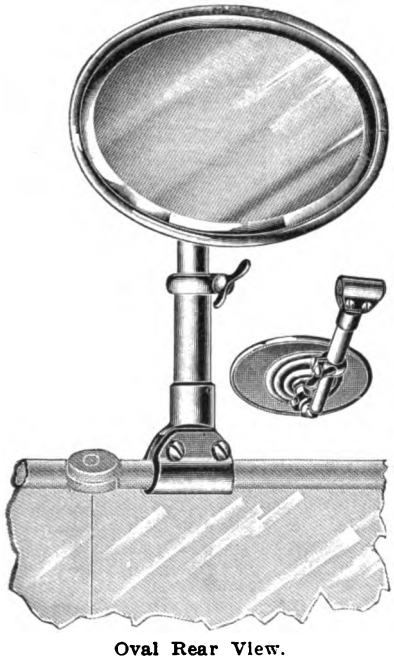
Mirrors for Ford Cars.

We illustrate two types of rear view mirrors especially made for Ford cars. The round rear view mirror, as shown, is 4 inches in diameter, and is especially made for the Ford car. It contains a diminishing glass and is fitted with a high-grade lens, and the material and workmanship is excellent throughout.



Round Rear View.

This is designed to give the driver a perfect reduced view of all objects in the rear without turning the head, and it can be attached to the wind-shield or upright rod. It is small and neat, and an ornament as well as a necessity to any car. It can be furnished with all brass finish, or black, or all nickel, and the list price is $1.25. The oval rear view mirror, also illustrated herewith, is made in 5 by 7 size. It is of French



Oval Rear View.

plate glass, with beveled edges, highly polished and perfectly ground. It has a universal ball socket on the back of the frame which allows the mirror to be set at any angle, and it will remain stationary. It also has an extension handle moving in a radius of from 5 inches from the windshield to 12 inches from the windshield. The finish is of the highest grade, and this is an exceptionally fine mirror in every respect. Purchasers may have a choice of finish all nickel, all black, or black body and nickel rim, black body and brass rim, or all brass, and the list price is $3.50. Both these mirrors are manufactured by Bergman Bros., 1777 Broadway, New York City.

The Barefoot Tire.

This is a new safety tread tire which has recently been brought out by the B. F. Goodrich Co., Akron, Ohio. The peculiar and desirable features of this tire are fully described in our advertising columns this month, and the technical description is well worthy of the careful attention of all our readers, whether they are car owners, dealers, repair men or public garage owners. The Barefoot Tire is known by the new black tread, which gives a stylish appearance, and it is the result of many years of careful experiment in the effort to produce a tire with a clinging quality, which will give traction without friction, on the same general principle that it is so much easier to get your footing with bare feet than it would be with slippery shoes on the feet.

Cleveland Tops for Ford Cars.

A large variety of practical tops for the Ford car is manufactured by Cray Bros., 1119 West 11th Street, Cleveland, Ohio. This includes Cleveland Regular Tops for Ford touring cars, also the One-Man Top for Ford runabouts and the Cleveland Slip Roof Outfit "A." All of these various tops are described in a special announcement which appears this month in our advertising columns. Dealers should write direct to the manufacturers for their special dealers' proposition on tops and slip roof outfits for Ford cars, and all car owners, as well as dealers, repair men and garage owners should write for the 512-page catalog which is issued free to the trade by Cray Bros. This is a valuable reference book for any garage man.

Kant-Slip Products.

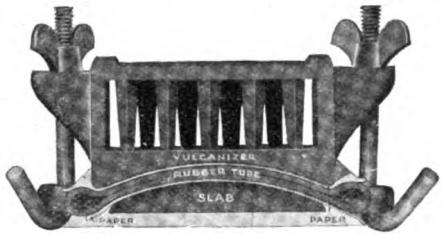
Two useful accessories are manufactured by Ford & Lyon, of Fitchburg, Mass. One of these is the "Kant-Slip" Inner Liner, which is one of the best on the market, as it can't slip inside of the casing. When this liner is placed inside of the tire, and the tire properly inflated, the liner will stay just where it is put and cannot slip. It is also a complete inside fabric reinforcement, extending the full length of the tire from bead to bead, and it is so durable that it can be re-used after the old casing has been discarded. The same firm manufactures the Kant-Slip Fan Belts for Ford cars. These are very popular with Ford owners, as they will give 100 per cent. service. They are absolutely guaranteed not to stretch and are oil-proof and made in endless belt style with no chance for defective seams. The cost of these belts is only 30 cents each. Readers who are interested in these two live accessories, whether they are dealers or owners, should write direct to the manufacturers for prices and full particulars.

Weehawken Tungsten Lamps.

Many garage owners and repairmen can largely increase their profits by carrying in stock a line of electric lamps for automobiles. The Weehawken Tungsten Lamp Co., Weehawken, N. J., manufactures a line of Tungsten Lamps which is likely to appeal to every car owner. This company is closing up territorial rights with jobbers now and it will undoubtedly be to the advantage of many of our subscribers to write immediately to them and secure the agency for these lamps, as they make a particularly attractive offer to dealers.

The Worcester Automatic Vulcanizer.

This is a small vulcanizer which enables the car owner to make his own tire repairs without recourse to garage or repair shops, and it will also do away with an extra wheel or shoe attached to the



For Tube.

car. In fact, it means practically the end of tire troubles, as it enables the car owner to fix, while on the road or in the garage, any puncture or blow-out, from a pin-head to an ugly gash. The price is $3.50, with money back if not strictly as represented. Every machine is guaranteed, and this vulcanizer will make permanent repairs in inner tube or shoe that are lasting, cost little, and are safe, speedy and strong. Write to-day



For Casing.

to the manufacturers, the Worcester Manufacturing Co., Vine and Foundry Streets, Worcester, Mass.

Detroit Battery Co. Builds.

The Detroit Battery Co. of Detroit, Mich., has made arrangements for the erection of a new factory building which the growth of their business has made necessary. The building is to be 70 by 100, of reinforced concrete fireproof construction throughout, and thoroughly modern in every way, with provision for a welfare room, shower baths and other conveniences. Ground has been broken and the building will be ready for occupancy the first of the year. The new building will enable the company to triple their working force, and provision is made for the erection of three additional stories as the business warrants it.

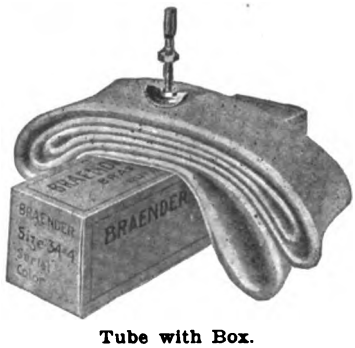
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Two Good Winter Specialties.

We wish to call special attention to two very useful winter specialties for the car owner which are manufactured by the Interstate Electric Co., 1845 Perdido Street, New Orleans, La. One of these specialties is the well known Steer Warms, which is a device for keeping your hands warm while driving. It consists of two neat leather covered grips, electrically heated which lace on the steering wheel at any place convenient for driving. They are operated from the storage batteries (or magneto on Ford cars) and cost nothing to maintain. They are simple, easy to install, durable, and guaranteed for five years. The price of this device for standard gasoline cars is $7.50, or $11.00 in Canada, and the special Ford type sells for $5 in this country, and $7.25 in Canada. This is a winner for any dealer to handle, and many dealers who subscribe for this publication will no doubt be glad to correspond with the manufacturers and obtain territory for this fast selling winter specialty. Another accessory which is particularly adapted to the cold weather is the Ieco electric manifold plug made by the same company. This plug does away with all cranking and trouble in starting the car in zero weather, while if you have a self starter it saves using up all your battery in revolving the engine many times. This plug puts a hot vaporized mixture into the cylinders, and the engine goes at once. The price for all cars is $5 in this country, or $7.25 in Canada. Correspondence on both of these specialties from dealers, repairmen, garage owners and car owners is invited by the manufacturers.

Pure Gum Inner Tubes.

Automobile owners are demanding this type of tube, as they realize that the initial additional cost is offset by the better service they receive from pure gum inner tubes. The tube is extra heavy built, each packed in a neat carton and protected from chafing in the box. Pure gum inner tubes are made with all rubber with sufficient sulphur to cure them, and will outlast by far any composition



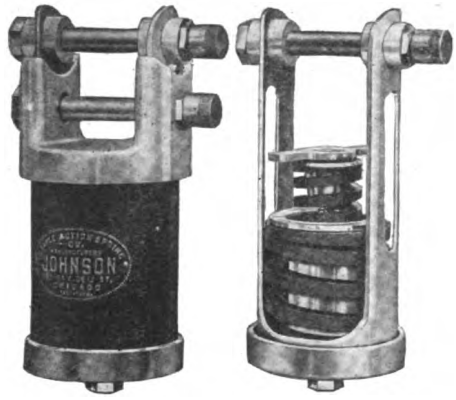
Tube with Box.

tube. The advantages are that the pure gum tube does not get out of shape as a composition tube does; can be repaired a greater number of times than a composition tube and will always retain its shape, and lasts about three times as long as a composition tube. It is by far the cheapest tube and the best tube for the automobile owner to buy. The tube is shown with box, as manufactured by The Braender Rubber & Tire Co., of Rutherford, N. J.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

The Triple Action Spring Company.

The manufacturers of the Johnson Shock Absorber, have come out with an improved 1916 model. They still maintain the same principle as in previous models. The changes are chiefly in the mechanical design, employing compression type springs in the outer, or heavy coils, instead of the inter coiled expansion type formerly used. By using a steel stirrup spring hanger for the outer coil, and a steel spring cup for the inner coil, the cup passing through the bottom of stirrup hanger as the tension increases, thus allowing a long free resilient action of both inner and outer coils, the inner coil being of lighter tension



New Shock Absorber.

than outer coil, giving a variable tension automatically. Also the rebound of the car is checked by the small inner coil. The top cap has been changed to a closed, weather proof design, with curved slots for the main stirrup hanger to pass through. At the bottom of the casing is an adjustment bolt; the nut on this bolt is self locking, making it possible for the non-expert to adjust the absorbers to any load or road conditions. Different sizes are made to apply on all cars from the lightest to the heaviest. Prices, $22.50 and $30 for all pleasure cars. $40 for trucks.

Harvey Boltless Auto Springs.

These springs are guaranteed against all defects. They are made of the finest selected steel. The plates are scientifically formed and tempered on the Harvey patented machines, which make them with an accuracy and uniformity that it is not possible to obtain with hand labor. Each step in the manufacture of Harvey springs is carefully watched, and every spring is inspected and tested before being shipped. These springs are made without a hole in the center. Instead of a bolt a small depression, or bead, is used to keep the plates from shifting. This preserves all the strength at the center, or point of greatest strain. Over 10,000 springs are carried in stock by the manufacturers at all times for quick shipment, and the Harvey springs are also carried in stock at all leading jobbing centers. Jobbers, dealers and garagemen are requested to send for an interesting free book, entitled "Automobile Springs," which gives a complete list of the springs required for over 300 of the leading makes and models of automobiles, also detailed measurements, specifications, and other valuable information that has never been published before. You should send for a copy of the Harvey Auto Spring Book today, and keep it for quick and ready reference. They will be mailed absolutely free for the asking. Address all inquiries to the Harvey Spring Co., 849 Seventeenth Street, Racine, Wis.

The Sta-Tite Piston Ring.

The manufacturers of this well known piston ring make the following claims for it: increase of motor power, prevention of lost compression, decreased fuel consumption, saving in oil, prevention of smoking, prevention of excessive carbon formations, remedy for flowing spark plugs. The Sta-Tite has sometimes been called the Eternally Tight Ring. Write for full information direct to the manufacturers, The Piston Ring Company, Specialists in Piston Rings, Muskegon, Mich.

Restoring Old Automobile Tops.

We wish to call the special attention of our readers to the "F-S" Evernew Auto-Top Dressing, which is manufactured by Felton, Sibley & Co., Inc., 136-140 N. Fourth Street, Philadelphia, Pa. This dressing will actually restore the life and looks of old automobile tops, and make them weatherproof. Material treated with this dressing will not crack in folding, and the preparation is absolutely non-injurious to any kind of fabric. It is easily applied and dries quickly to a durable, pliable, waterproof finish. This is just the thing for leaky, moisture-holding mohair tops, and it is made in eight standard colors, also special shades to order. Readers are urged to write for free color card and prices. The same manufacturers also make the "Evernew" Auto Top Sizing for a first coat on mohair, cloth or canvass tops that have never been painted, and the "Evernew" Auto-Body Enamel for application to the body of the car, which is also made in colors corresponding with those used in the "Evernew" Dressing.

Air Compressor Installations.

A new bulletin, or booklet, entitled "Air Compressor Installations," has recently been brought out by the Gardner



Governor Co., Quincy, Ill., and this will be found extremely useful to any garage owner as it gives full technical and mechanical directions for installing air compressors properly and to the best advantage. We understand that this booklet will be mailed free to any of our readers who will write for it direct to the Gardner Governor Co., and we hope that many will send in for it.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.
71-73 Murray St., New York.

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Stop! Don't Part With Your Half Worn Tires

Don't sell your worn tires to "Jimmy the Junk Man"—it's just as unnecessary—just as extravagant—to sell your tires when they get rim cut or rut worn as it is to throw away your shoes when the first sole wears thin, for you can NOW get 5,000 miles more service out of them by doing what European motorists have done for the past three years. This will result in a saving of $50.00 to $200.00 a year for you.

What European Motorists Are Doing

For three years European motorists have been getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American Motorists have been getting only from 3,000 to 5,000 miles, and—what is perhaps more important—have almost entirely eliminated the constant dread of punctures, blow-outs and rim-cuts.

In the past 9 months over 20,000 American Motorists have followed their example—and are "half-soling" their tires with "Durable Steel Studded Treads" just as we "half-sole" our shoes when the original sole gets thin.

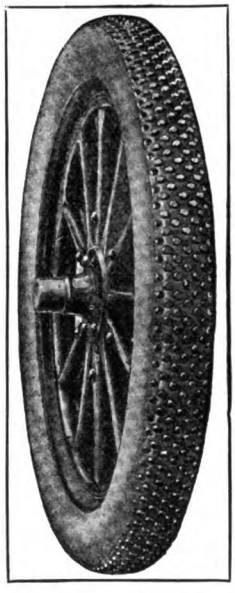
Guaranteed 5,000 Miles Without Puncture

To many motorists this fact is of more importance than the money saved by eliminating tire repair bills—the constant dread of puncture or blowouts spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop"—makes the man at the wheel think of tire trouble FIRST.

Durable Treads are backed by a signed guarantee—as good as a Government Bond—for 5,000 miles **without** puncture. Think of the joy of motoring when you KNOW in your own mind that your tires are **impervious** to the roughest roads—when you KNOW that **you** won't have to get out and sweat fixing a puncture or blowout, besides, you save nearly enough to pay your yearly gas and oil bills, and the guarantee holds good no matter whether your tires are new or old, rim cut or rut worn.

No More Skidding

"Durable Treads" are as sure-footed as a Rocky Mountain Burro—look at the photograph—they're simply BOUND to be safe—the sharp-edged steel rivets make skidding almost impossible. With Durable Treads on your tires you receive **perfect non-skid** service while your tires are **protected instead of injured,** and you don't have to get out in the mud and put on chains.



Strong, Sturdy — impervious to the worst roads, "Durable Treads" add a touch of distinction to any car—and make the tires the much desired over-size.

We Ship On Approval

We ship on approval to any motorist—without one cent of deposit—prepay the express—and allow you to be the judge. Durable Treads are easily applied in your own garage, without special tools, in thirty minutes.

If your tires are new then protect them from cuts and punctures by putting on Durable Treads at once—don't wait until they are all shot to pieces. **If they are old and rutworn** don't sell them to Jimmy the Junkman—remember that "Durable Treads" are **guaranteed** for 5,000 miles without puncture—no matter whether your tires are old or new.

Special Discount Offered

To motorists in new territory where "Durable Treads" have not been introduced we offer a special introductory discount. The sales of "Durable Treads" increased 917% in the United States alone during the past year—over 40% of these sales were **unsolicited**—made through the recommendation of "Durable Tread" users. Where is there **another** automobile accessory that has received such universal, country-wide endorsement?

Mail the Coupon

Let us make you a special introductory offer. Let us give you a demonstration of "Durable Treads" **at our own expense.** Let us make you an offer so fair and square that you do not stand to lose one red cent, either before or after you buy. Act NOW—don't run your tires "barefooted" another week. Tear off the coupon, sign and get it in the mail box today—if you haven't got a pen or pencil handy tear off the coupon anyway and then sign it later—it will be the means of adding 5,000 miles to the life of the tires on your car.

TEAR OFF—MAIL

Colorado Tire & Leather Co.
125 Tread Bldg., Denver, Col.
L-5 Transportation Bldg., Chicago
512 Woolworth Bldg., New York.

Gentleman:

Please send me full information, sample, copy of guarantee—without any obligation to myself.

Name .....

Address .....

.....

My tire sizes are .....

The Colorado Tire & Leather Co.

125 Tread Bldg., Denver, Colo.

L-5 Transportation Bldg., Chicago — 512 Woolworth Bldg., New York

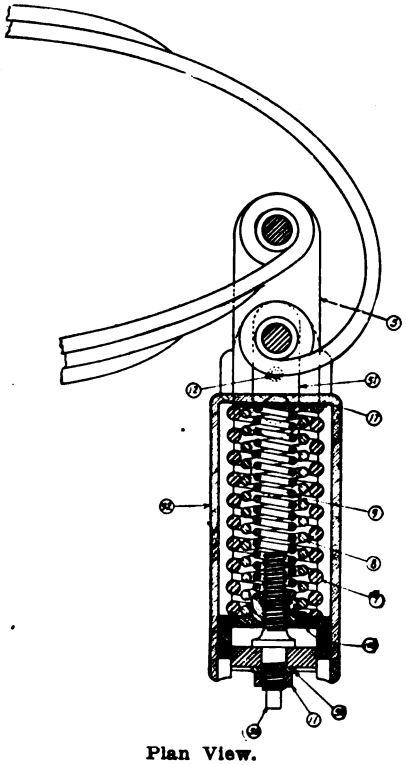
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The C-C Shock Absorber.

The Cox Brass Mfg. Co. of Albany, N. Y., offers an improved form of the C-C Shock Absorber that has already won wide popularity. In the extensive trials made with the new type before it was offered to the trade, it developed such superior riding qualities that the manufacturers unhesitatingly say it is the best they have ever turned out. Besides the regular guarantee against mechanical defects, it is guaranteed to be absolutely noiseless and "rattleless." Every posible care that the experience of years in manufacturing shock absorbers could suggest has been taken. The head and cylinder are made in one. There are no joints to weaken. A special feature is the piston that combined with the long slide bearings makes it positively imposible to have any lost motion or rattle. This piston works smoothly in the body. The two parts are machined accurately to size. The size of piston rod is 2x¾ inches, insuring increased bearing surface.

In the illustration it can be seen that while the longer bearings on the staples prevent play, this increased length at bearing together with the enlarged piston absolutely minimizes chances for wear. Now, the piston with the machined bearing surfaces makes the sliding parts absolutely proof against the lost motion that produces rattles.

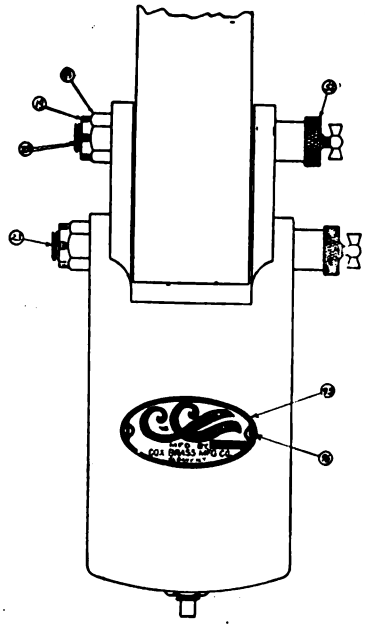
The Cox Co. maintains that it is not practical to make Shock Absorbers of



Plan View.

one standard width and size of spring bolt and then shim out to fit the various different requirements of cars. Instead, they make the Shock Absorber for spring widths of 1¾, 2, 2¼ and 2½ inches with the various sizes of shackle bolts; thus, insuring the proper set of Shock Absorbers for the car. Time has enabled them to perfect a series of five springs, which when worked in combinations of three carry the weight of the car prescribed for. This company publishes charts and directions for their dealers, which clearly set forth the changing of springs and fitting for the various cars. This chart has been carefully compiled and covers the attaching of C-C Shock Absorbers for various cars thoroughly.

The triple helical springs that have done so much to give C-C Shock Absorbers their widely merited use and high reputation are retained unchanged and a larger bearing surface afforded for



The C C Shock Absorber.

their support. The extreme bottom of the case is open to allow making the proper adjustment of the springs for the car weight it will carry. The shackle bolts by which it is attached are specially milled and drilled so that the grease cups with which they are furnished supply proper lubrication to the spring connections. This is a feature that is found elsewhere only in the very highest priced absorbers and one that is of marked value to the motorist. As shown in the illustration the new C-C is simple, substantial and good looking. Car weight has no terrors. It has been used successfully on the heaviest types of limousines. The price on the new model has not been advanced, but remains at $10 the set. Its many features of excellence can perhaps be best summed up in the words of its manufacturers who say, "The C-C has everything in its favor, even the price."

Curtis Garage Air Compressor.

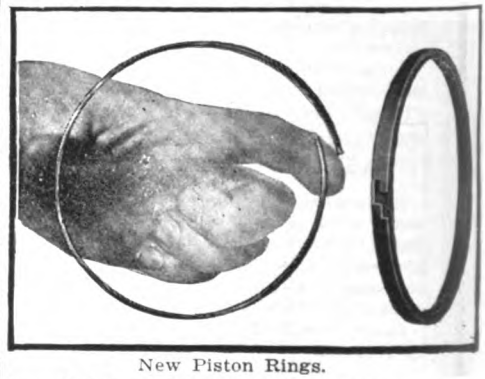
This is a thoroughly reliable device, and it is guaranteed to furnish your customers with air free from oil or other impurities. This compressor is made in five sizes and forty different combinations, and there is one to fit any requirement. Some of the advantages of this compressor are found in its mechanical construction. It has an unloading device which saves power and permits the use of a smaller motor, which means cheaper air. The fan flywheel means cooler discharge air and higher efficiency at less cost. The compressor also has a safety cage so that a broken valve cannot damage the machine. It is made with inspectable valves and head removable without disturbing pipe connections. It also has adjustment, die-cast, anti-friction bearings and an oil level indicator. Probably your jobber can supply you with one of these air compressors, but you are urged to write for full particulars directly to the manufacturers, the Curtis Pneumatic Mchy. Co., 1530 Kienlen Street, St. Louis, Mo.

The Grace Pneumatic Controller.

This device consists of a small flexible tube leading from the steering post or dash of automobiles to an enlarged pipe or heater placed on the exhaust manifold or hottest part of the engine. From the opposite end of this heater or drum, the tube is continued to the intake manifold just above the carburetor where the air warmed in its passage through the tube unites with a warm mixture from the carburetor, vaporizing and making its more volatile and highly explosive. The manufacturers claim that this is the most efficient gasoline saver, decarbonizer, primer, air brake, and carburetor controller possible. It does not burn the fuel; it explodes it. It is simple and effective in operation, and has no moving parts. To operate you simply open or close the valve. The price of this controller post paid is $10 and it is manufactured by Grace & Company, 3205 W. Washington St., Los Angeles, Calif. Readers are urged to write for descriptive circular.

Davidson's Multiple Piston Rings.

These rings, illustrated herewith, are designed to preserve every ounce of power generated by the combustion in the engine. Every essential that can enter into the manufacture of a good piston ring has been obtained and utilized in making these rings, and the material used has been compounded after thirty years of study and experience in the mixture of metals. It is claimed that no matter what the age of your motor, the Davidson multiple piston ring will practically renew its power plant, and save hundreds of dollars, giving



New Piston Rings.

less friction, less wear, less heat, more compression, more power, and more mileage. Interested readers should write for full particulars to Davidson's Repair Shop, 227 West 64th Street, New York city.

Martell Aligning Reamer.

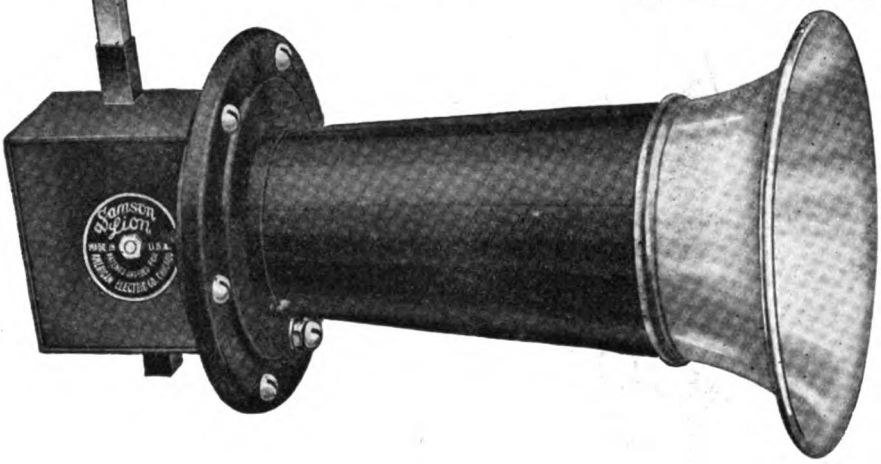
This is a device which will soon pay for itself in any repair shop or service station, and it is especially adapted to take the place of the ordinary method of scraping bearings by hand. This reamer insures absolute alignment of bearings, accurate size, perfect gear mesh, and produces truer and smoother bearings than could possibly be obtained by hand work. Readers are urged to send for an interesting free booklet, entitled "The Better Way to Scrape Bearings." Address all correspondence to the Harding Manufacturing Co., 40 Court Street, Boston, Mass.

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Buy Entire Line from One Factory

As to whether a motor-driven vibrator or hand actuated type horn is best we need not argue, as we make all types. We have continued to add to our various horn models until we now make the most extensive line on the market. **Bulk your orders. Buy your entire line from one factory.**

Samson-Lion
Automobile Hand Horn



is built up to a standard not down to a price. Mass production has made our fair lists and money-making discounts possible; it has permitted the subdivision of the various manufacturing operations so that we now have maximum production at a minimum cost. This means bigger profits for you; it means repeat orders from your customers.

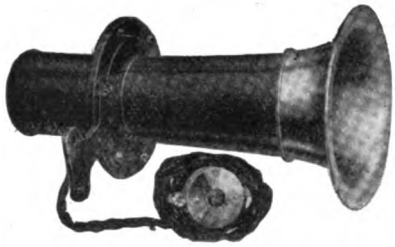
Some horns have as many as four gears to catch, break or wear out. Only one shaft is used in this 1916 horn—the Samson-Lion. The pinion and strike wheel are cut from solid pieces of special high grade steel, afterwards case-hardened, and every tooth on the strike wheel is ground to a clean edge, so it will absolutely produce a uniform tone. The pressed steel rectangular back is small and neat, it does not protrude in way of driver.

If you haven't ordered your initial stock of Samson-Lion Horns, do so today. Now is the time. Not tomorrow, next week, or next month, but now. Write for some horns today; talk horns to your salesmen and your customers—then watch the results.

No. 45 Samson-Lion "Push-Down" Horn. Length 9¾ inches over all. Attractively finished in black with nickel trim. List price complete, **$4.50 LIST**

WRITE FOR CATALOG OF COMPLETE LINE

SAMSON JR. MOTOR-DRIVEN HORN
A Bigger Horn with a Bigger Motor



The tone volume, the finish and the motor are unequalled in any motor horn sold at a nearby price.

No. 23 Samson Jr. Length 10¼ inches over all. Complete with push button and 10 feet of duplex cord. List price complete, **$10.00**

THE VICTOR VIBRATOR HORN
We have simplified the parts and compressed all the essentials into a casing about the same dimensions as our "Samson Jr." motor horn.



A wonderfully low priced vibrator horn. Write for money-making discounts today.

No. 16 Victor Vibrator Horn. Length 10 inches over all. Finished in all black or black with brass or nickel trim. Complete with push button and 10 feet of duplex cord. List price - - - **$4.00**

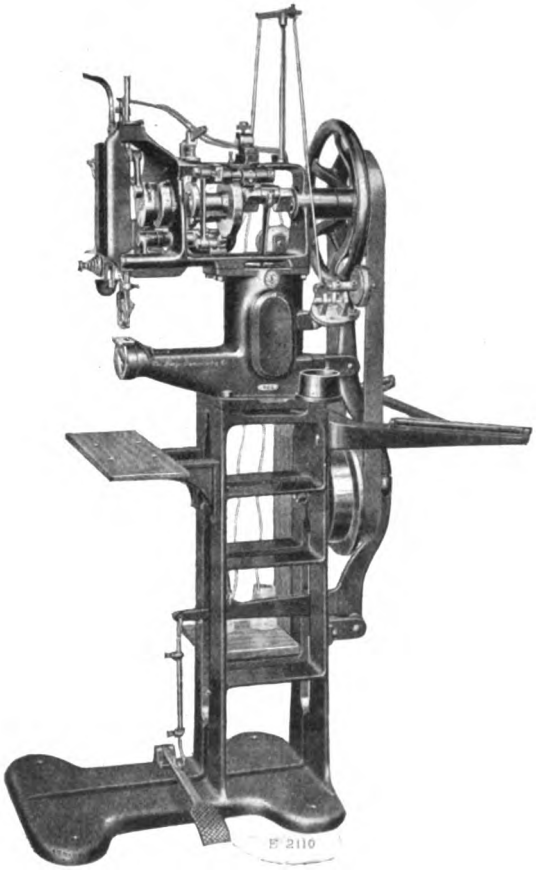
American Electric
COMPANY

STATE AND 64th STREETS **CHICAGO**

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A Machine for Sewing Tire Treads.

Shown herewith is a rear view of machine No. 98-2 manufactured by the Singer Sewing Machine Company, especially for sewing treads on used tires of automobiles, and the usefulness of this machine in any repair-shop is too obvious to need comment. With this machine two old tires can be used to make one re-treaded tire. A tire having a good foundation of fabric and beading is selected and another tire with a sufficiently good rubber exterior is utilized as the tread, after about an inch has been trimmed from each of its clincher edges. The improvised tread is placed outside the "fabric" foundation, and the tread is then stitched on firmly by the machine. To illustrate the work more completely, is shown a section of the re-treaded tire with the firm lock stitches. The first line of stitching is usually made about a half inch from each edge and about half inch space is allowed between the lines of stitching. Many tire repair establishments are making a specialty of reconstructing two old tires which have been discarded by motorists and it has been found a very profitable business. This machine will put the repairman in a position to take up this line of business and it will pay for itself in a very few weeks. The machine is fitted with a Singer Driving Attachment which enables the operator to run the machine by pressure on the treadle. The Singer Sewing Machine Co., which manufactures these machines, has branches in nearly all the large cities of the country, but readers are requested to write for prices and full particulars direct to the Singer Sewing Machine Co., Room 3508, Singer Building, New York City.



Tire Tread Sewing Machine No. 98-2. Rear View.



Section of Retreaded Tire, Showing the Firm Lock Stitches.

The Poor Man's College.

Thomas A. Edison, who ought to be an authority on such matters because he certainly rose from the ranks and is a self-educated man, says, "Instruction by correspondence is the cheapest and best way for the poor man." If this is admitted, it is certainly a great argument in favor of the International Correspondence Schools located at Scranton, Pa. They provide a large variety of correspondence courses, covering almost every technical subject. In this issue of our magazine an advertisement appears from the International Correspondence Schools which contains an application coupon giving you an opportunity to indicate the course in which you would most likely be interested. If this coupon is filled out and mailed to them, they will be glad to furnish full information. Address all correspondence to International Correspondence Schools, Box 7751, Scranton, Pa.

New Car Company at Fostoria, Ohio.

The Fostoria Light Car Company has been recently incorporated with a capital stock of $500,000. They have taken over the holdings of the Fostoria Storm Buggy Company, and they will start with a plant capable of turning out twenty cars per day. They will make five types of cars, touring cars, runabouts, delivery trucks, roadsters and coupes, and their prospects for business appear to be bright.

Old Sol Electric Spotlights.

With these lights you can spot danger by a turn of the wrist, as the lamp may be turned with ease at any angle, enabling the motorist to detect danger on all sides, also to read signboards and house numbers, to supplement dimmed headlights. The device may also be quickly detached and used as a trouble light. The 5-inch model for Ford and other light cars sells for only $3.50, while the 7-inch model for larger cars is sold at $6.50. This is an especially quick seller for dealers, as sales are stimulated by the use of an Old Sol Spotlight Silent Salesman, which is a handsome illustrated colored display stand which is given absolutely free to Old Sol dealers. This is but one of the many benefits to be derived from a real dealer co-operation plan offered by the manufacturers. Write today for full particulars to the Hawthorne Mfg. Co., 4 Spruce Street, Bridgeport, Conn.

The Aerofram.

This is a gasoline saver, which feeds air automatically into the intake manifold after the mixture is formed. One gallon tests have been made on automobiles of ten different makes. The lowest added mileage was 2.4 and the highest 5.7 per gallon. It is also claimed that the Aerofram makes motors run more smoothly when throttled low. A guarantee is packed in every box with this instrument, and money will be refunded if not satisfactory. Good agents are wanted everywhere. The Aerofram retails for only $1, and can be attached to any car in ten minutes. Write for prices and discounts to the Aerofram Co., 755 Boylston Street, Boston, Mass.

Small Trucks to be Made by Standard Company.

The Standard Motor Truck Co. of Detroit, Mich., which has heretofore given its entire attention to the heavy type of trucks, will soon place upon the market a light truck for which there is likely to be a large demand. This will be a new two-ton worm-drive truck. Mr. Vincent Link, formerly truck engineer of the Packard Motor Car Company, designed this new model, which includes many new and original features, yet is standard in design and made up of standard units. For the manufacture of this truck the company has contracted for the extension of their factory building, also for new machinery equipments. These light trucks would make an excellent line for many dealers to handle, and any who are interested should write direct to the manufacturers, the Standard Motor Truck Co., 496-500 Bellevue Avenue, Detroit, Mich.

Edelmann High Grade Automobile Specialties.

A very large line of useful accessories is manufactured by E. Edelmann & Company, 341 East Ohio Street, Chicago, Ill. This line includes the Break-Not Syringe Hydrometer, which is made with new construction, which will eliminate 99 per cent of the breakage. This company also manufactures stationary and adjusting cones for Ford cars, ornamental hub caps for Ford cars, bushings for Ford cars, ball races and retainers also for the Ford car. Ford dealers are especially urged to send for prices and discounts, and every reader of this paper should write for their interesting 1916 catalog, direct to E. Edelmann & Co. at the above address.

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NEW DEPARTURE BALL BEARINGS

American Made for American Trade

Strength — Economy — Service

are imparted to any motor car through their use and eighty-two per cent. of American manufacturers of pleasure cars, trucks and tractors, now use *New Departure Ball Bearings* in their several models.

New Departure Ball Bearings in your car will increase its life, decrease its up-keep cost, add to its comfort and outlive the car itself.

Send for a copy of the "Brown Book"



The New Departure Double Row—A "fool proof" unit carrying *all* the loads and stresses simultaneously from *whatever* direction they may come, with equal efficiency and with a reduction of friction to the vanishing point.

THE NEW DEPARTURE MANUFACTURING CO.

BRISTOL, CONN., U. S. A.

Conrad Patent Licensee

Western Branch: 1016-17 Ford Building, Detroit, Michigan

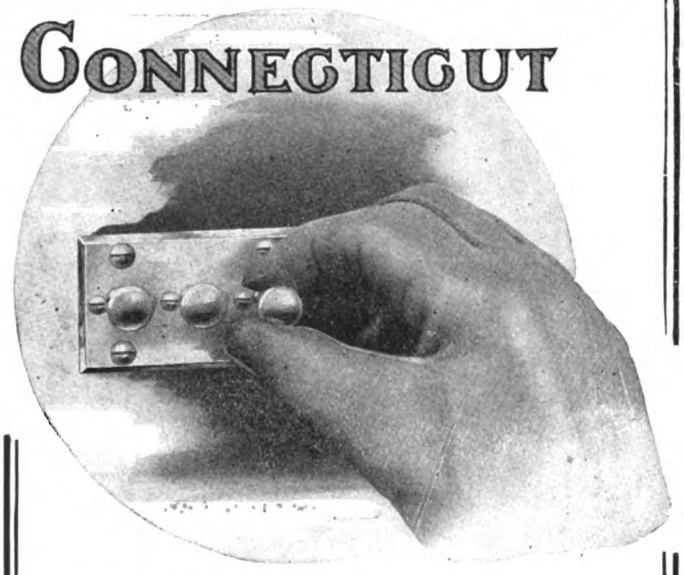
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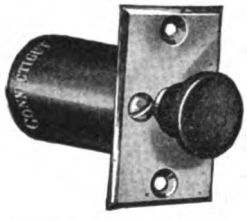
Sole British Agents: Brown Brothers, Ltd., London & Manchester

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CONNECTICUT



Lighting Switches



are the neatest, simplest and most easily installed equipment of their kind on the market.

They are designed to provide every arrangement of lighting control that can be desired.

HEAD LIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

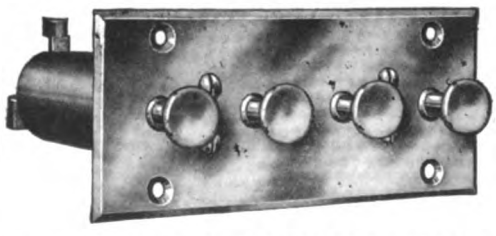
DASH LAMP
Individually of in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practicable arrangement has its switch.

One switch for all lights, individual switches for each, or any choice of functions individual or in combination.

Simple construction insures unending service and satisfaction.

Easily operated with a gauntleted hand.

Trade catalog illustrating and describing full line upon request.



CONNECTICUT TELEPHONE & ELECTRIC COMPANY

MERIDEN, CONN.

COLD WEATHER.

Modern Improvements Make it Easier to Start the Engine.

"The unpleasantness of cold weather starting has been eliminated by better motor design," states F. N. Nutt, chief Engineer of The Haynes Automobile Company, Kokomo, Ind.

"Automobile engineers have done a great deal of experimenting in order to make easier the starting of cold motors. As a result there are cars having carburetors designed in correct relation to the motor, ignition that is reliable even on the lowest motor speed, and easily accessible priming devices.

"Carburetion is naturally a big item for cold weather starting. Gasoline will flow at low temperatures, but its vaporization is difficult to draw into the motor on cold days. Hence, the long intake manifold is practically useless as the gasoline vapor, on striking its cold walls, condenses and flows back to the carburetor. This obstacle has been overcome by having the carburetor directly connected to the cylinder block and therefore at the nearest point to the cylinder chambers.

"Methods to produce carburetion have also undergone changes. Water was used in some instances to flow around the carburetor. The more simple design of using hot air from the motor has superseded this, however, giving better results.

"Ignition is a factor to be considered in easy motor starting. Magnetos are admitted to be reliable when the motor is running at a high speed, but not when it is being turned over slowly by the starter. Dry cells are only reliable when at their full power and to have this requires frequent renewals.

"Low speed ignition that has proven reliable for easy starting has met with success in the generator storage battery system. This method gives a good hot spark at all times and serves the purpose of starting the motor at once even if only a lean gasoline mixture exists.

"The old time method of priming the motor by hand may be replaced by a cowl board control that operates the carburetor in such a manner that the raw gasoline is drawn directly into the motor. Besides the accessibility of the device, more easy starting also is brought about.

"Automobiling is becoming a national sport that is followed at all times by people in all climates. To meet the demand, followers of the sport are becoming critical in their selections, and the car used must be capable of withstanding varying conditions."

Renewed Gears.

Nothing can be done with badly-worn and noisy gears that will effect any appreciable improvement. All that can be done is to run them in fairly heavy lubricant. This will deaden the vibration, but as the noise is the result of backlash between the teeth nothing, except renewal, is of any real use.

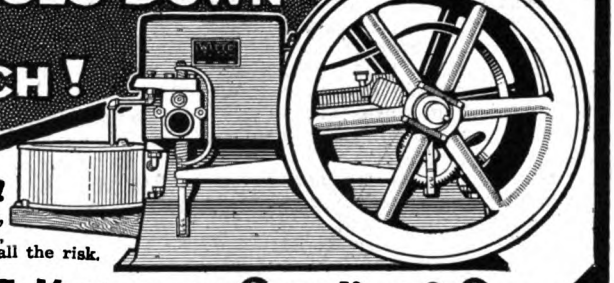
Worn or greasy brake bands should be inspected and tried, and adjustments not delayed but made immediately when needed.

An ordinary match is just the right size to push up the settlings that clog and drain cock on the radiator. But be careful the match does not break off.

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ENGINE PRICES DOWN ANOTHER NOTCH!



Look at these Prices!

2 H-P, $34.95; 4 H-P, $69.75;
6 H-P, $97.75; 8 H-P, $139.65; 12 H-P, $197.00.
Other sizes up to 22 H-P, proportionally low.

Direct from Factory to User!

Why pay two prices for any good engine, or take chances on a poor, or an unknown engine, when the "WITTE" costs so little, and saves you all the risk.

LET ME send you a "WITTE" engine to earn its own cost while you pay for it. It's cheaper than doing without one. I have proved that to thousands who are now WITTE users.
Ed. H. Witte.

WITTE ENGINES, Kerosene, Gasoline & Gas

Stationary, Portable and Saw-rig Styles.

Liberal 5-Year Guaranty CASH OR EASY TERMS.

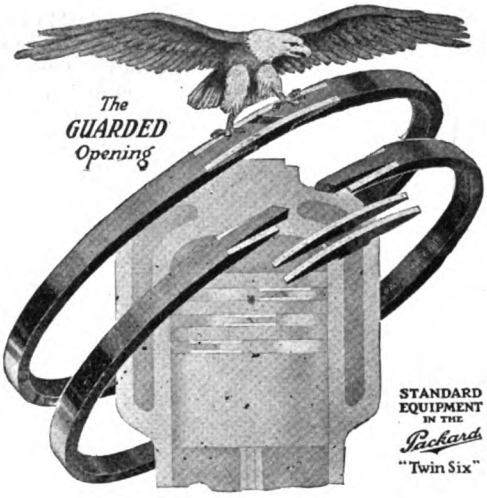
GET your engine from an engine specialist. All my life I have done nothing but make engines. **The success of my customers and nothing else, makes my success.** I've simply got to sell better engines. I can't lose money on an engine and make back the loss on something else. My present big factory has been built up only by my engine quality.

It is cheaper and easier to own a "WITTE" engine than to do without one. My New Offer makes it easier to get the work done by machinery than by muscle or brute power. No need now to get along without a "WITTE."

New Book Free My New Book—the finest in the whole engine business—explains all. It tells you how to be sure in your selection, even if you don't pick a "WITTE." Send me your address today, so I can send you this book FREE with my New Offer.

HOW TO JUDGE AN ENGINE
READ THIS BOOK BEFORE YOU BUY ANY ENGINE
IT IS SENT FREE FOR THE ASKING.

Ed. H. Witte, Witte Engine Works, 2494 Oakland Ave., Kansas City, Mo.
2494 Empire Bldg., Pittsburgh, Pa.



STANDARD EQUIPMENT IN THE Packard "Twin Six"

BURD RINGS

Induce a Material Saving in gas and oil bills. Frequent careful and thorough tests have repeatedly proven that fact beyond question.

But the greatest saving following their installation is not so readily perceived—yet it is highly more important to the car owner than mere waste of fuel and lubricant.

The Metallic Guard, standing sentinel at the ring opening, prevents the formation of carbon resulting from burned lubricating oil in the cylinder. Such destructive carbon formations—carbons that fairly grind away the working parts of the engine—are positively impossible when Burd Rings are used.

Only a sufficient quantity of oil to lubricate the parts is allowed to pass. The surplus simply can't get by. It runs back into the crank case to be used again—not burned.

No motor—old or new—will generate its maximum power, attain its highest speed, operate at minimum cost or continue in service as long as it should unless Burd Ring Equipped.

Burd Ring Performance is warranted. Ask for a copy of the warranty. Its the strongest claim ever made for a piston ring, and it is backed by the largest manufacturer of Patented Piston Rings in the United States.

BRANCHES AND SALES OFFICES

Buffalo, N. Y.	810 Iroquois Bldg.
Chicago Branch	927 Monadnock Blk.
Dallas, Texas	819 Wilson Bldg.
Detroit Branch	736-8 David Whitney Bldg.
Grand Rapids, Mich. Branch	313 Murray Bldg.
Independence, Iowa	Gidney Hotel Bldg.
Kansas City, Mo.	216-217 Rialto Bldg.
Los Angeles, Cal.	316 317 Hass Bldg.
Milwaukee, Wis.	403 Jefferson Bldg.
Minneapolis, Minn.	714 Metropolitan Life Bldg.
Peoria, Ill. Branch	223 Masonic Temple
Portland, Oregon	816-817 Lewis Bldg.
Rochester, N. Y.	254 East Avenue
San Francisco, Cal. Branch	847 Phelan Bldg.
Seattle, Washington	427 Central Bldg.

BURD HIGH COMPRESSION RING CO. Rockford, Illinois

Makes Old Bearings as Good as New.

Old, worn-out annular ball bearings may be made practically as good as new by regrinding, and the Ahlberg Bearing Company, 2643 Michigan Avenue, Chicago, Ill., makes a specialty of this work, which they do accurately, promptly and at a reasonable cost. By having your old bearings reground you can obtain a set of new bearings at one-fifth of what it would cost you for the new goods. The Ahlberg Bearing Co. also carries in stock a full line of new annular, thrust, radax and double row bearings, also high-grade steel balls, and they are in a position to make special bearings from specifications. Correspondence from our readers is invited.

Bell Touring Cars and Roadsters.

An interesting and attractive line of cars is manufactured by the Bell Motor Car Company of York, Pa. Their line includes a light 4 cylinder, 30 H. P. car with 112-inch wheel base, 4-inch tires, genuine leather upholstering, one-man top, full floating axle, spiral bevel, differential gears, high grade lighting and starting system, roomy stream line body designed by an engineer of world-wide experience. This company makes both roadsters and touring cars with these specifications, and they have a well-organized and financed company, and claim to make the most high grade popular priced cars in this country. They have a liberal proposition for dealers and some territory is still open. Correspondence from our readers is invited.

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F-F Magnetic Rectifier.

It has long been the desire to charge small storage batteries from an alternating current and to do it without waste of current or bother. To this end the France Mfg. Co., Cleveland, Ohio have designed the new F-F Magnetic Rectifier, which is a radical departure from anything in this field and sells at a price exceptionally low for an instrument of this kind.

The transformer and magnetic rectifier are firmly mounted on a metallic base and enclosed in a neat case. The entire machine is rigidly constructed, small, compact and readily portable, measuring 5 by 6 by 9 inches and weighing only 12 pounds. It is also simple and foolproof and like an electric motor, has practically no maintenance or depreciation expense. It will run continually at full load and charge the average battery at a cost of from 5 to 15 cents, depending upon the condition and state of charge in the battery. It is perfectly insulated from shock and requires no attention. It is also safe to put a battery on charge over night, because the F-F rectifier automatically stops and starts in case the alternating current should be temporarily interrupted and opens and closes the charging circuit so that the battery cannot discharge through the rectifier. Where it is desired to charge several 6-volt batteries at a time or batteries of higher voltage, two or more rectifiers can be connected together.



New F-F Magnetic Rectifier for Charging Small Batteries from an Alternating Current.

Peerless Piston Rings.

These rings are guaranteed to maintain a tight high compression in spite of any climatic conditions, furnishing a reserve power than can only be proved when you try it. These rings are completely compression-tight and carbon-proof. They are simple, sensible, economical and efficient, and a money-back guarantee goes with each ring. Write for prices and concessions to Larson & Hilker, Distributors, 19 South La Salle Street, Chicago, Ill.

The Neverout Auto Radiator and Garage Heater.

This is a practical heating system which solves the cold garage problem, keeps the automobile warm in the coldest weather and makes the garage comfortable. It is low in price, and eliminates the necessity of a costly heating plant. With this device there is no need of leaking radiators, cracked cylinders, frozen-up bearings, burst water pipes, etc. It is portable, burns kerosene, and is extremely simple in its operation. Readers should write for interesting literature to Rose Mfg. Co., Dept. R, 910 Arch Street, Philadelphia, Pa.

The Carleton No. 68 Generator.

The special attention of readers is directed to this excellent generator, which is an easy solution of lighting problems. It is applicable to any car, cycle, boat or miniature stationary plant, and special brackets are made for Ford, Saxon and Metz cars, with special chain drive for Ford cars when desired. Write for full particulars to The Charlton Company, 180 Summer Street, Boston, Mass.

Mosco Specialties for 1916.

Many of our readers are already familiar with the large line of Mosco specialties, and some of the leaders for 1916 will be the Beamus Ball Contact Timer, also the Loose Plunger Type Wheel Pullers for Ford, Overland, Buick and Maxwell cars, and the Mosco Valve Grinder. This valve grinder is a tool which differs radically from others in many respects, but mainly in the fact that it can safely be used by those unskilled or unexperienced in valve grinding. It is really more of a machine than a hand tool and it renders valve grinding an accurate mechanical operation rather than a guesswork hand job. The price of this valve grinder is only $1.50, bringing it within the reach of every car owner who cares for his own car. For full particulars in regard to this and a very large line of specialties for Ford and other cars all bearing the trade mark name of 'Mosco," write for 1916 free catalog to the Motor Specialties Co., manufacturers, Waltham, Mass.

Electrical Supplies.

A full line of small electrical supplies and parts is manufactured by the Chicago Fuse Mfg. Company of Chicago and New York. This line includes "Union" auto fuses, contact clips, cutouts and boxes. Special electrical parts are made to order by this well known house, and the trade is invited to send blue prints or samples and get them to quote prices. Write for full description of the large line of electrical supplies manufactured by this firm.

Rayntite Folding Water Bucket.

How many times have you passed a water fountain or spring and needed water for your engine, but had no means of conveying the water to your machine? You remember the trouble you had getting a bucket. All such anxiety can now be avoided. The Du Pont Fabrikoid Company of Wilmington, Del., has just introduced a folding water bucket that serves the purpose and yet takes up very little room. It is made of waterproof Rayntite, their top material, and all seams are stitched and cemented with a special adhesive to prevent leaking. The bucket holds one and a half gallons of water and pours easily into the radiator head. Rayntite does not harden and crack, and the bucket may be folded and kept under the rear seat cushion so that it takes up practically no room. The price is 75 cents.

The Beartone for Ford Cars.

This is a horn and fan combined, especially adapted for use on the Ford cars. No gears, motor, battery or wires could give trouble with this horn. It gives a warning signal by merely pushing the button at the driver's seat. The Beartone sounds through the front of the radiator. It increases the efficiency of the fan and motor and keeps the radiator cool. It is easily interchangeable with the regular fan on any Ford in a minute's time. The same manufacturers make the Oakes Kranklock combination starting crank holder and lock and license holder, which makes the car thief-proof. This device holds the starting crank rigid and the license tag securely, and it is especially made for Ford cars. It can be put on easily in a few minutes. There are no holes to drill and it prevents garage employees from using or tampering with the car while in the garage. The Oakes Kranklock sells for 50 cents without padlock, or $1 with a special Yale padlock, and the Beartone retails for $5. A large number of other interesting specialties are made by the same manufacturers, and readers are urged to write for complete description of their entire line to the Oakes Company, Indianapolis, Ind.

A Spark Plug Detector.

The Carter Spark Plug Detector is the latest device now being placed on the market by the Carter Spark Plug Detector Co. of Detroit, Mich. This automatic instrument is very simple in operation and any one not experienced with ignition system of gasoline engines can quickly determine the spark plugs that are firing from those that are missing. This instantly places the motorist at the very root of motor troubles by proving out the spark plugs first, thus finding and replacing the missing ones with clean plugs eliminates the uneven running of the motor. This detector is the latest invention of H. O. Carter, who has designed a number of successful cars during the past ten years. Having found that the prevailing custom among the great majority of gasoline engine users is to condemn the carburetor first, while the ignition system with its complications is the last to be examined.



Carter Spark Plug Detector.

The "Invincible" Blow-Out Patch.

This new patch is described as a wonderful seller for garages and dealers. It solidly binds itself to the fabric of the tire; is attached from the inside and clinched on the outside. The manufacturers state that this is proving a whirlwind profit producer for all garages, dealers and repairmen and you are urged to write immediately for terms to R. B. Hutchinson Co., 323 Penwood Avenue, Wilkinsburg, Pa.

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New and Useful.

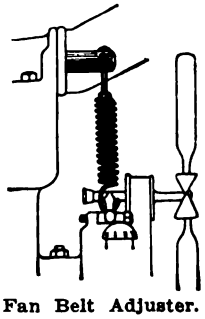
The Auto Parts Company, Providence, R. I., maker of the well known line of Apco specialties for the Ford car, is marketing three new devices which will appeal to owners because of their practicability and moderate cost. Two of the



Belt Retainer.

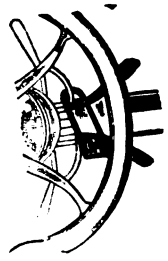
devices are applied to the fan belt assembly, the belt retainer being designed to prevent the belt from jumping or leaving the pulleys. The device is attached to a crankcase bolt and is adjustable to position. It retails at 20 cents.

The automatic fan belt adjuster maintains the proper tension and after instal-



Fan Belt Adjuster.

lation does not require any attention until the belt wears out. The maker claims that it will increase the life and efficiency of the belt, can be easily installed and will prevent rattling of the fan belt assembly. The spring is of imported steel and is guaranteed to operate



Spark and Throttle Lock.

as represented. The device sells for 40 cents. The Apco spark and throttle lock retains the levers in a fully advanced position as shown in the illustration. The device is easily fitted and prevents practical use of the car as the spark is so far advanced that the motor would not operate without danger. The device includes a high grade lock and keys. It retails at 60 cents.

C-Cleer for Safety.

C.-Cleer is a compound for application to the glass of the wind shield, which keeps the glass transparent at all times and prevents the dangerous conditions which often prevail in cold and stormy weather. For safe driving it is necessary to have a clear view of the road through the wind shield, and by using C-Cleer this desirable result can always be obtained. C-Cleer sells for only 25c per can, and should be carried in stock by every dealer in auto supplies. The compound is packed two dozen to a counter display box, and these boxes present a very neat appearance. Dealers are especially urged to write for particulars and discount, and address all correspondence to the Sole Manufacturing Co., New York.

Fowler Quality Searchlights.

These lights are highly recommended by all who have used them. The lamps are made of all brass and will not rust, and each lamp contains a 400 spot light, with a 24 candle-power Mazda Nitrogen Bulb. The Fowler Swivel Joints are made with strong compression coil springs, providing an even tension and always flexible swivel bracket. Any combination of radius and angle, forward, back or to the side, may be obtained, which is not the case with other lamps. Readers who are interested should write for prices and full particulars direct to the general distributors of these lamps, the Monarch Motor Parts Co., 2332 South Michigan Avenue, Chicago, Ill.

White's Permanent Top for Ford Cars.

This is a complete new top for the Ford car. It is described as a perfect limousine top for winter and better than a one-man top for summer. It is light but strong and fits the irons already on the body. It can be attached by anybody without mechanical skill in a few hours' time. It is made of fine warm mohair of best quality. The doors and frame are of wood covered with mohair, giving the entire top a rich, soft appearance. The windows, which are of glass, fit snugly and will not rattle. In short, it is a perfect top for winter motorists who own Ford cars. This top is marketed by the Arsenal Varnish Company, 2501 Fourth Avenue, Rock Island, Ill., and this is the same company which also has a system for the home painting of motor cars. Readers may obtain free of charge, by writing to this company, a big 36-page book, entitled, "The Car Beautiful," which will show how old cars may be improved and renovated without the expense of carrying them to a shop to be repaired and repainted.

Want Business Literature.

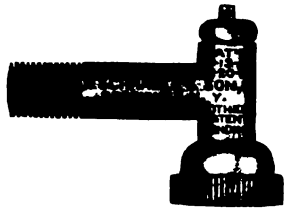
The Cycle and Motor Trade Supply Company, Wiener's Building, Lower Burg Street, Cape Town, South Africa, desires our advertisers who have goods which they could sell, to send them catalogues and price lists. They say they are so far away that it takes a long time after they have written a letter before they get a reply with the literature desired. These people are wholesale dealers and refer to R. G. Dun & Company, of this city, for their financial standing.

New Distributors for Gray & Davis.

The New York branch of Gray & Davis, Inc., formerly located at 245 West 55th Street, has been discontinued. and P. J. Durham Co., Inc., of 244-250 West 49th Street, have been made distributors of all Gray & Davis products for the metropolitan district. The entire stock of the former branch has been transferred to the Durham Co., and a full line of Gray & Davis lamps and Ford electric starters, as well as repair parts for all Gray & Davis starting and lighting systems, will always be kept in stock. H. B. Shontz, formerly with the C. T. Silver Motor Co., and the Willis-Overland Co., have joined forces with the P. J. Durham Co., and will have charge of the sales and other business.

The New Schrader Universal Pump Connection.

In addition to a complete line of their justly famous tire valves, A Schrader's Son are exhibiting the Schrader Universal Tire Pressure Gauge, the Schrader Quick-acting Dust Cap, the Schrader Valve-repair Tool and a new and improved pump-connection which will be in the hands of the jobbers by January 1 and be known as the Schrader Universal Pump Connection. This latest of Schrader products is a patented device, which may be attached to any and all pumps now in use, for inflating automobile, motorcycle or bicycle tires. It screws on the end of the rubber tubing of the pump and connects with the tire-valve by means of a swivel nut. A deflating



pin directly over the vertical arm of the apliance permits the taking of the pressure in the tire while the pump is still attached to the tire and in operation. The motorist pumping up a tire will thereby be saved the labor and annoyance of detaching the pump from the tire to test the degree of its inflation and of re-attaching it in case the tire is found to need more air. The price to the consumer will be 35 cents.

A Profit Producer.

The manufacturers of the Waterhouse Welder state that this outfit is a profit producer for any blacksmith. If you want to be really up to date and get all the best repair work in your neighborhood, you certainly need a welding outfit, and this one is thoroughly reliable, while the complete outfit sells for only $42, with rods and fluxes $4.50 extra. Think of the work you lost last month because you did not have a welding equipment in your shop. This outfit has enabled many blacksmiths to add largely to their incomes and there is no reason why many of our readers should not get the same advantage. Write for full particulars and descriptive literature direct to the Waterhouse Welding Company, 16 Pelham Street, Boston, Mass.

Temporary Injunction Issued.

A temporary injunction has been issued in favor of the Prest-o-lite Co. of Indianapolis, against the Sun-Lite Gas Co. of Louisville, Kentucky, by the U. S. District Court for the Western District of Kentucky. The Louisville company is enjoined against refilling the Prest-o-lite tanks, unless they destroy the identity of the Prest-o-lite cylinders and have them properly branded with the Sun-Lite name.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

AUTOMOBILE MOTORS

SPECIAL DISCOUNT TO DEALERS AND REPAIRMEN

MITCHELL 4-cyl. 4¼x5", 30-35 H.P.	$100.00
OHIO 4-cyl. 30 H.P., 4x5"	100.00
THOMAS 4-cyl. 60 H.P., with Bosch magneto and Stromberg carburetor	150.00
HERSCHELL-SPILLMAN 4-cyl. 30 H.P.	115.00
RUTENBUR 4-cyl. 30 H.P.	115.00
KRIT unit power plant, 22 H.P. with carburetor, Remy uni-sparker, pedal and fan	115.00
OSWALD 4-cyl. 30 H.P	110.00
HERSCHELL-SPILLMAN 40 H.P.	125.00
MUSKEGON 4-cyl. 40 H.P.	125.00
VAN 20, 22 H.P.	75.00
RAMBLER 35 H.P. 4-cyl.	75.00
THOMAS 6-cyl. 90 H.P., 5½x5½", full equipped	250.00
WISCONSIN 6-cylinder 50 H.P., fully equipped	250.00
MITCHELL 6-cyl. 50-60 H.P., with magneto and carburetor	200.00

Our stock of motors is the most complete in the U. S.

Send your specifications. This is only a partial list. Get our 128 page dealers' catalog of parts and supplies.

DEPT. D

AUTO PARTS COMPANY

742 W. Jackson Blvd. Chicago, Illinois

SPECIALS FOR DECEMBER

New 35 H.P. motor, clutch and fan, equipped for Self Starter, for $125.00.
New Michigan 4¼x5¼ motor with fan and carburetor for $157.50.
5-pass. bodies, 92 and 100" long, not upholstered, streamline, each $15.00.
Upholstered, $70.00 and $90.00 each.
60" tread Weston Mott Axles, front and rear, pair, $60.00.
34x4 wheels Q. D. rims, set 4, $12.00.
34x4 Baken Demountable, straight side, set at $22.00. Brown-Lipe transmission with levers, at $48.00.
Pope Toledo motor, 4⅞x5½, second hand, at $65.00. 1,000 ft. ½" secondary cable, 20 ft., $1.00. 2.000 ft., 5/16".
40 asst. spring clips, $2.25.
Rubber magneto wire, 25 ft., $1.00. 200 ⅛.
Priming cups, doz., $1.00. 200, ½x3½, hard spring bolts with grease cups, 6 for $2.00.

We sell everything. Try us.

K. C. AUTO PARTS CO., 1827 McGee St., KANSAS CITY, MO.

WE SPECIALIZE IN SUPPLIES

NOT CARRIED BY OTHERS

Including bearings, $1.00 up; Stromberg and Schebler Carburetors, Springs, Transmissions, Axles, Tops, Motors, Bodies, Windshields, Radiators, Steering Gears, Presto Rings, etc. Order any of this material specified with the distinct understanding that if you are not entirely satisfied you may return it and get your money back.

Send for PRICE WRECKER listing 3000 bargains.

TIMES SQUARE AUTOMOBILE CO.
World's Largest Dealers
S. W. corner 56th Street and Broadway, New York
1210 Michigan Avenue, Chicago, Ill.

BUY WRITE—Get Our New Catalog before placing your orders.
NEW YORK & BROOKLYN AUTO SUPPLY CO.
1717-1719 Broadway Established 1905 **New York**

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete
$25.00 Models
Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00.
Odometers reset to zero, 25c.
All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.

51 West 63rd Street New York, N. Y.

AUTO DEALERS, REPAIR AND GARAGE MEN

We want you to come in and see us when visiting New York Show. Will have some special bargains for you.

(SEE OUR 1916 HAND HORN.)

WESTCHESTER ACCESSORIES COMPANY
1777 BROADWAY NEW YORK CITY
Wholesale Only.

Fore Doors for Open Front Cars

Prices right. A postal will bring particulars. ECONOMY SERVICE CO., 2714 Boulevard Place, Indianapolis, Ind.

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

Auto Accessories

FALL BARGAINS

Black and nickel elec. head lamps, 11¼", $5.85; mechanical hand horns, guaranteed, $2.75; motor-driven elec. horns, guaranteed, $4.65; windshield searchlights, 4½", $4.25; 7½", $6.75; one-man Pantasote and Mohair tops, $26.00; steering gears, $9.00 up; Stromberg carburetors, all models and sizes, $8.00 up; Schebler model B, 1¼", $11.00, model L, 1¼", $8.00; Marvel, Holley or Kingston, 1½" carburetors, $3.00 each; model B Prest-O-Lite tanks, $10.00 each; Stewart model B Speedometers ($50.00 list), $12.50; same with clock and elec. light comb. ($85.00 list), $20.50; magnetos, Bosch DU, 6-cylinder high tension, $52.50; Eisemann high tension EMIR 6-cylinder, $42.50; Splitdorf model D or X, 4-cylinder, $14.75; Splitdorf model Y, 6-cylinder, $16.75; Splitdorf T.S. transformer coils for above, $12.50. Rambler motors, second-hand, thoroughly overhauled, guaranteed to be in perfect condition, all models, $115.00 with carburetor; D.W.F., Hess-Bright, New Departure, Timken, and other standard bearings, new at prices of reground. Send numbers of bearings for prices. Other parts and accessories at equally low prices.

RADIATORS.

Model T, Honeycomb, V-shaped for Ford	$22.50
Buick 16 and 17, Honeycomb	33.50
Buick 16 and 17, tubular	28.50
Buick 10	20.00
Hudson 20, 32 and 33	28.50
Chalmers 30	30.00
Cuttings, models A and B, 40 and T 35	30.00
Colby, models 40 and 50	30.00
Rambler radiators, all models	26.00

Write for prices and other makes.

AUTOMOBILE APPLIANCE COMPANY
1438 Michigan Avenue Chicago, Illinois

ONE MAN TOPS—$20, $25

Fit Fords and others. Top enveloped, $1.
20th CENTURY COMPANY, 1694 Broadway cor. 53d St., N. Y.

ALL TYPES OF BEARINGS

The New Departure Service Station

THE GWILLIAM COMPANY

ENGINEERS
Specialists in Bearings
NEW YORK, 253 West 58th Street, (at Broadway)
PHILADELPHIA, 1314 Arch Street.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Ford Book *Free*

Tells you how to take care of your car. And it tells how to buy your supplies at prices cut to the bone. Besides the amazingly low prices, the quality is absolutely guaranteed. Ask for your Free Copy of Ford Book DR.

General Automobile Supply Company

1671-1673 Broadway New York City

Chatfield Indestructible Tubes

WILL (not) LAST FOREVER

but come mighty near it and don't cost much more than any other good tube. Write us for full particulars.
IT WILL PAY YOU WELL.
CHATFIELD TIRE COMPANY, 312 W. 52nd St., New York City

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Tires

Cut YOUR Tire Bills

Save 75 Per Cent

—USE OUR—

Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

Write us for all other prices and for full particulars.

Be sure to state the bead, whether Q.D., Straight or Clincher.

M. LIBEN & CO.

27A East 110th St. NEW YORK CITY

Branch: 205A W. 48th St., New York City

Double Tread Tires

AT 75% SAVING

GUARANTEED 3500 MILES

Size	Plain	Non-Skid	Size	Plain	Non-Skid
			35x4	$8.00	$8.75
30x3	$5.00	$5.25	36x4	8.00	9.00
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
32x4	7.00	8.00	36x4½	9.00	10.00
33x4	7.50	8.25	37x4½	9.00	10.00
34x4	7.50	8.25	37x5	10.00	11.00

These Tires are absolutely Puncture Proof.

Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER

243a West 56th Street NEW YORK

TIRES

Every Tire User is aware of the great savings by using Double Tread Tires; providing he buys the right kind o. Double Tread Tires of the right kind of people. Buy of us and you know that you get the right kind at the following prices.

30 x 3	$4.50	34 x 4½	$9.00
30 x 3½	5.50	35 x 4½	9.50
32 x 3½	6.50	36 x 4½	9.50
34 x 4	8.00	37 x 4½	10.50
36 x 4	9.00	37 x 5	11.00

One dollar extra for non-skid.

A deposit of 10% is required on all C.O.D. orders. You can save C.O.D. charge by sending a money order. Please specify in order whether Q. D., Clincher or Straight Side desired.

For rebuilding the old tires the price is 40% from above list.

R. K. TIRE CO.

1401 Ridge Avenue PHILADELPHIA, PA.

JANDORF AUTO COMPANY

World's largest dealers in Tires and Tubes. Bargains.

1764 BROADWAY NEW YORK

Tires

SAVE 75%

ON YOUR

TIRE BILLS

BY USING OUR

DOUBLE TREAD TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED 3500 MILES

These are our prices for double tread tires in stock, net. These tires are positively puncture proof.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

We also carry a complete line of new inner tubes. prices as follows:

30x3.....$2.00 30x3½.....$2.25 34x4.....$3.25

For retreading your old tires we charge you 40% off above prices.

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

We carry a full line of 1st and 2nd Tires of all makes. Prices upon request.

Terms: 10% Deposit, Balance C. O. D.

I. JAFFESS

MAIN STORE

1319A Fifth Avenue, New York

BRANCH AT

282A Halsey Street, Newark, N. J.

SAVE YOUR OLD TIRES

AND HAVE THEM

Reclaimed for $2.00 to $4.00

ACCORDING TO SIZE.

SQUARE DEAL TIRE EXCHANGE

247 West 49th Street NEW YORK CITY

Write for catalogue on Double Tread Tires.

Tires Guaranteed

We have at last perfected the Double Tread. It is practically blow-out and puncture proof. Our tires are not sewed on. There are no stitches to cut your inner tubes. Let us send one to you to-day for trial. Money back if not satisfactory.

THESE TIRES AVERAGE ABOUT 5000 MILES.

Size	Tires	Tubes	Size	Tires	Tubes
28x3	$4.50	$1.75	33x4	$9.00	$3.15
30x3	5.00	1.93	34x4	9.75	3.20
30x3½	7.50	2.25	35x4	10.00	3.50
31x3½	7.75	2.25	36x4	10.00	3.58
32x3½	8.00	2.25	34x4½	11.50	3.50
34x3½	8.50	2.50	35x4½	11.75	3.75
30x4	8.00	3.00	36x4½	11.85	4.00
31x4	8.25	3.00	37x4½	12.00	4.50
32x4	8.50	3.15	37x5	14.75	4.75

Tires are sent subject to examination, C. O. D., 10% deposit required. Tubes are guaranteed.

TUXEDO AUTO TIRE EXCHANGE

304 W. 54th Street NEW YORK CITY

Tires

TIRES TIRES

Double Tread Tires

GUARANTEED 3500 Miles

AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY

261A West 54th Street 112A East 110th Street

NEW YORK CITY

The Home of Double-Tread Tires

OLD TIRES RECLAIMED

Making Them Practically Puncture Proof

Why not get 2,000 additional miles out of your old casings, in place of throwing them away? Others are doing it. Why not you? Reclaiming prices sent on request.

COWANS BROTHERS

150 West 55th St. New York

Branch: 815 North Broad St., Philadelphia

SAVE YOUR OLD TIRES

Send us 2 OLD TIRES, one with a good bead and the other with a good tread, and WE WILL COMBINE them by our DOUBLE TREAD SYSTEM into a SOUND ONE for a cost from $2 to $4, according to size.

If you have ONLY ONE tire in this shape we can Furnish you with the Other one at a cost from $4 to $9.

If you have NO OLD TIRES to have remade, you can Order Ready Remade ones, that we carry in stock from $4 to $12.

POSNER & BLOCK

1211A Bedford Ave. BROOKLYN, N. Y.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

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Tires

BIG TIRE BARGAINS

Look at these prices for absolutely new Diamond, Blackstone, Imperial, Pullman and Congress second tires that were originally guaranteed for 3,500 miles.

Size	Plain	Skid	Guar. Tube
30x3	$5.40	$5.65	$1.75
30x3½	6.95	7.35	2.05
32x3½	8.00	8.40	2.15
33x4	11.45	12.00	2.95
34x4	11.65	12.20	3.05
36x4½	16.40	17.22	3.90

Should we not have the tire you order we will send you the next best. All orders must be accompanied by 10 per cent. of the amount of purchase. We have other sizes. Write for prices. Henschel Tire and Rubber Co., 1675 Broadway, New York City.

3,000 TIRES—BIG CUT IN PRICES—Diamond, Empire, American, Mansfield and McGraw Tires. New, fresh stock. Money back if not as represented.

30x3	$6.00	31x4	$12.00	34x4½	$16.50
30x3½	8.00	33x4	12.50	35x4½	16.00
31x3½	8.00	34x4	11.00	36x4½	16.50
32x3½	9.80	35x4	12.00	37x4½	16.50
34x3½	9.00	40x4	16.00	36x5	18.00
30x4	10.00	33x4½	16.00	37x5	20.00

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Davidson Multiple Piston Rings will do that and more.

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The motor will not smoke and you save gas and oil.

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Patents

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G. Street, Washington, D. C. Inventor's Handbook upon request.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

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Patented Ideas Make Money. We Show You How. Send for Free Book.

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FOR SALE.—Set Hassler Shock Absorbers, new, $12.00, for Ford cars; also Connecticut Master Vibrator, used, $4.00. H. Crossley, Ludlow, Vt.

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NEW PISTONS AND RINGS FITTED CORRECTLY
GEARS and other parts to order.
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No-Leak-O Piston Rings.

There is no doubt but what good tight piston rings will increase power, decrease fuel and also decrease the amount of oil used on any motor. The No-Leak-O Piston Rings have a special construction and they are highly recommended by motorists who have used them. They are made with grooves and the volume of oil in the grooves act as a packing against the oil being drawn or forced up into the firing chamber. Perfect lubrication is thus attained without waste. Each ring is guaranteed for quality, accuracy and satisfactory service and the manufacturers state that where these rings are used there will be no smoke in carbon, no oily spark plugs, and no necessity of frequently grinding the valves. Write at once for complete particulars to the Automobile Accessories Co., 816 West North Avenue, Baltimore, Md.

"Little Wonder" Special Battery.

This is a storage battery for your car which well deserves its title of "Little Wonder." The retail price of this battery is only $7.50 and it is claimed that it is equal in value to other batteries that retail for double the money. This battery weighs only 21 pounds and has a 6 volt, 60 ampere hour capacity. A sample battery will be sent to any responsible dealer at the wholesale price for a trial. The battery will also be sent to any automobile owner on receipt of the retail price, or with bank reference one will gladly be sent on trial. The same manufacturers make all sizes of batteries in addition to the "Little Wonder" and will be glad to quote prices. Ask for Seven Important Reasons Why you should own one of these batteries and address all correspondence to the Wright Rapid Fire Storage Battery Co., Tiffany Bldg., 96 Market Street, Poughkeepsie, New York.

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New Rhoades Battery Ignition System.

The New York Coil Company of 338 Pearl Street, New York, have entirely redesigned their Rhoades Battery Ignition System, which they have been marketing for the past six years. This System is particularly adapted to Ford cars, and includes necessary fittings to enable its installation in one hour's time.

The novelty of this ignition device consists of the peculiarly constructed circuit making and breaking mechanism, as but one intense spark is produced for



each ignition, entirely independent of the speed at which the engine is revolving. No spark whatever is produced, should the engine turn in the reverse direction. A further feature of great merit is the fact that the device never stops with the battery circuit closed. Accidental draining of the battery by forgetting to turn off the switch is therefore an impossibility. The makers claim it contains

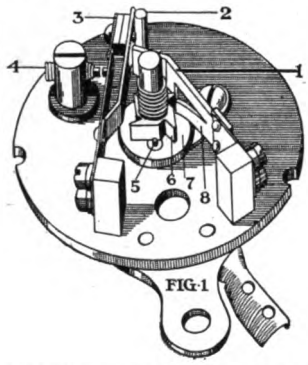


FIG-1

fewer working parts than any other single spark system on the market, which by reference to the cut would seem to be a true assertion.

A hardened steel arm, Fig. 1, is supported on the base by means of a tempered flat spring. Near its center a lip is formed, which is engaged by the cam 6. When the shaft 7 is revolved clock wise, this cam moves the arm outward until it slips off the tooth, when it is returned by the spring, striking the contact, carrying member 3 a sufficiently hard blow to swing in contact with the contact screw 4, closing the circuit for a brief interval, and immediately opening same, which causes the non-vibrating transformer coil to produce an intense flaming spark.

A hardened tool steel pin 5 compels the cam to revolve with the shaft when driven in the proper direction. However, should the engine turn backard the cam remains stationary, as surfaces suitably shaped on under side of cam allow the pin 5 to be forced downward without moving cam, therefore no spark is produced in backward rotation. Glass hardened parts are employed on all wearing surfaces, and as these are of very large dimensions and subjected to a perfect natural mechanical action long life of the device is assured.

The makers state the device has undergone an unusually severe test, extending over a period of one year, and guarantee the system to produce 2,000 to 4,000 miles running on the current supplied by one set of six dry cells. The price is $20 complete, which includes transformer coil, the described instrument and elevating oil type bracket containing cut gears with all necessary cables, wires and fittings, as well as a very neat metal tube, which supports the wires in a neat workmanlike manner above the cylinders.

50 Mends for 50 Cents



Price 50c

Genuine Solder

With an ordinary match it easily mends and solders metals permanently. Used by the housewife, farmer, electrician, automobilist ,moving picture operator, jeweler, merchant and mechanic.

AGENTS WANTED

Show what it will do and it sells itself. Everybody wants SOLDERALL. Send 50c for large tube. Your money back if dissatisfied.

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BRIGHT AS THE SUN
SIMPLE AS A CANDLE
A Flood of Shadowless Light

for every purpose. If we are not represented in your town, write for particulars in profit making deal for dealers and agents.



BRILLIANT GAS LAMP CO., 1009A So. Wabash Ave., Chicago, Ill

Will you give one family a MERRY XMAS DINNER?

We are but your agents—you are the host.

300,000 poor people cheered last Xmas in the U.S. by The Salvation Army.

Help us in this way to get close to these people. Give them at least one happy day in the year.



$2.00 Feeds a Family of Five

Send Donations to Commander Miss Booth
118 West Fourteenth Street, New York City
Western Dept., Commissioner Estill, 108 N. Dearborn St., Chicago

O'Neil Outer Tires

will make your old tires new both in appearance and service. Made of fabric and rubber. Will also make your car ride easier, by increasing the dimensions. Guaranteed 3500 miles. *Send for description and prices.*

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Thos A Edison

Edison is Right!!!

You admit the International Correspondence Schools are a good thing. You'd take a course right now "if"—"except"—

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Wasn't it Edison who stayed up half the night to educate himself in spite of every handicap you could ever have?

All big men who have made their mark in the world had the *ambition*—the *determination*—to improve their spare time, to train themselves for big work. You, too, can possess power, money and happiness if you'll only make the effort. The reward is great—it's worth it.

Here's all we ask: Merely mail this coupon. Put it up to us without paying or promising. Let us send you the details of others' success through the I. C. S., and then decide. Mark and mail this coupon now.

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Explain, without further obligation on my part, how I can qualify for the position before which I mark X

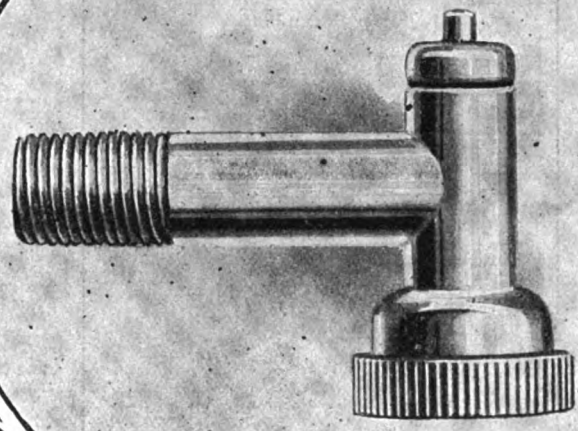
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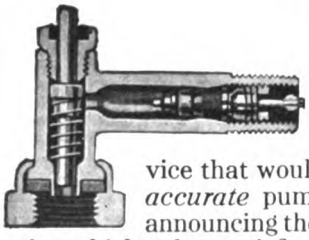
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Street and No._____
City_____ State_____

The makers will be glad to supply detailed information to readers of this Journal.

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Something New





After long study and many experiments to find some attachment or device that would permit quick and at the same time *accurate* pumping up of tires, we take pleasure in announcing the placing on the market a pump connection which at last satisfies us and to which we can lend our name.

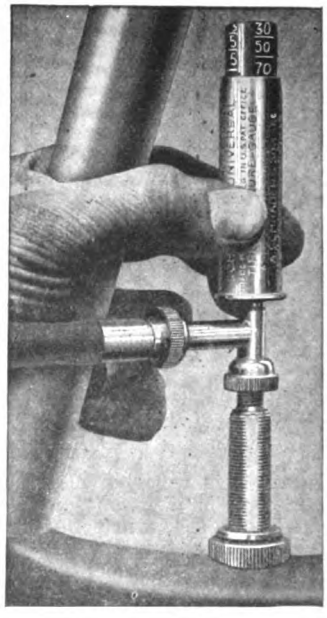
THE NAME SCHRADER is a guarantee of quality.

The new **SCHRADER UNIVERSAL PUMP CONNECTION** is a patented device which may be attached to any and all pumps now in use for inflating automobile or motorcycle or bicycle tires. It screws on to the end of the rubber tubing of the pump, as shown in the illustration, and connects with the tire-valve by means of a simple swivel-nut. In combination with the contact with the tire-valve, is a deflating pin which permits of the pressure in the tire being taken while the pump is still attached to the tire and in operation.

The motorist pumping up a tire will thereby be saved the labor and annoyance of detaching the pump from the tire to test the degree of its inflation and of re-attaching it in case the tire is found to need more air.

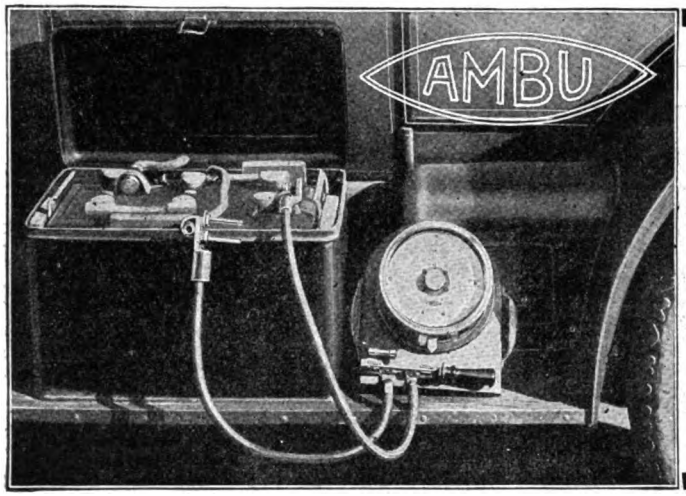
The **SCHRADER UNIVERSAL PUMP CONNECTION,** as the cross-section view will show, is equipped with regular check valves so that in no way can there be any leakage when the pressure gauge is applied. It is offered for sale to the consumer at 35 cents, and extensive advertising in national and automobile magazines will be undertaken to foster and develop the brisk demand already existing.

SCHRADER UNIVERSAL PUMP CONNECTIONS will be in the hands of jobbers after Jan. 1, 1916. If your jobber happens not to have them in stock, please write us direct, (giving his name) and we will see that you are supplied.



A. SCHRADER'S SON, Inc., 785-795 Atlantic Ave., Brooklyn, N. Y.

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You Won't Need to Turn Down Another Electrical Repair Job if You Own

AMBU

TRADE MARK

Electric Trouble Shooter

You have struggled along day after day facing those difficult problems of repair work on the electric starting and lighting systems of automobiles.

Many you could not handle.

You have wasted hours trying to find the trouble.

You have not charged half of what the job is worth.

You have held up the owner's car one or two days because you could not quickly find the trouble and correct it.

You have been handicapped because you have had to depend on **your** knowledge of the various systems in the various cars.

Of course you can't know all about all of them—because there are about 250 places for trouble in every one of 50 or more types and adaptations of starting and lighting systems. Think of it—*a total of 12,500 possible troubles!* No one man can possibly know all of them and locate all of them, but AMBU, the Electric Trouble Shooter, does.

And AMBU will overcome for you all the troubles, all the worries, all the uncertainties you have been through in your attempts to solve difficult jobs of electrical troubles.

AMBU

will positively and accurately detect and locate the trouble in any electrical starting and lighting system standard on any American made automobile.

AMBU is a circular metal instrument easily and quickly attached between the battery and battery cable as shown in the accompanying picture.

The battery is the heart of the starting and lighting system.

AMBU goes right to the seat of the trouble and—

YOU DON'T HAVE TO TEST A HUNDRED PLACES FOR TROUBLE.

Because AMBU finds it at once—definitely, accurately and without guesswork. You read the dial of AMBU just as you read the dial of your watch and you read the truth every time.

Therefore, the possession of AMBU will add to your reputation as an electrical expert. Its business-like appearance, its quick action, will make and hold customers. Your work will bear the stamp of authority.

YOU KNOW WHAT YOU ARE DOING WHEN YOU USE AMBU.

AMBU Service

But AMBU—the instrument—is only one part of the broad, comprehensive service furnished by the American Bureau of Engineering—to make you the leader in the repair of troubles in the electric starting, lighting and ignition systems in automobiles in your community.

AMBU Service is really a complete education in the application, details and workings of the various types of starting and lighting systems as installed in the various makes of motor cars.

AMBU Service consists of AMBU blue-prints—showing the exact layout of every electrical system as applied to automobiles.

AMBU Repair Charts—giving concise and practical working information and complete instructions on how to make repairs quickly and positively.

AMBU Service Bulletins keep you posted on all changes, additions and improvements which may be made in the various systems.

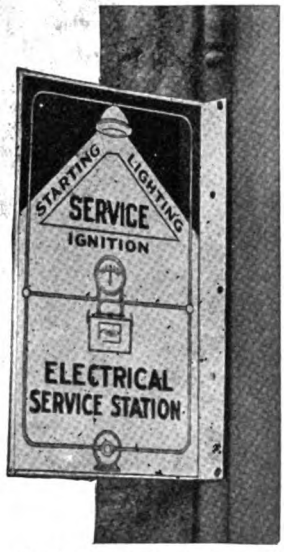
AMBU Engineering Advice—to help you out of any unusual difficulties.

AMBU Instruction Book—compiled by experts gives you a complete working knowledge of the various makes and types of electrical starting, lighting and ignition systems.

The complete AMBU Service contains information impossible for you to obtain in any other way—classified, systematized, readily accessible, and filed in a handsome, substantial metal case with lock—a compact authoritative Service.

The possession of AMBU will benefit you to the extent of hundreds of dollars. It saves hours of time, makes an expert of you—it brings you hundreds of dollars of extra repair work because **you** know **how** to do the work.

With AMBU your garage or repair shop becomes a magnet drawing the desirable trade to you.



The Starting, Lighting and Ignition Service Sign

Your place of business is identified by a handsome, enameled sign furnished by the American Bureau of Engineering.

Car owners will learn to look for garages and repair shops displaying this sign—as the proper place to obtain dependable, authoritative repair work on the electric starting and lighting system.

Think of the quantity of other repair work too which will come your way.

Individualize your garage **now.** Get that trade with AMBU.

Hundreds of repair and garage men are now using AMBU.

If you are not—fill in the convenient coupon today for detailed information regarding this remarkable instrument and service.

American Bureau of Engineering, Inc.

1018-1036 Wabash Avenue, Chicago, Ill.

COUPON—Tear off and mail to-day

American Bureau of Engineering, Automobile Dept.
1018-24 Wabash Ave., Chicago, Ill.
Gentlemen:—I am interested in AMBU Trouble Shooter as advertised in The Automobile Dealer and Repairer. Kindly send me complete details, prices, etc., of your AMBU Service.

Name.....
Address.....
City..... State.....

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THE same superlative merit of the Gould Storage Battery, in use by the greatest armies and navies of the world, has earned for

The GOULD AUTOMOBILE BATTERY

this sobriquet: "The Strong Right Arm of a Starting-Lighting System."

"The Armored Car," a war story by Edward S. Moffat, illustrated by W. H. Foster and C. B. Falls, will be sent upon request.

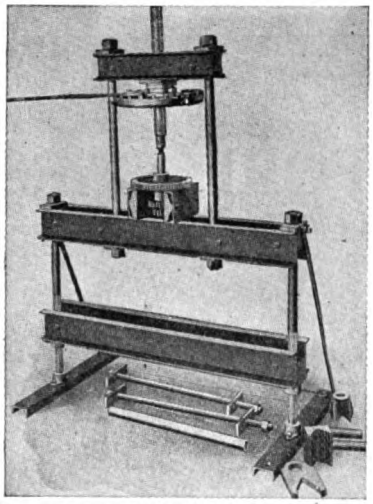
GOULD STORAGE BATTERY CO.
30 East 42d Street, New York
Boston, Philadelphia, Cleveland, Detroit, Chicago,
Los Angeles, San Francisco

Gould
STORAGE BATTERY

The Strong Right Arm
REG U.S. PAT. OFF
of a
STARTING-LIGHTING SYSTEM

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Manley Garage and Shop Equipment



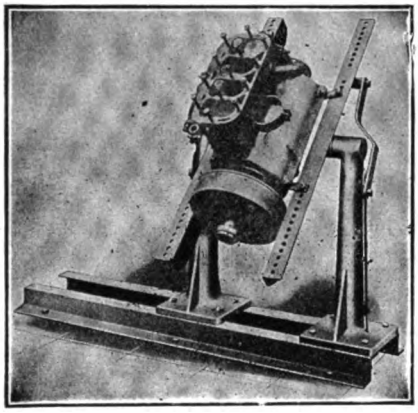
Universal Auto Press

Large Capacity.
42 inches between uprights.

Takes in Largest Truck Wheels. Self Contained, Quick Action. Spin the Hand Wheel until contact is made, then use the powerful lever.

Instantaneous Vertical Adjustment of Lower Table—No Bolts to Remove.

Two Presses in One.



Every Way Engine Stand

The Garageman's Best Asset.

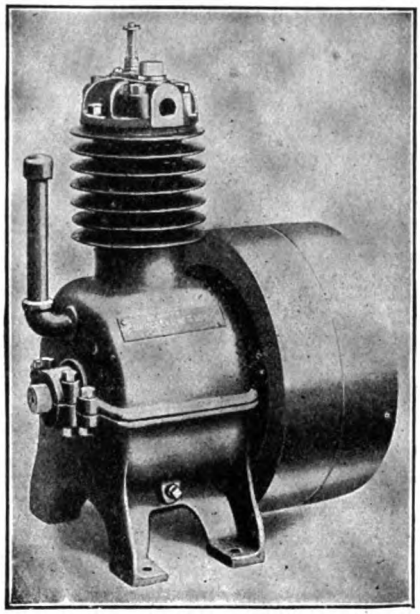
Perfectly Get-at-able for Working on and Mounting Motors.

Designed for Garage Use

Conditions and Service to Handle the Work in the most efficient manner.

Each one a Labor Saving Tool, and Money Makers for the Garage.

The prices are so low you cannot afford to be without them.



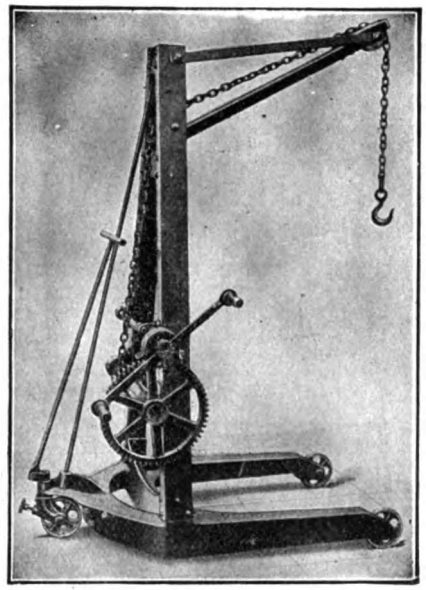
Manley Air Compressors

Single and Compound

Exceptionally Well Built and Rugged Machines. Designed to stand up to Hard Service, having Adjustable Bearings, Heavy Crank Shafts and quiet and efficient valve action.

Built in seven sizes, from 3 cubic feet capacity up. Guaranteed pressures from 300 to 350 lbs.

Send for Complete Catalogue and Prices



Hilite Portable Crane

Powerful Leverage

Double Throw Operating Handle.

Single Hoist Chain, always out of the way of the operator.

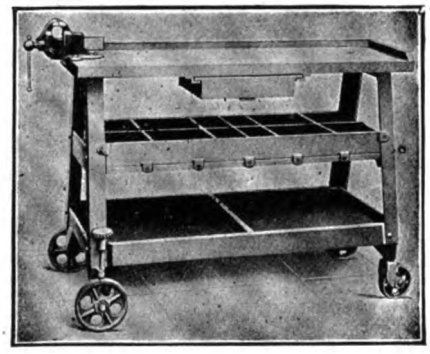
Gears Covered for Safety.

Wheel Lock.

Three Point Suspension for Base, Unbreakable Steel Handle.

Steel Cantilever, Bridge Type Construction.

Strength and Rigidity. Ease of Operation.



Quick Action Portable Table Bench

Independent of the Main Repair Shop. Always Ready.

A Time, Labor and Room Saver.

— MANUFACTURED BY —

The United Engine & Mfg. Co., Hanover, Pa.

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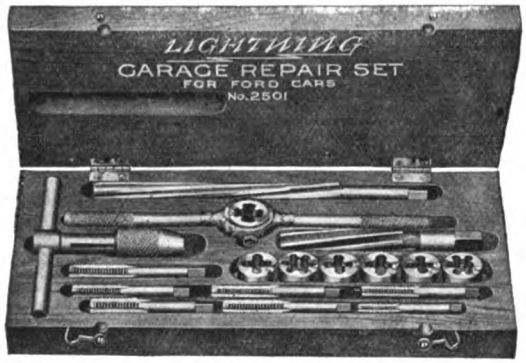
LIGHTNING

GARAGE REPAIR SETS FOR FORD CARS

A complete assortment of taps, dies and reamers has been selected to meet the demand from garages and repair shops, and is based on their experience in handling repairs on Ford cars.

The tools are of

The Celebrated Lightning Quality



which have been in the front rank for nearly 45 years.

Contains:

Screw cutting sizes $\frac{1}{4}^{28}$, $\frac{5}{16}^{24}$ $\frac{3}{8}^{24}$, $\frac{13}{32}^{16}$, $\frac{7}{16}^{20}$, $\frac{7}{16}^{14}$, $\frac{1}{2}^{20}$.

Plug Taps and Round Adjustable Dies.
Spiral Fluted Reamers.
2-in-1 for spindle body and spindle arm bushing.
1 for piston pin bushing.
Stock for Round Adjustable Dies.
"T" Tap Wrench (Adjustable).
Weight 4¼ lbs.

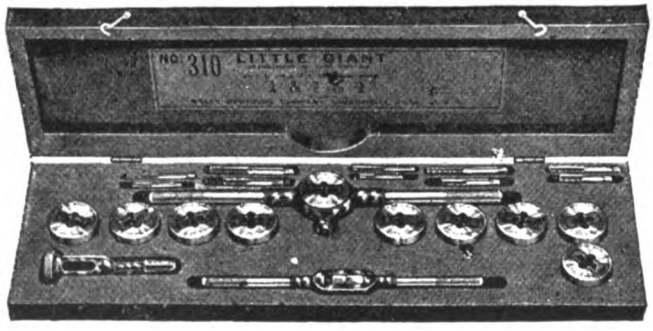
WILEY & RUSSELL MFG. CO. Division

Little Giant COMBINATION ASSORTMENTS

Saves the cost of buying a separate outfit for each thread standard and the annoying duplication of stock and tap wrenches.

Each and every Die in the assortment is contained in its own collet.

A Bit Brace Die Holder is also provided in these assortments for convenience where it is desired to merely run over a slightly battered thread without removing the bolt or screw from its place in the car.



No. 310. 5 CUTTING SIZES

1/4, 5/16, 3/8, 7/16, 1/2. U. S. S. 1/4, 5/16, 3/8, 7/16, 1/2. S. A. E. Stock 14½ in. long. Adjustable Tap Wrench. Dies in 2 in. diameter collets. U. S. Standard Taper Taps. S. A. E. Standard Plug Taps.

No. 311. 8 CUTTING SIZES

1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 3/4. Both U. S. S. and S. A. E. 2 Stocks, 14½ in. long and 23 in. long. 2 Adjustable Tap Wrenches. Dies up to and including ½ in. in 2 in. diameter collets. Sizes larger than ½ in. in 2¾ in. diameter collets. U. S. Standard Taper Taps. S. A. E. Standard Plug Taps.

WELLS BROS. CO. Division

Write at once for catalog describing other screw plates for automobile repairs.

GREENFIELD TAP AND DIE CORPORATION

SCREW CUTTING TOOLS AND MACHINERY

GREENFIELD, MASS.

NEW YORK
28 Warren St.

DETROIT
55-59 Wayne St.

In Canada: WELLS BROTHERS COMPANY OF CANADA, Limited, Galt, Ontario

Little Giant

PHILADELPHIA
36 No. 6th St.

CHICAGO
13 S. Clinton St.

LONDON—149 Queen Victoria St.

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BRAENDER

Trade *Mark*



BRAENDER TIRES and Tubes

will ***not*** be exhibited at the New York Show

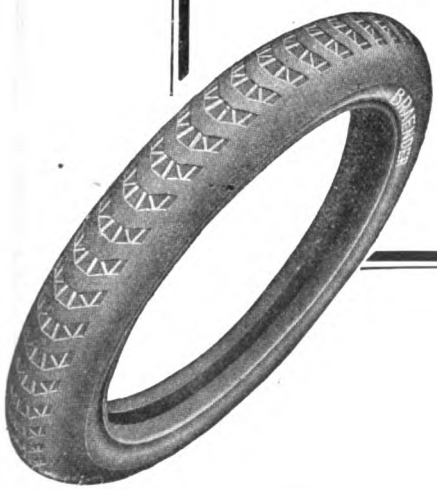
We cordially invite you to call at our New York City Salesrooms 250 W. 54th Street

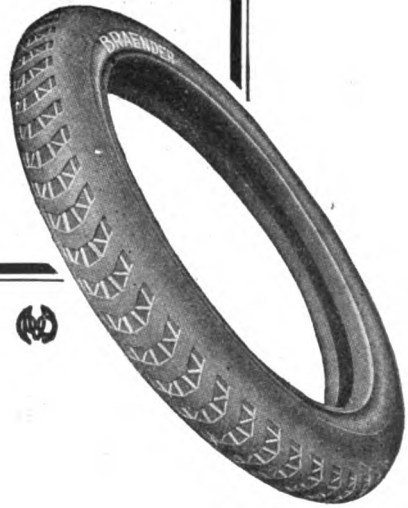
where our complete line of Braender "Bull Dog" Tires (Non-Skid and Plain), Tubes, etc., will be shown.

BRAENDER RUBBER & TIRE CO.

Factory

Rutherford, N. J.





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Perfection in a one-piece ring—at a lower price!

Why pay two prices for a piston ring in two or more pieces, when ***positive gas-tight*** service can be bought in this one-piece ring—at a lower price?

The Inland combines the strength and durability of the eccentric ring; with the uniform radial pressure of the concentric ring, and with all the permanently ***gas-tight*** qualities that any ring can have, of any number of pieces or at any cost.

A continuous ring, cut spirally for half its circumference and heat treated so that the free ends will hug tightly together. The result is a ring that uncoils in expanding, insuring uniform ***gas***-tight pressure and ***continually perfect*** contact with the cylinder walls. You cannot get, at any price, a more perfect gas-tight ring that will STAY gas-tight during the whole life of your engine.

The strongest ring on the market because it is made in one-piece; and because it has no weak or thin places; of uniform width and thickness all around. Made of close grain, elastic cast iron. Easy to install; will not break in handling.

Every Inland Ring is absolutely guaranteed: Money refunded on any ring that fails to give perfect satisfaction after 90 days' trial.

The need of new rings to replace the common type which come with most cars, is evident to any motorist after the first year's running. A set of new ***permanently gas-tight*** rings quickly pays its cost in more power, less carbon, and greatly increased mileage per gallon of gasoline and oil.

Install the Inland because it is perfectly and permanently gas-tight, and because its simple construction allows it to be sold for much less.

Write for illustrated booklet today.

INLAND MACHINE WORKS, 802 Mound St., St. Louis, Mo., U. S. A.

Dealers and Jobbers should write for interesting prices.

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FORD OWNERS TAKE NOTICE!

The New Rhoades Battery Ignition System

For Ford Cars Is Ready



This system is new in its entire construction—in no way resembling our old model (or any prevailing design) yet all necessary qualifications of the Battery Ignition System, operated by six dry cells, are retained. This new Model "L" is a revelation in simplicity, reliability and battery economy—it contains no delicate parts subjected to wear, and will last as long as your car. Its effect on your Ford is indeed remarkable—you will at once notice a tremendous increase in **power, smoothness** and **flexibility** that you have never thought possible.

Your motor will throttle down to a walk, yet at a touch accelerate like a six—unevenly applied jerky power will be absent entirely, in a word your ignition troubles are **ended.** You get the same satisfaction enjoyed by the owner of the most expensive car, as all vibrating coils, their troubles and replacement of parts are **dispensed** with. It is operated entirely by six dry cells which supply sufficient current for 2,000 to 4,000 miles running – leaving the Ford Magneto to furnish lighting current exclusively.

We supply a transformer non-vibrating coil of great power, equipped with **kick switch,** also an oil type elevating gear bracket containing cut bevel gears, upon which is mounted our new sparker, also all cables, wire and cable carrying tube, with instructions that enable you to successfully install in one hour.



PRICE $20.00, thoroughly guaranteed

Attention Dealers

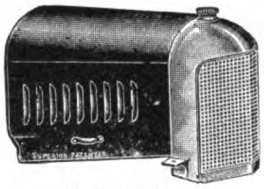
Our New Catalogue with 1916 prices is now ready. Send for copy and cuts. Our line covers real live wire business getters, embracing Master Vibrators, our Automatic Head Light Regulator, Lock Switch, and many other rapid selling accessories for Ford Cars.

NEW YORK COIL COMPANY

338 Pearl Street **New York City**

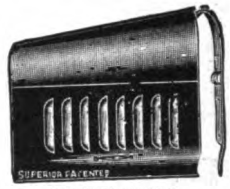
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"SUPERIOR" RADIATORS & HOODS for Ford Cars



"SUPERIOR" HOOD AND RADIATOR OUTFIT No. 12 $40.00 Complete

1916 "Superior" Products FOR FORD CARS LEAD THEM ALL!



"SUPERIOR" MODEL "A" SURE-FIT STREAMLINE HOOD (1912-13-14). $8.00 Complete



"SUPERIOR" Honey-Comb V-Type Radiator Brass, $34.70

START THE SEASON with the right line and you can't go wrong!

Get Our New Prices

REMEMBER—

Quality as well as Quantity still enter into the construction of "SUPERIOR" PRODUCTS

LAMPS HOODS RADIATORS



"SUPERIOR" Straight Front Honey-Comb Radiator Brass, $30.00

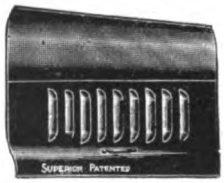
CROWN FENDERS
COMMERCIAL FENDERS
DEMOUNTABLE WHEELS
CONVERTIBLE LAMP BRACKETS
HOOD AND RADIATOR OUTFITS
COWL, ZIG-ZAG AND
VENTILATOR WINDSHIELDS, Etc.



"SUPERIOR" Regular Type Radiator Brass, $15.00

ENORMOUS DAILY SALES PROVE IT!

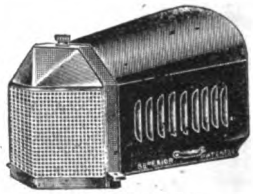
SEND FOR NEW SHEET!



"SUPERIOR" MODEL "B" SURE-FIT STREAMLINE HOOD (1915-16). $8.00 Complete

MR. FORD DEALER!

It's Your Move Next.
We Are Ready To Quote You.
WRITE TODAY.



"SUPERIOR" HOOD AND RADIATOR OUTFIT No. 80 $40.00 Complete

Immediate Delivery

Superior Lamp Mfg. Co. 136 W. 52d St. N.Y.

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"Alive With Power"



MAXWELL TYPE

DEALERS

Do you realize that there are more than one million batteries sold at retail every year and that very few dealers are really pushing them? Do you realize the business you can get by going after this trade with a first class battery?

Detroit Batteries Are Made For Every Car And Starter



STUDEBAKER TYPE

There is a Detroit Battery made for every American car and starter. Detroit Battery dealers can supply any car in their territory. Sales possibilities are limited only by the number of cars. You can get this business if you go after it!

Detroit Batteries Test the Highest

Competitive tests prove the Detroit Battery first in capacity, first in capacity for weight and first in durability. The engineering expert who made the tests says: "Of all the batteries tested the Detroit is clearly ahead in capacity. On the basis of ampere hours per pound it is ahead of the majority by a large margin."



BUICK DELCO TYPE

Detroit Batteries Are Priced Right

All prices are net, printed plainly and mean what they say. There are no shifting discounts, doing away with bargaining methods and exorbitant profits to either manufacturer or dealer. The Detroit policy is based on fair dealing and has the confidence of both dealers and consumers.

Detroit Battery Dealers Are Cashing In On Our Proposition

We have an extraordinary proposition to make to live dealers. Write at once for full particulars. **Early** requests for territory will be given the preference.



OVERLAND TYPE

Detroit Batteries Are Regular Equipment on
Argo, Crow, Princess, Mecca, Moore, Monitor, Niagara,
Denby Truck, Disco Ford Starters and Others.

DETROIT BATTERY COMPANY

DETROIT, U. S. A.

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MATTSON
RUBBER ACCESSORIES



Most Complete Line in the Market

THE MATTSON
SLIP-ON PEDAL PADS
SELL AT SIGHT!

Made for *all models* of Ford and Overland cars

Get acquainted with our line of
HIGH GRADE TIRES

Not How Cheap?
but How Good!!!

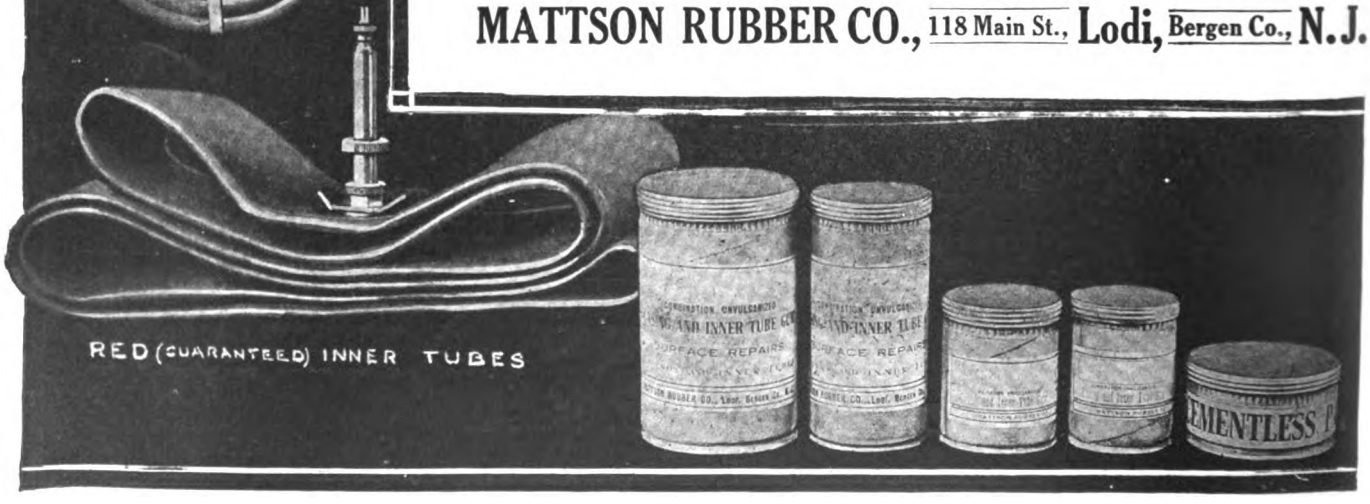
A Rapidly Increasing Line of Enthusiastic Customers Tells the Story
JOIN THEIR RANKS!



We Want LIVE DEALERS
Who Want LIVE TIRES

OUR PRICE LIST—SENT ONLY TO JOBBERS—TELLS THE STORY

MATTSON RUBBER CO., 118 Main St., Lodi, Bergen Co., N.J.

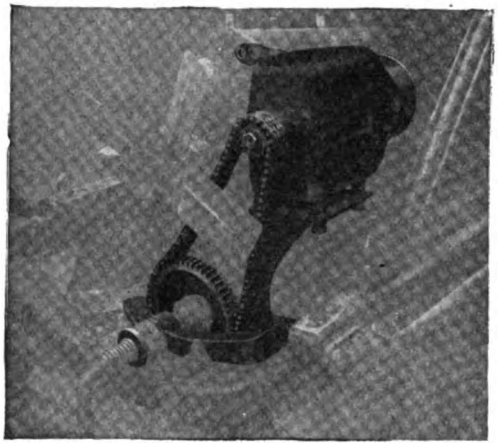


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ELECTRIC
DISCO
SYSTEM

"It SPINS the Motor"

For Starting and Lighting your FORD CAR



Disco Single Unit System, Simple, Light and Reliable.

There is always a start in the Disco. It employs the single unit system, simple, light, easily installed and reliable. It operates on a ***twelve volt current,*** spinning the motor no matter how cold the weather. It charges the battery at a low engine speed, insuring a full charge at all times. It is absolutely automatic in operation; with no adjustments to cause trouble. Its patent yoke bracket insures perfect alignment at all times and prevents chain breakage. It is strongly built and durable, and will give efficient service throughout the life of the car.

Link Up With The Pioneer Ford Starter

The Disco was a pioneer in the electric starter field. Disco equipment is now standard on eighteen American cars. Disco Ford Starters are relieving thousands of owners all over the country of the inconvenience of hand cranking and the old fashioned acetylene lights. Disco dealers are everywhere cashing in on the Disco reputation and are making the profits which come to a good product with a large demand. The Disco factory is amply equipped to make prompt and regular deliveries, and give good service of every kind. We still have some territory for a few more responsible and "live" dealers.



Starts the natural way with a touch of the foot.

$75
Complete,
F. O. B. Detroit

Owners, Dealers, Jobbers, Manufacturers, we have an extraordinary proposition to make. Write at once for full particulars. ***Early*** requests from dealers for territory will be given the preference.

DISCO ELECTRIC STARTER CORPORATION
DETROIT, U. S. A.

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CARBON
HART-BELL
REMOVER

A Success for the Dealer—
A Success with the Car Owner.

IT'S that kind of a proposition—for there's a **real** demand for a **real** carbon remover and car owners were quick to realize the value of the Hart-Bell Carbon Remover. Evidence of this is thousands of orders coming in from all over the country and countless letters of highest endorsement from users.

But we need more live dealers to help us distribute. We do not ask our dealers to buy our goods until they have felt the demand, so we have a special co-operative selling proposition that we will submit to the dealer who believes in being stocked and organized ahead of his competitors.

The HART-BELL CARBON REMOVER is a device for introducing live steam into the cylinders of the motor. Carbon cannot be dissolved, only loosened, and live steam is the best agency for loosening carbon. The carbon is then blown out through the exhaust while the motor is running. The HART-BELL CARBON REMOVER is permanently attached (you can attach it yourself), and can be used as often as desired.

There are two million car owners who will want the HART-BELL CARBON REMOVER just as soon as they hear about it.

A REAL BUSINESS OPPORTUNITY FOR LIVE DEALERS.
Write at once for our co-operative selling plan.

$5.00 COMPLETE

Satisfaction guaranteed or money refunded

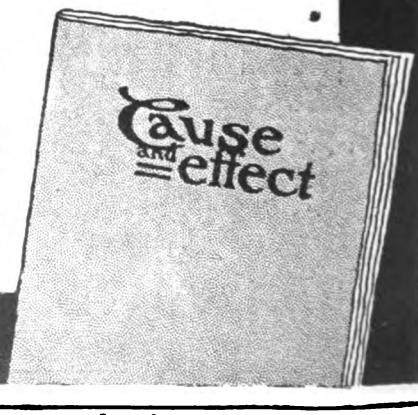
Send for Free Booklet

"Cause and Effect," explaining the merits of the HART-BELL CARBON REMOVER.

See the Hart-Bell Carbon Remover at the Auto Show, at New York, 4th Floor, Booth D-220.

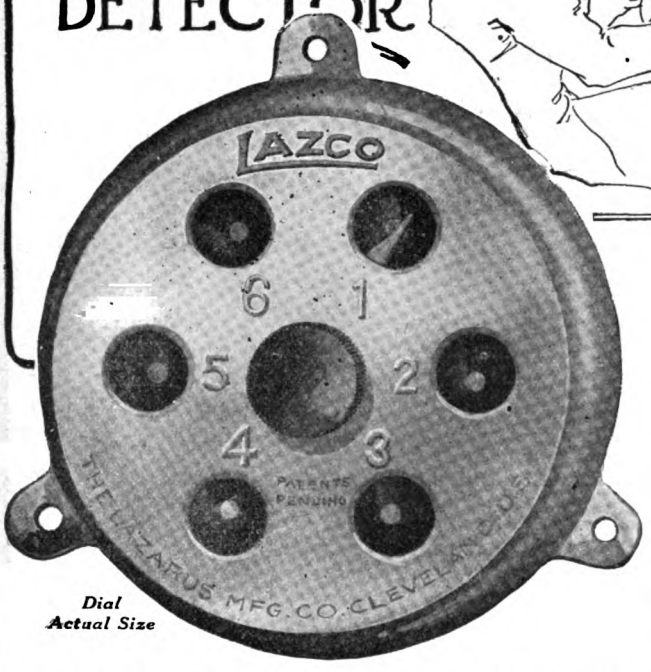
We guarantee that the HART-BELL CARBON REMOVER will do all that is claimed for it, and if found unsatisfactory the full purchase price will be refunded upon return of same, within ten days, to agent from whom it was purchased, or from us if purchased direct. You run no risk whatever.

UTILITY PRODUCTS CO.
1414 TIMES BUILDING NEW YORK CITY

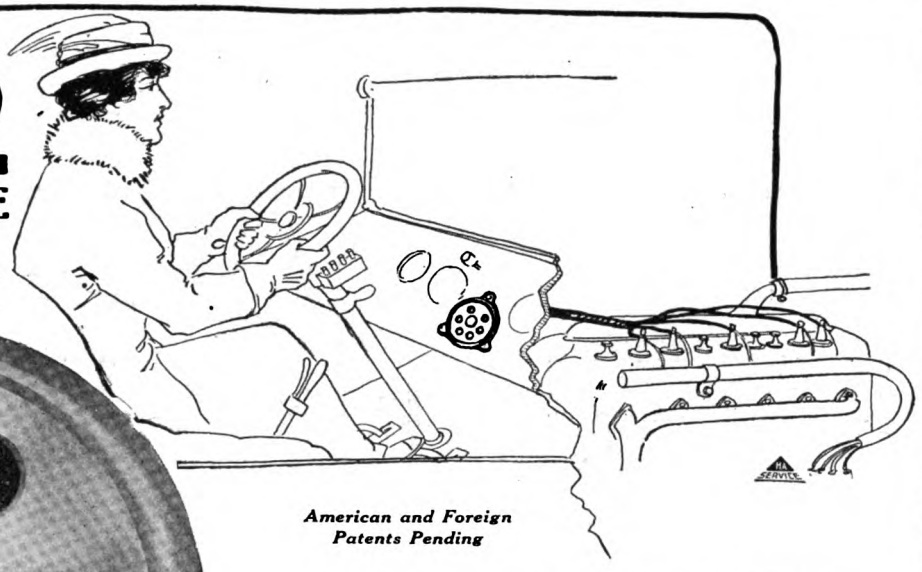


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LAZCO
ENGINE TROUBLE DETECTOR



Dial Actual Size



American and Foreign Patents Pending

"More necessary than the speedometer, more useful than the clock"

Fulfills a positive need in the convenience and economy of motoring. With the Lazco Detector you can quickly locate and determine engine trouble from the dash, without raising the hood. Misfiring cylinders, carbonized or broken spark plugs, faulty ignition, cylinder knocks, battery and magneto difficulties, loose connections, lack of compression, etc., are simply and conveniently investigated and determined with the aid of this ingenious device. No complicated connections. You can install it yourself. The dial is quickly attached to the dash—boring one ¾" hole through which to pass the motor connections. The ONLY DEVICE of its kind and purpose. No motorist can afford to be without one. Shipped complete with all attachments and instructions.

Price Complete $5.00

Order through your dealer or direct.
Full Information, etc., on Request, Dept. R.



LAZCO Products

	PRICE
Engine Trouble Detector	$ 5.00
Lazco Vulcanizer	1.50
Lazco Spring Lubricator (4 Pairs)	2.00
Lazco 2-in-1 Vulcanizer (Large Size)	2.50
Lazco Fire Extinguisher 22"	2.00
Lazco Fire Extinguisher 12"	1.00
Lazco Repair Rubber, 1 lb	1.75
Lazco Electric Vacuum Cleaner	21.50



THE LAZCO VULCANIZER

For Casings and Tubes to 3½" Size, especially adapted for Ford Sizes, a smaller type of our well-known 2-in-1 Vulcanizer—effects perfect vulcanization, either tubes or casings. Automatic in operation. Enclosed flame, safe and sure—in the garage or on the road. Repairs casing cuts while tire is inflated. Complete with roll of Lazco Repair Rubber and instructions. **Price $1.50.**

DEALERS

The Lazco Line offers every advantage to dealers. A wide range of meritorious products—priced right and liberally discounted to the trade.

LAZCO SPRING LUBRICATOR

Cushions the jars, kills the squeaks, minimizes breakage and prevents rust. Automatically distributes the oil evenly and slowly between each leaf of your spring—simple—compact—efficient and easily attached to any make of car.

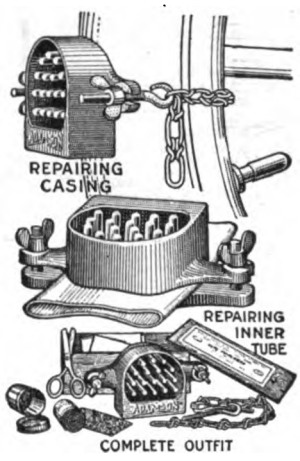
Full Equipment, **PRICE $2.00** (set of eight—4 pairs).

The Lazarus Manufacturing Company, Dept. R

752 Euclid Avenue, CLEVELAND, OHIO

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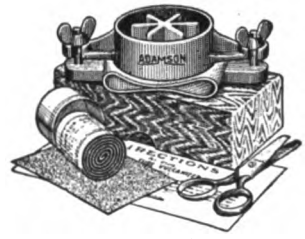
It's Easy to Sell What They All Need—



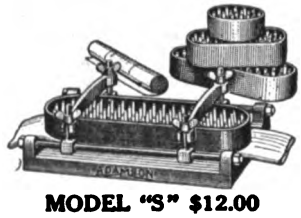
COMPLETE OUTFIT
MODEL "U" $3.00



MODEL "T" $2.00



MODEL "M" $1.50



MODEL "S" $12.00

"ADAMSON" REPAIR GUM



ADAMSON VULCANIZERS

—most economical of all tire insurance

Every Motorist

is a prospective customer. He must face tire repairing sooner or later; and the cheapest and surest kind of quick and lasting repairs is made by ***vulcanizing*** with the "Adamson". No steam or electricity, no watching or regulating; the "Adamson" uses common gasoline and is automatic.

Repairs Instantly

right on the spot, wherever you are. No running on a flat tire and ruining it; no delay; no waiting for a new tube or tire. Do your own work, at a few cents' cost, saving time and money. Repair minor injuries before they grow larger and ruin the tire.

The Simplicity of

"Adamson" vulcanizers keeps their cost down low. No "knack" required; no book of instructions to study; they are safe, sure and easy for ***anyone*** to use.

Over a Million

are now in use—more than all others combined—giving universal satisfaction and creating a demand for ***More "Adamson" Vulcanizers.***

Dealers: Grasp the Big Opportunity

offered by the "Adamson" line for MORE sales and MORE profits. **Write for catalog and Dealers' Proposition.**

Free Booklet—"Repair and Care of Tires"

ADAMSON MANUFACTURING CO.
EAST PALESTINE, OHIO

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White's Permanent Top For Fords

A LIMOUSINE TOP FOR WINTER—BETTER THAN A ONE MAN TOP FOR SUMMER

1915-16 Touring car $65.00, Roadster $50.00
1913-14 Touring car $67.50, Roadster $50.00



For Winter

White's Permanent Top for Fords is a complete new top. It is a perfect limousine top for winter and better than a one man top for summer. Is light but strong and fits the irons already on the body. Anyone can attach this top in a few hours' time.

White's Permanent Top for Fords is made of fine warm mohair of best quality. Doors and frames are of wood covered with mohair, giving entire top a rich soft appearance. Windows are glass, fit snugly and will not rattle. Door handles operate from inside or outside same as on most expensive enclosed bodies. Workmanship is by highest skilled coach makers and trimmers.

For summer use doors and windows are easily removed, making White's Permanent Top a better top than any so-called one man top. Nothing in the way from wind shield to back curtain. Summer side curtains furnished at reasonable price if wanted. This top is manufactured for us by the Geo. White Buggy Co., Rock Island, Ill., builders of high grade vehicles for years.



For Summer

If you desire to use your old top for summer, White's Top is easily removed.

Tops are boxed for shipment in crate 12 inches high. Immediate delivery.

Write for detailed description.
Order direct or through your dealer.

DEALERS—An Agency for White's Top is the best top agency on the market. Sells winter and summer.

ARSENAL VARNISH CO., 2501 4th Ave., Rock Island, Illinois

PAINT YOUR OWN CAR—Save $25 to $50

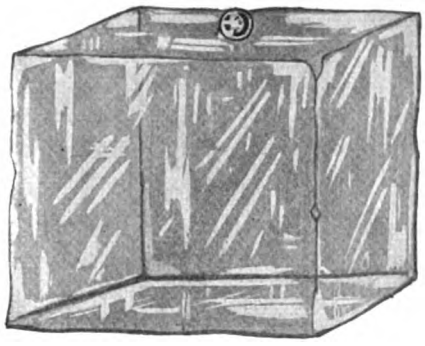
Our big, 36-page book, "THE CAR BEAUTIFUL," is the recognized authority on the Home Painting of Motor Cars. After reading it, you yourself, without previous painting experience, can successfully repaint your car or only revarnish it, or enamel the hood and fenders, enamel or silverplate the lamps, etc., redress the top and cushions, paint the wheels a different color—in fact, do anything you otherwise would have to pay a professional painter big money to do.

During the past eight years, thousands of motorists have successfully painted their own cars with our materials. The Arsenal System of repainting Motor Cars (for novices) is one of the big successes of the industry. DON'T SPEND A CENT FOR PAINTING MATERIALS UNTIL YOU HAVE READ THIS BOOK. Send for your copy today. It is FREE.

ARSENAL VARNISH CO., 2501 4th Ave., Rock Island, Illinois

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Your Motor Will Run As Smoothly In WINTER AS IN SUMMER



A drop of gasoline on a cake of ice—congeals and hangs

MORE POWER

—

LESS GASOLINE

Year 'Round

—

WITH A



A drop of gasoline on a hot griddle—vaporizes immediately

WILMO ONE PIECE COMBINATION MANIFOLD



PRICE $10.00

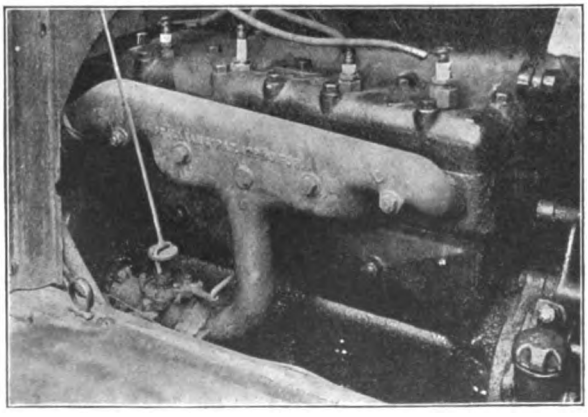
50% Discount on FORDS

Guaranteed Ten Years

QUICKLY and Easily installed. NO CUTTING AND FITTING. Each "WILMO" is specially designed for the Motor on which it is to be used.

Don't you realize a lot of good power is lost by turning the exhaust loose into the air? Put it to work in Your motor.

NOT AN EXPERIMENT :-: THOUSANDS IN USE



FORD SPECIAL, $5.00

Carbon Troubles Entirely Eliminated. Motor More Flexible.

DEALERS and AGENTS

Some good territory still open. How about yours. Write today.

LIBERAL DISCOUNTS

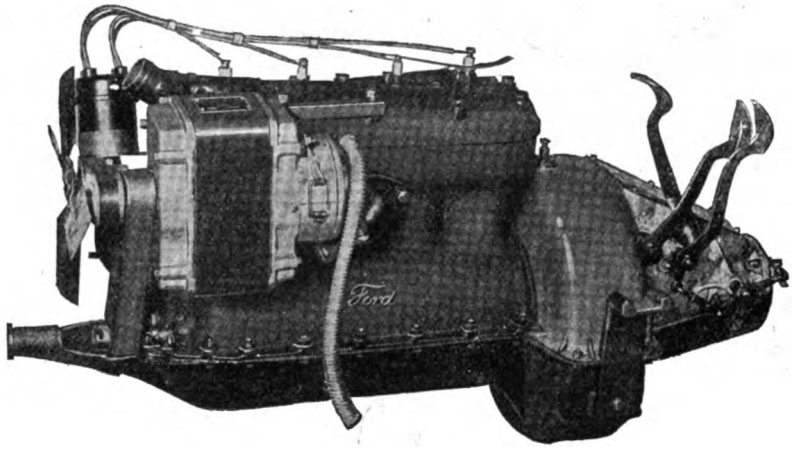
LIVE SELLING PROPOSITION

You can make big money with us.

WILMO CO., 209 South 5th Ave. CHICAGO

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WESTINGHOUSE



Starting-Lighting-Ignition for

Ford Cars

Have You Contracted?

We have commenced shipments of our Starting, Lighting, Ignition Equipment for Ford cars, free from the driving-chain and sprocket troubles heretofore generally experienced.

For several months we have directed our efforts in designing and testing, and manufacturing; we now have a large stock from which to make immediate shipments.

Our perfected equipment includes a silent chain of double previous chain strength, special compensating sprockets, and easily adjusted mounting brackets.

We are now represented by the following distributors, and have an interesting proposition for well established, aggressive accessory houses in territories not assigned. Write us in advance and see us at our exhibit in the New York or Chicago Automobile Shows.

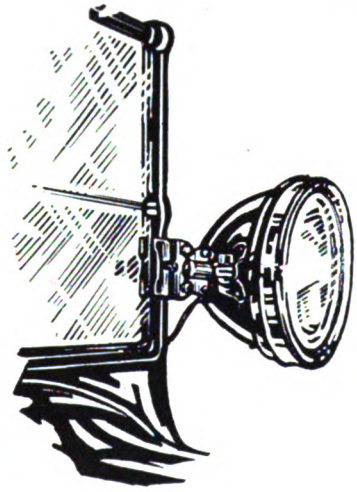
ATLANTA, GA., Ozburn Automobile Supply Co.
BALTIMORE, MD., The Richardson Garage.
BOSTON, MASS., Motor Parts Co.
BUFFALO, N. Y., Motor Parts Co.
CHICAGO, ILL., Motor Car Supply Co.
CLEVELAND, O., The Auto. Elec. Equipment Co.
DENVER, COLO., Shaffer Auto Supply Co.
KANSAS CITY, MO., The Equipment Company.
HOUSTON, TEX., Tel. Electric Co.
MINNEAPOLIS, MINN., Reinhard Brothers Co.
NEW ORLEANS, LA., Shuler Rubber & Supply Co.
OELWEIN, IOWA, Chas. W. Bopp.
OKLAHOMA CITY, OKLA., Severin Tire & Sup. Co.
OMAHA, NEB., Powell Supply Co.
PHILADELPHIA, PA., Motor Parts Co.
PITTSBURGH, PA., Pittsburgh Auto Equipment Co.
SPRINGFIELD, MASS., Motor Parts Co.
ST. LOUIS, MO., Phœnix Automobile Supply Co.
WASHINGTON, D. C., Record Auto Sup. & Ser. Co.
WICHITA FALLS, TEX., Western Auto Supply Co.

Westinghouse Electric & Manufacturing Co.
Automobile Equipment Department. Shadyside Works, Pittsburgh, Pa.

WESTINGHOUSE

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OLD SOL
Electric Spotlights



Spot danger by a turn of the wrist—easily atttached to any windshield

Like many modern and important innovations, Old Sol Electric Spotlights have caused hundreds of motorists to wonder how they ever ventured into the night without one.

Attached to the windshield, an Old Sol Spotlight can be turned with ease at any angle and enables the motorist to detect danger on all sides, read signboards and house numbers, supplement dimmed headlights, and may be quickly detached and used as a trouble light.

No. 70 seven-inch model, complete, $6.50

No. 75—Five-inch model, for Fords and other light cars, complete, $3.50; Nickel Plate Motor Boat Stand, $1.00.

Free to All Old Sol Dealers

Quick sales are further stimulated by the use of an Old Sol Spotlight Silent Salesman—a handsome, illustrated, colored display stand given ABSOLUTELY FREE to Old Sol dealers. This is but one of the many benefits to be derived from a real dealer co-operation plan offered by the manufacturers of the OLD SOL Lighting Systems. ***Write us today.***

Hawthorne Mfg. Co., Inc.

4 Spruce Street BRIDGEPORT, CONN.

Manufacturers of Old Sol Lighting Systems for Automobile, Motorcycle, Motorboat, Carriage, Bicycle and Hand Use.

Pacific Coast Representatives: Bailey-Drake Company, 604 Mission St., San Francisco, California

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Repair Tires—Make Money

The garage that does not repair or vulcanize tires is losing money every day. Every car owner must have his tires vulcanized. Every storage customer is a vulcanizing customer and drives into your garage every day. You don't need to go outside your own door to get the business.

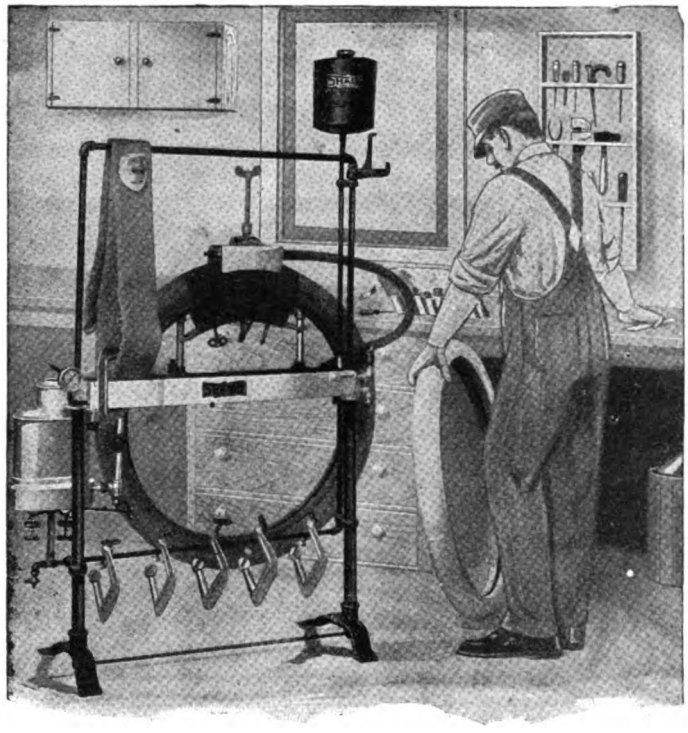
The motoring season is now opening up. It will soon be at its height. From now on tires will need many repairs very often. Be prepared to get this "extra trade." Install in one corner of your garage a

SHALER Vulcanizing Plant $60 Subject To Trade Discount

The auto owner, when he comes to you for supplies, gasoline, oil, etc., and knows that you can repair his tires, will gladly give you the job.

Exclusive tire repair shops who do nothing but vulcanize tires and make big money by it have no such advantage. They must go after every dollar's worth of business. Your business is entirely different because the car owners drive right into your garage every day. You can keep tab on their tires and remind them when vulcanizing is needed.

Give your customers this complete service they like and be ready to repair their tires.



Simple to Operate

Anybody who can clean or adjust a car can operate a Shaler because of the simplicity of Shaler Wrapped Tread Method and Automatic Heat Control.

The Shaler Wrapped Tread Method

The Shaler System has been used successfully by tire makers for many years.
The repair is built up on the inside of the tire without cutting away any good rubber or fabric.
The repair is heated from the inside and outside at the same time so that it cures very quickly.
Less repair material is needed than with any other method.
No airbags are necessary.
All sizes of tires are mended without moulds or extra fixtures.
The tire is not disfigured as by sectional repairs.
The repair is as strong as the rest of the tire.

Automatic Temperature Control

This is an exclusive Shaler feature that keeps the temperature of the vulcanizer exactly at the right point from morning till night without any watching or regulating.
The vulcanizer can't possibly overheat a tire, the operator can use all of his time in preparing repairs because the vulcanizer doesn't need to be watched.

Send the Coupon—Make More Money

You can easily add up to $25 a day to your revenue repairing tires with a Shaler Vulcanizing Plant. Send coupon at once for full details—the low discount price and our book for garages only—"Common Sense About Tire Repairs."

To Accessory Dealers 70 per cent of all the vulcanizers in use are Shaler Vulcanizers. Sell the best—the one that gives the best results. Write for offer.

C. A. Shaler Co., 811 Fourth St., Waupun, Wis.

The Largest Manufacturers of Vulcanizers in the World

Canadian Distributors: John Millen & Sons, Ltd., Toronto, Winnipeg, Montreal, Quebec, Vancouver

Opportunity Coupon

C. A. SHALER CO.
811 Fourth St., Waupun, Wis.

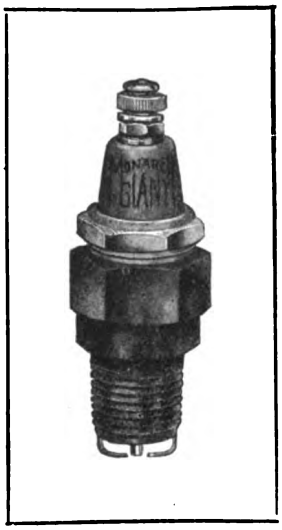
Please send me full particulars about Shaler Vulcanizing Plant, low discount price and book "Common Sense About Tire Repairs."

Name .....

Address .....

.....

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MONARCH
Spark Plugs

Announcement

1916 will be the biggest year in our history.

We are going to hammer our story into the minds of the Mighty Millions. We are going to create a demand for our products by the biggest advertising campaign ever attempted by any Spark Plug Manufacturer. We are going to let every car owner know that MONARCH SPARK PLUGS are on the map.

We will fire our first advertising shot in a very short time. The boom of our guns will be heard everywhere and by everyone.

You, Mr. Dealer, are going to be directly in line for your share of the business that will be created by our advertising. Write us today for details regarding this proposition. It's a real money maker, and you can't afford to overlook it.

Benford Mfg. Co., Mt. Vernon, N. Y.



The Nite-Lite

Searches out DANGER
Reads SIGNS

An Absolute Necessity for Night Driving

21, 40, 50, C. P.
Nitrogen Bulb included

The DETROIT Limousine TOP

For Ford Cars

Write for All Particulars



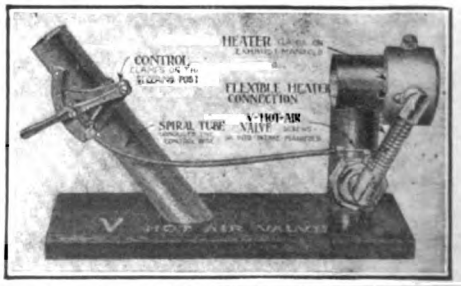
The "Detroit" Top showing operation of Barbour Flexible Doors

The V HOT AIR VALVE

Screws into the intake manifold just above the carburetor so it will admit superheated air into the gas as it passes from the carburetor to the cylinders, PREVENTING ALL CARBURETOR TROUBLES. SAVES ONE GALLON OF GASOLINE OUT OF EVERY FOUR, AT THE SAME TIME INCREASING THE POWER OF YOUR CAR. **WRITE ABOUT THIS TODAY—IT IS IMPORTANT.**

We also carry a general line of accessories.

CARBON REMOVED by oxygen process.

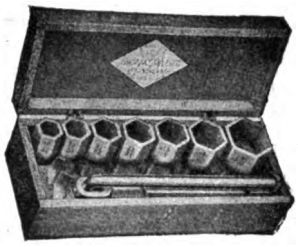


Manufacturers Distributing Company of America

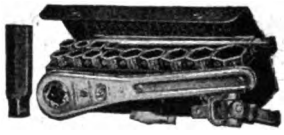
BATTERIES REPAIRED RECHARGED REPLACED

246 West 56th St. NEW YORK

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No. 6 A $2.20



No. 16 $6.00



No. 10 $8.00



No. 14 $12.00

The "Complet-est" Set



Pliers that are absolutely guaranteed.

Ask for Wrench Book No. 181B



Mossberg No. 7—The sturdiest 6 in. wrench 36c



Mossberg Auto Wrenches

8 in., 9 in., and 11 in. long



Thin model small adjusting wrenches

An Ideal Realized

For 18 years Mossberg Co. has faithfully tried to manufacture the most desired wrenches and tools in the best possible grade of material and labor and yet sell them

At Lowest Prices Consistent with an

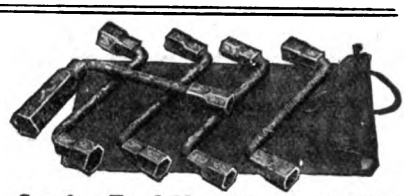
Absolute Guarantee

Judge for yourself if we have not succeeded in considerable degree.

Just write us your wrench troubles. We will be mighty glad to help you all we can.

MOSSBERG

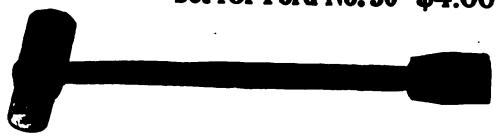
Means Wrench Service



Set for Ford No. 17 $2.00



Set for Ford No. 30 $4.00



No. 630 for Fords 26c



Hub Cap Wrench for Ford, 10c



Ratchet Transmission Wrench for Fords, 50c

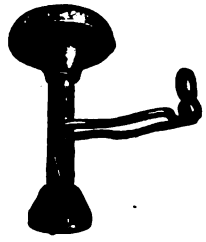


Kit Wrench for Ford 16c



Transmission Wrench for Ford, 12c

Any of these items sent prepaid on receipt of price, if you cannot get them at your dealers.



Valve Grinders for Ford, 25c

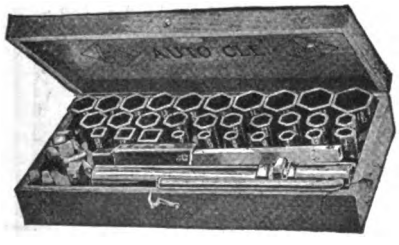
FRANK MOSSBERG CO.

ATTLEBORO, MASS.

LIST OF BRANCH OFFICES.

Chicago, Ill., 180 No. Market St.
Los Angeles, Cal., 504 Equitable Bldg.
Seattle, Wash., 214 Maritime Bldg.
San Francisco, Cal., 425 Underwood Bldg.
Waynesville, N. C.
Dallas, Texas, Box 927.

The Reliable Auto Cle, $10





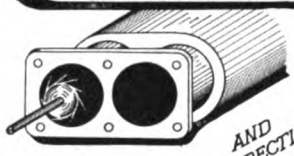
Thin model open end Engineers' Wrenches at really reasonable prices.





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CYLINDER GRINDING



OVER SIZE PISTONS AND CORRECTLY FITTED RINGS



GEARS and SPROCKETS



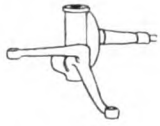


OF EVERY DESCRIPTION

WE CAN DUPLICATE ANY MACHINE PART OF YOUR CAR, DOMESTIC OR FOREIGN.







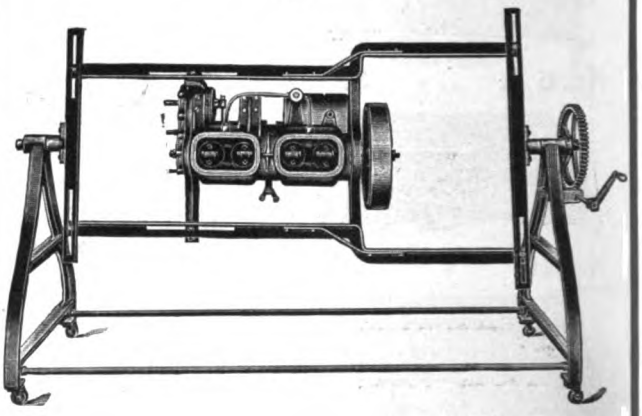
"OUR EXPERIENCE IS YOURS FOR THE ASKING"

NILSON-MILLER CO.

1302 HUDSON ST. HOBOKEN, N.J.

TEL. 36 HOB.

Dolder's Auto Engine Stand



REPAIRMEN: Get away from the time-killing dangerous method of holding motors while repairing them. You can put a motor on Dolder's Engine Stand, turn it in any position you desire and it will lock instantly and securely.

You can do quicker and better work with it than by the old method, and time is money. Write for prices.

The Dolder Manufacturing Co.

EARLVILLE, ILLINOIS



Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

GOLDEN STAR will save you this expense. Contains no acid alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.

INCORPORATED

Kansas City :: Missouri



Gouin ANTI-RATTLERS for Ford Cars and Any Car With or Without Door Jambs

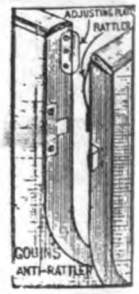
Every FORD owner is interested in this Device as it will stop that troublesome rattle of the car doors.

Send us your check or money order for a set of three for your FORD.

Price, $1.00 or send us $1,25 for a set of four if you have Four Doors and kindly mention your dealer's name.

Dealers, write for our prices and secure your share of this business.

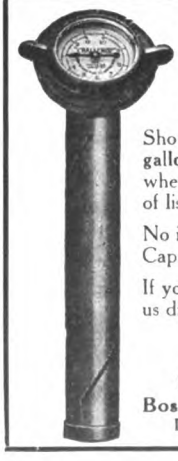
ASK YOUR JOBBER



Manufactured by L. J. GOUIN COMPANY,

14 Roosevelt Ave., POUGHKEEPSIE, N. Y.

CHANSLOR & LYON CO., 1238 Van Ness Avenue, San Francisco, Cal., Distributors for the Pacific Coast.



The "CHALLENGE"

A PERFECT Combination Gasoline Gage and Filler Cap

For FORD CARS

Shows accurately at all times just how many gallons of gasoline are in the tank. Sent anywhere in the United States or Canada on receipt of list price of **$2.00**

No installation required. Takes place of Filler Cap.

Dealers

If your jobber does not carry this gage, write us direct for samples and dealers' proposition.

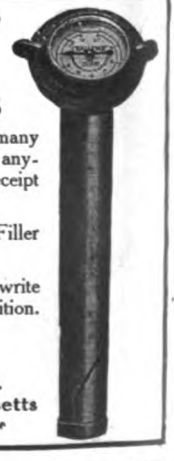
Be sure the gage you sell is a **Challenge.**

Quality Counts

BOSTON AUTO GAGE CO.

Boston Massachusetts

DETROIT OFFICE 1231 Woodward Avenue



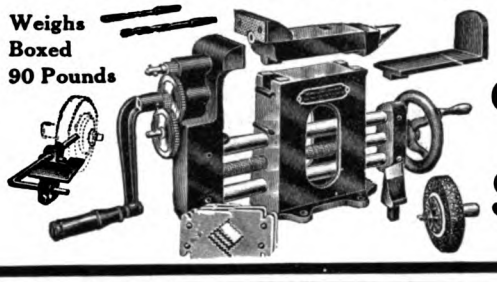
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Try this Repair Outfit

At Our Expense. Every GARAGE, PUBLIC or PRIVATE, needs this BIG, STRONG, COMBINATION OF TOOLS called the

STEWART HANDY WORKER

Weighs Boxed 90 Pounds



Price Complete Only $12.50

If you bought all the tools you get with it, of the same high quality, strength and durability, and the equipment to operate them, they would cost you at least $25 at wholesale price.

A complete, compact workshop that you can attach to a table or bench anywhere about the garage and make it pay you big profits.

NOTE WHAT IT INCLUDES

A strong, practical anvil; powerful vise, up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ inch pipe; a Corundum grinding wheel, 5 inches x 1 inch; a two speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing the handle grip. It operates grinding wheel, buffing wheel and many other similar tools. With the Stewart "Handy Worker" you can do much of your own car repairing, etc., blacksmith work, home repairing, make plumbing repairs, keep knives and other cutting tools sharp and in good working trim.

READ OUR SPECIAL OFFER

Send for one of these great combined outfits today with the understanding that if you don't like it in every way you can ship it back and we will return every cent you paid out. Of all the thousands shipped, not one customer has made a single complaint. It pleases every customer, but our standing offer to return every cent paid out holds good to each purchaser.

SEND ONLY $2.00 WITH YOUR ORDER and pay the balance when it arrives. ORDER TODAY OR WRITE FOR BOOKLET.

CHICAGO FLEXIBLE SHAFT CO., 586 No. La Salle St., Chicago



PARKER-HYDRAULIC Pressed Steel WHEELS for Fords

give you the easiest and quickest demountable rims. Their great strength insures your safety—their light weight reduces unsprung weight, which means a saving in tires and gasoline.

And they cost but $19.75 complete, ready to attach, per set of four, 30x3½ inch wheels with extra tire carrying rim.

Write Today for Illustrated Literature.

THE HYDRAULIC PRESSED STEEL CO.,

3158 East 61st Street, CLEVELAND, OHIO.

You Should Worry About Lubrication!

Pack all bearings and gears with

NON-FLUID OIL

and Forget Friction!

At every point where metal-to-metal contact sets up friction, NON-FLUID OIL inserts a lubricant film which keeps the parts from wearing and makes motor cars run *silently, smoothly, swiftly.*

Packed only in orange-colored cans.

AT ALL DEALERS

N. Y. & N. J. LUBRICANT CO.,

165 Broadway, NEW YORK.

EVENLITE AT ANY SPEED FOR FORD CARS



The EVENLITE is a governor of the "juice" flow from the Magneto. It keeps the lights constant at 6 or 60 miles.

For 1915-16 Ford Cars

with factory-equipped electric headlights

The EVENLITE juice governor is rugged, simple, has no moving parts. Is installed in fifteen minutes, requires no further thought or attention and lasts forever.

Assures a steady, clear light at all speeds equal to the full light of the Magneto at a twenty mile speed.

COMPLETE, with lamps, $3.50
(DISCOUNT TO THE TRADE)

Install one on our GUARANTEE of perfect satisfaction. It will convert all Ford owners.

St. Louis Electrical Works

5405 Easton Avenue, St. Louis, Mo.

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Are You Alive?

If so, you know a little about **EDELMANN HIGH-GRADE AUTOMOBILE SPECIALTIES** but perhaps not all. Let us send you our 1916 catalogue; all live dealers and jobbers want to handle our **specialties** because they are **money makers.**

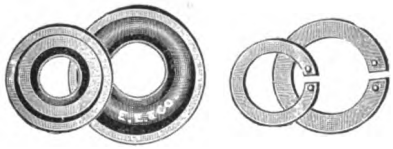
BREAK-NOT SYRINGE HYDROMETER



Note the construction of this new Hydrometer Syringe.
Will eliminate 99% of the breakage.

PRICE - - $1.00

BALL RACES and RETAINERS for FORD Cars



Ford No. 2804.	Outer Ball Race (small), each	10c
Ford No. 2805.	Inner Ball Race (large), each	15c
Ford No. 2806.	Outer Ball Retainer (small), each	3c
Ford No. 2807.	Inner Ball Retainer large), each	5c



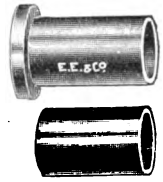
STATIONARY and ADJUSTING CONES for FORD Cars

Ford No. 2704.	Stationary Cone	20c
Ford No. 2705	Adjusting Cone, Right	15c
Ford No. 2706.	Adjusting Cone, Left	15c



No. 56 ORNAMENTAL HUB CAP For FORD Cars

PRICE, POLISHED BRASS, 50c



BUSHINGS for FORD Cars

No. 2713.	Spindle Body Bushing (Pair)	20c
No. 2714.	Spindle Arm Bushing (Each)	10c

FORD DEALERS:—Send for our prices and discounts.

E. EDELMANN & COMPANY - 341 E. Ohio Street, CHICAGO

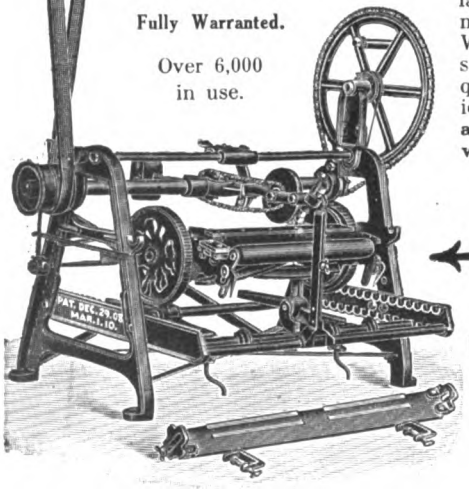
IDEAL
Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Will also grind straight knife without removing from mower. Operated by either hand or power. Ball bearing Alundum Grinding Wheel and Main Shaft. The only practical machine for sharpening Lawn Mowers on the market. Has Skate Sharpener Attachment for sharpening skates.
Write today for full information of this great labor saver and money-maker. Will do the work so much better, quicker and easier, you **cannot afford to do without it.**

Write today.
Don't delay.

Fully Warranted.

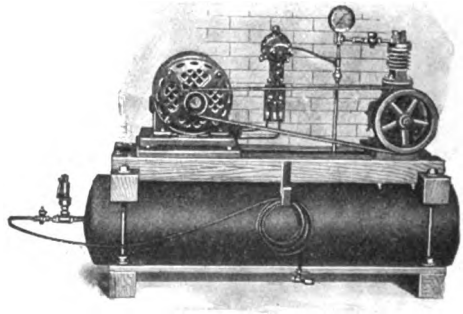
Over 6,000 in use.



THE ROOT-HEATH MFG. CO.,
PLYMOUTH, OHIO.

"You Grind It as You Find It"

The Standard Oil Company
Bought Several Hundred of these



GARDNER FILLER STATION OUTFITS
FOR TIRE FILLING

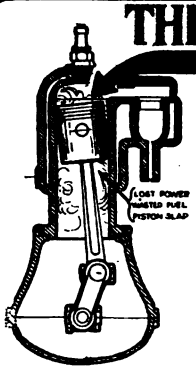
These units passed the Standard Oil Company's tests, were adopted and are giving absolute satisfaction. If they can save money and give the best of service to The Standard Oil Company—why can't they do the same for you?

Just drop us a line for complete information today. It will interest you.

THE GARDNER GOVERNOR COMPANY,
Station R, QUINCY, ILL.

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THIS IS YOUR TROUBLE



WASTED FUEL
LOST ENERGY
PISTON SLAP

When your motor is worn or cylinders scored the explosive pressure will escape down between the sides of the piston and cylinder walls and the fuel used to produce this energy is lost. This condition of your motor causes a waste of fuel, which necessarily increases the cost of operation and causes that misery of nerve-racking noise.

With your cylinders reground and new pistons and rings fitted, your motor will run like new, will have more power, smoother and quieter running. Where the cylinders are scored, we puddle in molten iron and thus retain the original strength of the cylinder walls.

We specialize in this work and have the most modern and complete equipment in the country. This work is done by skilled engine mechanics. Satisfaction is absolutely assured.

AUTO MACHINE WORK, wrist-pins, gears, crank shafts, bushings and valves.

Don't delay—ship your cylinders, or write us.

THE MOTOR ENGINEERING COMPANY
Automobile Engineers, Machinists and Designers
1688 West 3d Street CLEVELAND, OHIO

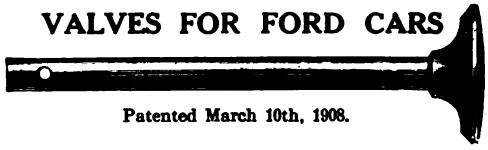
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REPAIRMEN—make your own valves and save money by buying the rough blanks from us; we can furnish you blanks with any size head or stem in quantities to suit you. All blanks have **Cast Iron Heads** and **Carbon Steel Stems** fused by a patent process and guaranteed.

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We can furnish you the **Finished Valve**, if you prefer.

VALVES FOR FORD CARS



Patented March 10th, 1908.

We make them and make them right, all finished complete. A large stock always on hand.

Get Our Prices Before Buying Elsewhere

MICHIGAN ENGINE VALVE CO. - Detroit, Mich.

ROME RADIATORS

offer the utmost in

QUALITY EFFICIENCY
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We Repair and Replace all Makes of Radiators

Large stock of radiators on hand for immediate shipment.

ROME-TURNEY RADIATOR CO.
WHITESBORO STREET
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$57.50
Complete

ANCHOR SEDAN
TOP for Ford Touring Car

"WINTERIZE"

Your FORD CAR with an

ANCHOR SEDAN COUPE TOP

All the comforts of the most luxurious limousine at a cost that is wonderfully low. Our immense factory and facilities make possible these almost unbelievable prices. All windows and doors are glass (not celluloid). Beautiful lines and finish. Perfect fit. No overhang. No rattle. Windows removable in Summer. Everything complete. No extras. Easily attached to regular body.

LOWEST PRICES.

ANCHOR SEDAN COUPE TOP (TOURING) $57.50
(ROADSTER) $47.50

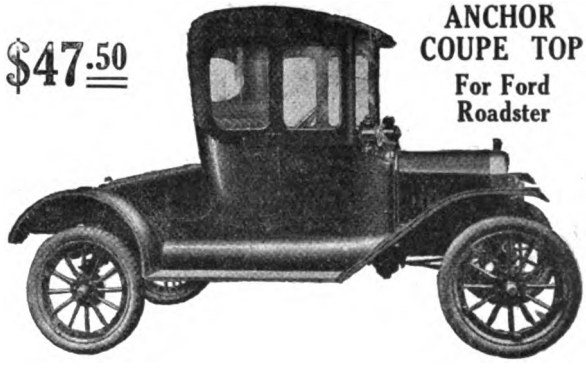
Write to day for illustrations and complete details about these beautiful tops. Now is the time to get one.

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Dept. A. R., CINCINNATI, O.

DEALERS WANTED EVERYWHERE
Ask your bank who we are and write or wire for our proposition.

$47.50

ANCHOR
COUPE TOP
For Ford
Roadster



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AJAX Auto Trunks

We carry in stock trunks for every make of car.



AJAX Lunch Outfits

Lunch kits fitted for 2 to 8 persons. Some styles contain ice chests or fireless cookers.



Ajax Trunk & Sample Case Co.
Our new enlarged plant
144-150 West 18th Street
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BUTLER'S SPECIAL ALLOY PISTONS

only one-third the weight of cast iron and having the same wearing qualities.

QUALITY AND DURABILITY ARE THE BASIC PRINCIPLES

Vibration, Noise, and Wear on Entire Car is Reduced.

Motor develops Higher Efficiency, has Less Carbon, Quicker Pick-Up, More Speed.

Standard and oversize Butler's Special Alloy Pistons for Ford, Buick, Overland and other popular cars at special prices; we can fit any make motor.

Cylinders Ground, and alloy, light semi-cast or standard cast iron pistons fitted.

BUTLER MFG. CO.,

Est. 1897. KNIGHTSTOWN, IND.

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

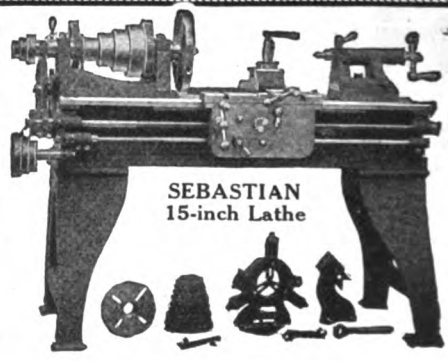
If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

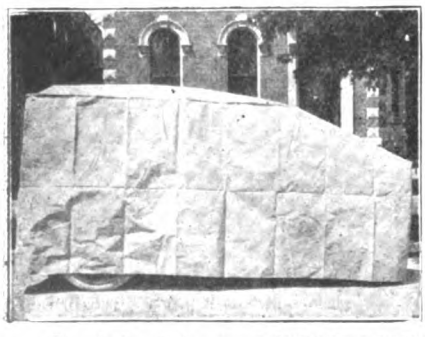
They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.
The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

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KENNEDY AUTO STORAGE COVERS



To meet the need of an inexpensive and efficient cover for automobiles while in dead storage we are making a paper cover, which is proving the right thing for this purpose.

These covers are made of strong heavy paper, properly reinforced to prevent tearing.

They protect the car against dirt, dust and moisture and will prevent the polished portions from tarnishing and the finish from checking in cold weather.

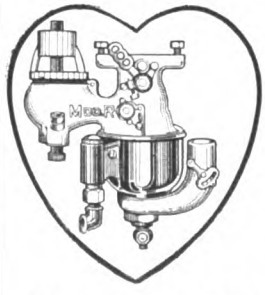
These covers are salable to individual car owners at a good profit as well as to furnish the dealer a protection for his stock of new cars.

We make them in four sizes: 7 PASSENGER, 5 PASSENGER, FORD SPECIAL, ELECTRIC.

Winter will soon be here and dealers can handle these covers with satisfaction and profit. Further information on request.

THE KENNEDY CAR LINER & BAG CO., Shelbyville, Indiana

Make Your Buick More Efficient



THAT'S easy. Thousands say so. Particularly those with new Buicks. Brand new Buicks act brand new longer, and old Buicks take on new life when equipped with

SCHEBLER Carburetors

You'll say "easy," too, when you read how your present carburetor may be turned in on an attractive exchange plan. So write today for Buick proposition. It's FREE.

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"Gemco Insurance"

It's A Good Policy

To Use A Gemco Bumper

And Protect the Front of Car

The front of every car should be protected by a GEMCO BUMPER. It is the most economical and the safest protection. At the same time a Gemco Bumper adds to the appearance of the car. This insurance costs only from $5.00 to $14.00, depending upon the style of Bumper desired, and will last throughout the life of the car.

THE WORLD'S STANDARD BUMPER

The Original End Thrust

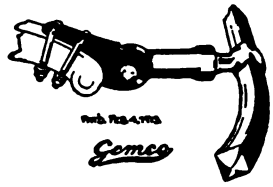
Fits All Standard Cars

No Holes to Drill—Simply Clamps to End of Frame

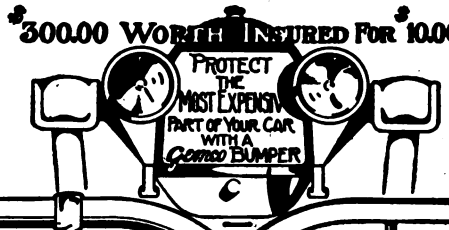
The Universal and Clamp-on Bumpers fit all standard frames. Special Fittings are designed for cars with individual frames, as the Ford, Cadillac, Overland, Hudson, etc. The Bars are furnished in various styles, sizes and finishes with Fittings for EVERY REQUIREMENT. Attractive and Substantial—they are the World's Standard Bumpers.

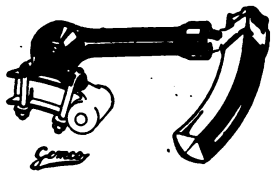
Sold and Recommended By All the Principal Supply Houses—Because They

ARE THE BEST



With Universal Fittings





With Clamp-On Fittings

GEMCO MFG. CO. 656 SO. PIERCE ST. **MILWAUKEE, WIS.**

Firestone Accessories



They are built from the standpoint of men who make tires. They cover every possible motoring emergency—are easy to use and certain to work. Their dependability, backed by our energetic campaign in the Saturday Evening Post and other magazines, is creating a big demand among motorists right now.

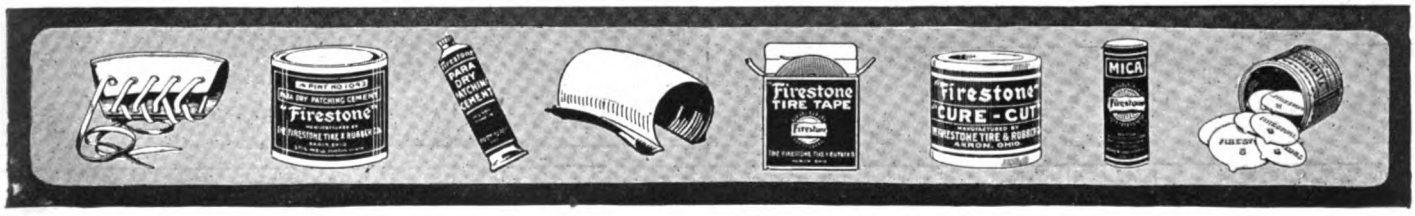
Be ready for the orders. Send for catalog. Here's a partial list

Hook-On Boots for Clincher or Straight Side Tires—Lace-On Boots—Blow-Out Patches—Cementless Tube Patches—"Cure-Cut" Cement—Air Pressure Gauges—Tire Tape—Tire Mica, etc.

FIRESTONE TIRE AND RUBBER COMPANY

"America's Largest Exclusive Tire and Rim Makers"

AKRON, OHIO—Branches and Dealers Everywhere



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THIS IS IT

Actual Size

A GASOLINE SAVER THAT SAVES.

The Aerofram

Which feeds air automatically into the intake manifold after the mixture is formed.

One Gallon Tests Increases the Mileage

on 10 automobiles. The lowest added mileage was 2.4 and the highest 5.7 miles per gallon.

The Aerofram makes motors run more smoothly when throttled low.

A GUARANTEE IN EVERY BOX
Money Refunded If Not Satisfactory

Agents Wanted — Big Discounts

COSTS ONLY ONE DOLLAR

Can be attached to any car in 10 minutes

Nothing to Adjust — Positively Automatic

THE AEROFRAM CO.
755 BOYLSTON ST. - BOSTON, MASS.

HORN and FAN Combined **OAKES**



$5

Gets the road
Cools the motor

No gears, motor, battery or wires to give trouble. Gives warning signal by merely pushing the button at driver's seat. Increases efficiency of fan and motor. Keeps radiator cool. Never fails to sound. Long life. Is easily interchangeable with fan on any Ford in a minute's time. Most reliable and safest horn.



Oakes Kranklock combination starting crank holder and lock and license holder. Make your car thief-proof with this handy and serviceable combination. It holds the starting crank rigid and license tag securely.

Every Ford owner needs one. Can be put on easily in a few minutes. No holes to drill. Prevents garage employees from using or tampering with your car while in garage.

50c Without Padlock

$1.00 with special Yale Padlock.

Made by the makers of the famous Oakes

For FORDS

Any Oakes accessory shipped direct on receipt of price.

Write for complete description of our entire line.

THE OAKES CO., - - INDIANAPOLIS, IND.

Guaranteed for 10,000 Miles



BRICTSON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Brictson Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding too.

Try Them At Our Risk

Give Brictson Tires a free trial on your own car. Put them to test at our expense. Find out why Brictson Tire sales are increasing daily.

Your Tires Rebuilt The Brictson Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blowouts, sidewall breaks, skidding, ruts and oil, and give you thousands of miles of additional service.

Write today for full information about Brictson Tires, Tire Rebuilding, and details of our liberal Free Trial Offer.

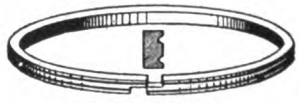
The Brictson Mfg. Co.
1125 Brictson Bldg.
Brookings, South Dakota

Brictson Pneumatic Tires

Self-Lubricating Oil-Grooved

PISTON PACKING RINGS

Fill the Bill



Solve the Problem

Patent Pending

What a wheel is to an automobile, the Oil-Grooved Packing Ring is to the cylinder—let it be gas, gasoline, steam or air.

AGENTS WANTED

Rittenhouse Fleury Company, Sole Manufacturers
304 N. Holliday Street, Baltimore, Md.



The gun you can load.

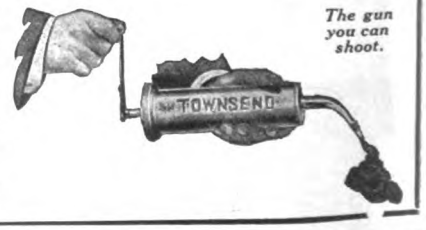
It can be filled— *others cannot.*

It is clean— *others are dirty.*

Easy of Operation— *others difficult*

Fill with a steel paddle, sent with the gun, slip one tube into the other, secure with cap and turn the handle. You can load and shoot a pound in a minute. Not a particle of grease gets on your hands or clothing.

6 Oz., $3.00 8 Oz., $3.50
12 Oz., $4.00 16 Oz., $5.00



The gun you can shoot.

S. P. Townsend & Co.,
Orange, N. J.

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SEE THE DANGER BEHIND YOU



when you are turning a corner, preventing a lot of unnecessary damage to your car, by having a

REAR VIEW MIRROR
ANY SHAPE

This mirror is perfectly round, highly polished, bevel edge, French plate glass, with a universal ball socket on the back of the frame, which allows its being set at any angle, where it will remain absolutely stationary. Also has an extension socket handle, so you can extend it from 5 inches to 12 inches from the windshield.

High grade finish in nickel, all black, black body nickel or brass rim, or all brass.

JOBBERS—Write Today for Prices and Terms

BERGMAN BROS., 1770 Broadway, New York City

Slip a New Roof Over Your Old Ford Frame



If you have a bad or leaky roof on your **Ford Top,** we can furnish a **slip roof outfit** which will make the old Top as good as new. You can easily take the old roof off and put on the new one in 15 minutes. We furnish new Roof, Quarters, Back Stays and Back Curtain with celluloid light, stitched and ready to slip on. Made of 32 oz. rubber for 1912 to 1915 Roadster and Touring Cars. Fit Guaranteed. We also make One-Man and Regulation Tops for Ford Touring Cars and Roadsters.

Write for samples of fabrics and prices, giving model and year of car.

CLEVELAND TOP CO., 3102 Franklin Ave., CLEVELAND, OHIO

!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS,
SMOOTH FORGED OR FINISHED
COMPLETE, READY TO
ASSEMBLE : : : : :
SEND IN YOUR ORDERS

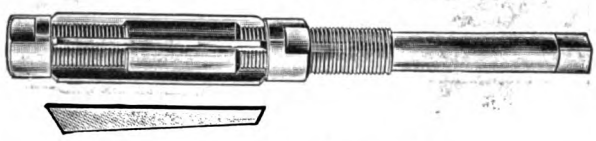
OBENBERGER DROP FORGE COMPANY

(PLANT AT CUDAHY) MILWAUKEE, WIS.

The best made for repair work

The Critchley Expanding Reamer

Try one and you will want more



Reams odd size holes

CHADWICK & TREFETHEN

32 BOW STREET PORTSMOUTH, N. H.

SPITLER PUNCTURE PLUGS

The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

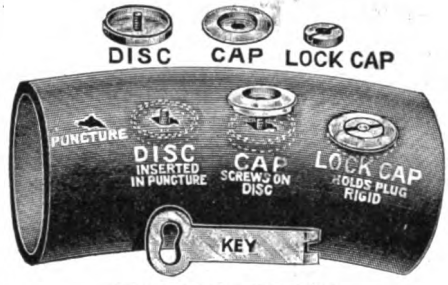
The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.



Write for Circular.

Price—Four to a Set, $1.00.

(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY



Oil on the roadway usually indicates packing that doesn't pack

Any packing in transmission, differential or crank cases that is destroyed by oil, grease, gasoline, hot or cold water is unsuitable for the service, and is sure to not only cause constant trouble, but is also expensive and wasteful of both lubricants and parts lubricated.

Endura Sheet Packing is made especially and only for oil, grease, gasoline, hot and cold water connections, and therefore always assures the user of tight joints in just the places where ordinary packing must fail.

We will gladly mail you free samples and a chart, "How to Pack the Car," if you'll send the coupon.

Endura Mfg. Co., 6305 Eastwick Ave., Philadelphia, Pa.

ENDURA
Special-Purpose Sheet Packing

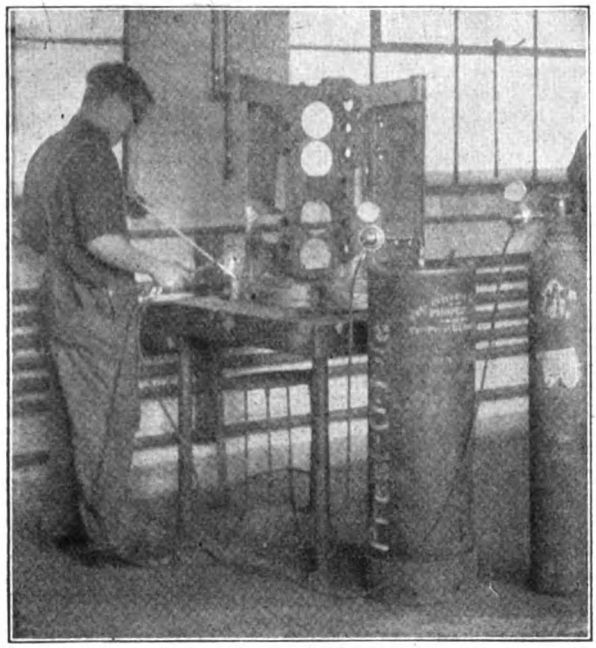
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Oxy-Acetylene Welding and Cutting



Showing the Variety of Work Handled and Simplicity of Apparatus.

Are You Sharing in These Enormous Profits?

Garages, repair shops, and metal working establishments everywhere are finding that in practically every instance where two pieces of metal are to be joined, Oxy-Acetylene welding does the work better, quicker and cheaper than any other process.

Many automobile manufacturers find this method immensely profitable in simplifying the manufacture of intricate metal parts, increasing production and improving quality. Garages are saving the cost of welding equipment many times over by being able to make instant repairs in their own shops.

Any workman of average intelligence can learn to do this work easily and efficiently. We train operators free of charge.

Necessary welding apparatus is very simple and inexpensive. We furnish a thoroughly high grade outfit for $60; (Canada, $75); Acetylene service at additional cost. Adaptable for Oxy-Acetylene cutting with addition of special cutting apparatus.

Prest-O-Lite PROCESS

Employs Prest-O-Light Dissolved Acetylene (ready-made gas) in portable cylinders—backed by Prest-O-Lite Service. Used as conveniently as cylinders of oxygen. Saves large initial outlay and heavy depreciation of making crude acetylene in carbide generators. Perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

START NOW—GET FULL DETAILS

The demand for Oxy-Acetylene Welding Repair work is large and growing. Get your share of the profits. Send for literature that shows how you can apply Oxy-Acetylene welding in your shop, with profits to you and savings for your customers.

The Prest-O-Lite Company, Inc.

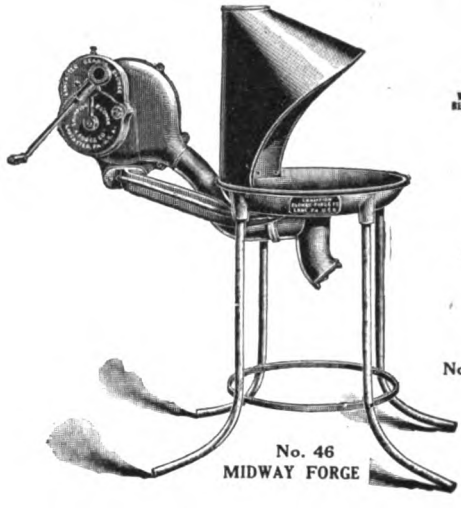
The World's Largest Makers of Dissolved Acetylene

Main Offices and Factory 820 Speedway, Indianapolis, Ind. Canadian Office and Factory Merritton, Ontario.

53 Branches and Charging Plants



Garage Tools of Quality



We manufacture a full line of Garage Forges Drills, Grinders, Screw Plates, Etc., Etc.

Write for our handsome Free 350 page catalog. It means not only a saving in labor but in money. Our tools sell because they satisfy.

CHAMPION BLOWER & FORGE COMPANY
LANCASTER, PENNA.

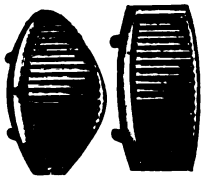
SIMMS High Tension MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers unite in pronouncing Simms Products "Electrical Equipment Par Excellence."

The SIMMS MAGNETO *Co.*
East Orange, N.J.

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To Have Instant Action

PIERCE-ARROW. FORD, CADILLAC

"Perfection"

PEDAL PADS

are a safeguard against ACCIDENT as they prevent the foot from slipping at a critical time. Made to fit all makes and models of cars.

Standard Equipment on

Stutz—National—Owens Magnetic and Lewis Cars

Send for Prices, Etc.

AUTO PEDAL PAD CO., Inc.

792 7th Avenue **New York City**

The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,

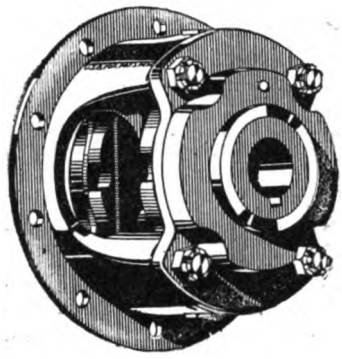
"Worn Out Tires Made New."

Please mention the size of your tires.

TRIPLE TREAD MFG. CO.

1542 MICHIGAN AVENUE **CHICAGO**

Factories: San Francisco, Chicago, Winnipeg



STOP!

Skidding—
Slipping—
Sliding—
Laugh at bad roads

The Bailey Gearless Differential

Power is always delivered to the wheel having traction—the loose wheel doesn't spin around, "sand-papering" the tire. You can pull through slush and mud and sand with ease.

The positive drive to both rear wheels insures you against skidding, slipping or sidesway. Thousands of owners say it adds fifty per cent to safety and comfort.

Ford, Overland and Chevrolet Replacements Now Ready

Owners are quick to see and purchase the Bailey Gearless Differential—our sales have increased five-fold in a few months.

Every sale is on a guaranty of satisfaction or money back in 30 days.

Write for circular and plan of dealer co-operation. The Bailey Gearless Differential is a big thing for the dealer, and getting bigger all the time.

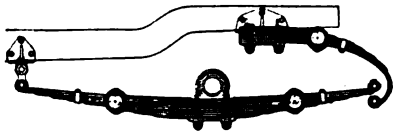
GEARLESS DIFFERENTIAL CO.

866 Woodward Avenue **DETROIT, MICHIGAN**

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Motor Car Supply Co., Chicago, Ill.
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Tri-City Electric Co., Davenport, Iowa
Auto Supply & Tire Co., Wichita, Kansas
Southwick Auto Supply Co., Topeka, Kansas
C. A. Harberg Rubber Co., Wichita, Kansas
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Motor Car Equipment Co., New York City, and Branches
Wood Auto Supply Co., Inc., Utica, N. Y.
Paxton & Gallagher, Omaha, Nebr.
U. S. Automobile Supply Co., Omaha, Nebr.
N. J. Engineering & Supply Co., Passaic, N. J.
M. & M. Supply Company, Cleveland, Ohio
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Capital Electric Co., Salt Lake City, Utah, and Branches
Kilmer & Sons Co., Spokane, Wash.
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Be The BROWN SYSTEM MAN in Your City.

We will advertise you as the Brown System Man. Show your customers why they should oil their auto springs—send them to your place. Big Auto Makers say You Must Oil the Springs. We have the proof and will give it to you. You will have first chance at this money maker which Fits All Makes.

OILS *ALL* SPRINGS FOR 3c.

The Brown System is entirely automatic. No spreading leaves—no jacking up the car—no tools needed—no hard work. **Removes rust—takes out squeaks—makes the car ride easy—lessens spring breakage.**

FREE—Convincing evidence and full particulars for your name. Exhibit at New York, D106-7—and Chicago, 98 Coliseum Gallery—Shows.

BROWN SPRING OILER CO., 6525 Carnegie Ave., Cleveland, Ohio

THE STALIT HEATING PLUG



Eliminates all trouble in starting a motor in cold weather. No priming of the cylinders or tickling the carburetors necessary.

SIMPLY TURN ON THE SWITCH

a minute before starting, after the Stalit Plug has been attached to the inlet manifold,

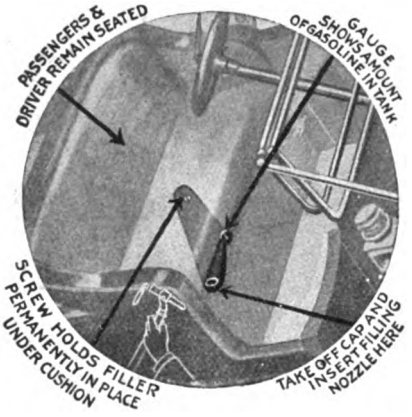
THE AIR IN THE PIPE IS HEATED, AND THE RESULT IS MIRACULOUS

Also indispensable when used in conjunction with the electric starter, as it will save the intense strain due to continuously turning over the cold motor.

YOU GIVE THE ENGINE ONE YANK AND OFF SHE GOES

Write today for prices and terms.

GEO. STAATS & CO., 250 Lorimer St., Brooklyn, N.Y.



A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge. Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline. A Great Comfort Particularly In Stormy Weather.

If You Once Install a *"Fillometer"* You'll Never Part With It

THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

APEX ELECTRIC MFG. CO.,

1410-12 W. 59th STREET, CHICAGO, U. S. A.



The MARKO Terminal Connector

(PATENT APPLIED FOR)

enables the replacement, without difficulty, of Starting and Lighting Storage Batteries, used on the various makes of gasoline cars.

Guaranteed highest quality and lowest prices.

DESCRIPTIVE CIRCULAR ON REQUEST.

PAUL M. MARKO

Office, 1191 BEDFORD AVENUE Factory, 220 CLIFTON PLACE

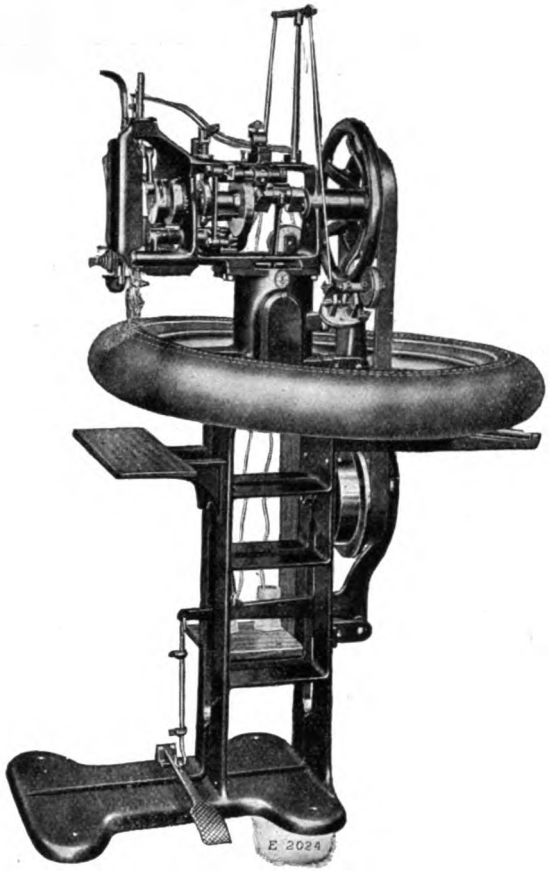
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HYATT QUIET ROLLER BEARINGS

HY-FLEX-ROL

SERVICE BRANCHES
ATLANTA ▼ ▼ ▼ DETROIT
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Singer Machine No. 98-2

THE ONLY PRACTICAL

DOUBLE TREAD TIRE STITCHER

IS THE

SINGER SEWING MACHINE

This machine is especially designed for double tread tire stitching by the largest, the best known and most reliable makers of sewing machines in the world.

BUY THE SINGER

and the retreading of old tires will be quickly and efficiently accomplished with the strongest lock stitch that can be produced.

SATISFACTORY EVERYWHERE

WRITE PROMPTLY TO

SINGER SEWING MACHINE COMPANY

Room 3508 Singer Building

NEW YORK CITY

DEALERS:—

We are the only house in the United States that carries an absolutely COMPLETE LINE of AUTOMOBILE ACCESSORIES. Get acquainted with us and you will soon realize that we are in a position to sell you everything at a big saving.

We sell all our goods under the broad Guarantee of Money Back if you are not satisfied. Send for our "Price Wrecker," quoting on all supplies at cut prices, including tires guaranteed for 4,000 miles.

Specialties Include:

BEARINGS,
BODIES,
CARBURETORS,
CHAINS,
RIMS, CUSHIONS,
HORNS,
GAS TANKS,
GREASE CUPS

VISITING DEALERS:

are especially invited to make our offices their headquarters during their stay in New York. Our establishment is located in the "Heart of Automobile Row," convenient to all hotels, theatres, clubs, etc. ¶ Have your mail addressed in our care. ¶ Stenographers to take any dictation you may have.

Specialties Include:

OIL CUPS,
HOOD CATCHES,
RADIATORS,
JACKS,
LAMPS,
MAGNETOS,
MOTORS,
PISTON RINGS
PUMPS

SEARCHLIGHTS - SPARK PLUGS - TIMERS - TIRES - VIBRATORS - COILS - WINDSHIELDS, Etc.

TIMES SQUARE AUTOMOBILE COMPANY

S. W. COR. 56th ST. and BROADWAY, NEW YORK World's Largest Dealers in Automobile Supplies 1210 MICHIGAN AVE., CHICAGO

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More Money for the Garage Man!

¶ There is more money in repairs to electric starting and lighting equipment than in any other department of the garage business. The demand is enormously increasing.

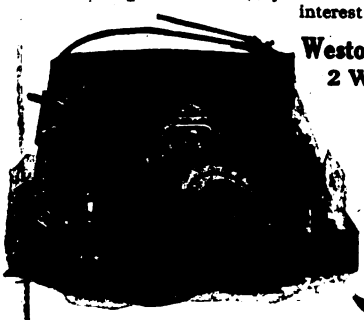
¶ The garage man who is equipped to handle this business will quickly do the biggest business in his locality.

¶ Don't drive your customer to other garages for his electrical adjustment and repairs. If you do, he will take his supply trade with him.

Weston Model 280 **GARAGE TESTING INSTRUMENT**

is the best, the most reliable and therefore the cheapest electrical equipment for you. It enables you to promptly and accurately determine the condition of the electrical equipment of any automobile, just where the trouble is, and just how to remedy it.

¶ We will make you a SPECIAL PROPOSITION that will interest you greatly. *Write us today.*



Weston Electrical Instrument Co.
2 Weston Ave., Newark, N. J.

New York, Boston, Philadelphia, Buffalo, Richmond, Denver, Chicago, Detroit, Cleveland, Cincinnati, St. Louis, San Francisco, Montreal, Vancouver, Toronto, Winnipeg, Florence, Paris, London, Petrograd, Johannesburg, S. Africa

AT THE SHOW

STEVENS & COMPANY
will exhibit as usual at the

1916 AUTOMOBILE SHOWS

We will be glad to meet our old friends and those interested in our lines for the coming season.

A number of new Accessories will be exhibited for the first time.

BE SURE TO LOOK US UP

BOOTH—D-214,
Grand Central Palace, New York.

BOOTHS—188-190,
Coliseum, Chicago.

STEVENS & COMPANY

Manufacturers of high-grade Accessories and Specialties

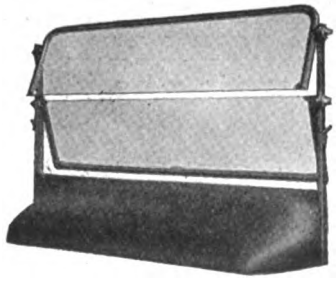
375 Broadway, NEW YORK, N. Y.

CONOVER COWL-WINDSHIELDS ON FORD CARS

Combined Cowl and shield as shown f. o. b. Adrian, Mich. **$15**

Rain Vision, Ventilating, Clear View

Used on 1912, 1913, 1914 and early 1915 Model T.



← This cowl gives a STREAM-LINE effect and makes your car look like the new model.

Also our **UNIVERSAL WINDSHIELD** →
for 1915-16 NEW COWL DASH FORD

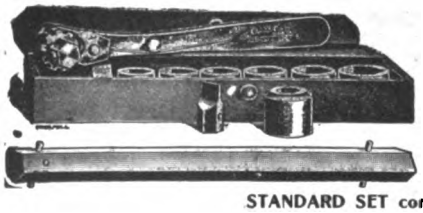
A rain vision ventilating shield that brings your new Ford right up to date. **Send for circular.**

Complete with brackets f. o. b. Adrian, Mich. **$10**



Liberal Dealers' Discounts

PAGE WOVEN WIRE FENCE CO.
Windshield Dept. ADRIAN, MICH.



LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U. S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch
Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - $2.50

FORD SET contains

1 Handle 7 inches in length,
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.
Price, in leather case, - - - - $3.00

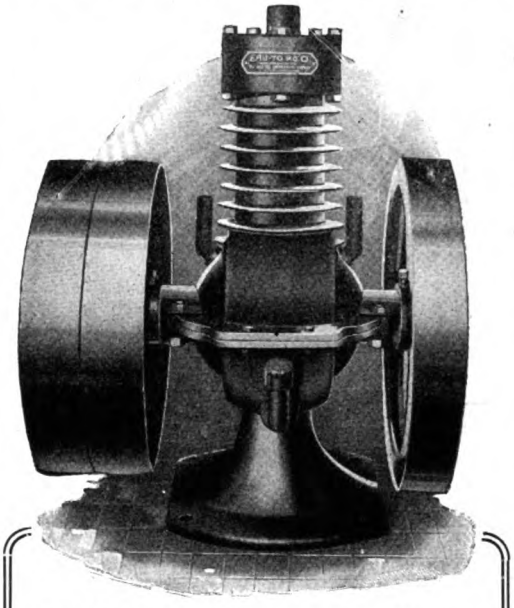
Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER, 180 N. Dearborn Street, CHICAGO, ILL.

The Trade Is Cautioned Against Selling Infringements On My Patent.

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It Puts the *air* in Repair Shop!



AIR for every purpose from inflating tires to cleaning the inaccessible parts of an engine,—air at any pressure up to 300 pounds and in quantities as desired,—you have it, at little cost and with no trouble, when you install

The AU-TO Air Compressor

Small in Size and Price—Large in Capacity

It is all metal, air cooled, simple and practically fool-proof. It takes up very little floor space, it is light in weight and is guaranteed to do the work required of it.

The AU-TO is an absolute necessity in every garage, machine shop and repair plant. Our catalog tells what you want to know. Write for it—the sooner the better.

THE AU-TO COMPRESSOR CO.

Dept. 62, Wilmington, Ohio, U. S. A.

MILLER'S TIRES

MADE IN ANDERSON, IND., U. S. A.

"There is More Fabric in Miller's Tires"

EXTRA HEAVY

Black or White Treads — *Non-Skid "Cog" Tread* — Red or Gray Sides

(Patented Feb. 16, 1915)



Write for Exclusive Agency.

MILLER'S REPAIR MATERIALS

Effective August 10th, 1915

Common Tread Stock, per lb.	$0.40
Standard Tread Stock, per lb.	.55
High Grade Tread Stock, per lb.	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb.	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried....Net,	1.10
*Miller's Three in One Repair Stock	.80

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's No. 14 Three Cavity Sectional

One of the 53 Styles We Make

Patented July 21, 1908

With Small and Medium Inside Vulcanizer Attachments.



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

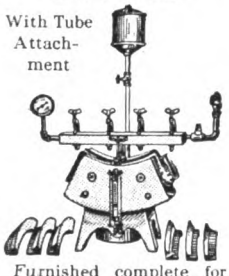
Complete with Gas Burner - - **$100.00**

With Gasoline Burner Outfit, extra, **$1.50**

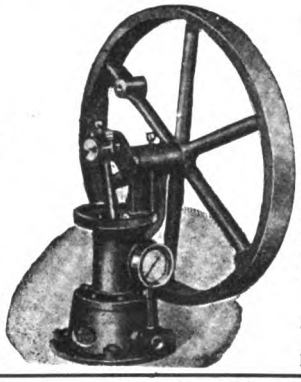
Without Inside Vulcanizers and tube plate **instead, $5.00** less.

MILLER'S SECTIONAL VULCANIZER

With Tube Attachment



Furnished complete for Steam Line, Gas or Gasoline Burner. Complete with **High Stand** and Gasoline Outfit - - **$36.50**



MILLER'S HIGH PRESSURE AIR PUMP

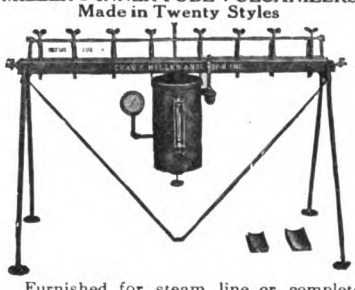
is Oil Cooled with our Fountain Oiling system. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight 200 lbs. This pump will easily compress air to **300 lbs. pressure.**

Write for details.

Junior, Single, $25.00
Pump Only,
Price, Single, $35.00

MILLER'S INNER TUBE VULCANIZERS

Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an **abundance** of steam.

PRICES FROM $5.00 to $30.00

MILLER'S RUBBER INSTRUCTION BOOK

Price Prepaid, $1.00, Net

Free Instructions with each outfit.

FREE—*Write for our* **1916** *catalog which lists Vulcanizers of* **All Sizes** *and* **Styles,** *and Equipment for Tire Shops. Write for prices on* **Miller's Heavy Wrapped and "Cog" Tread Tires** *and* **Heavy Red Tubes.**

Address Dept. D.

CHAS. E. MILLER

ANDERSON RUBBER WORKS

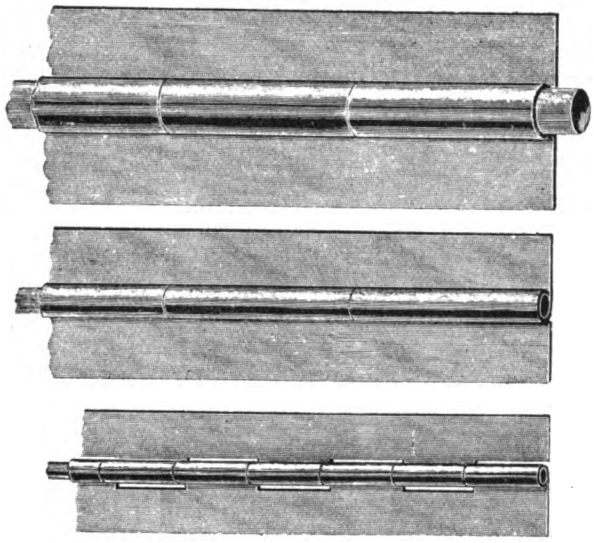
ANDERSON, IND., U. S. A.

Cor. 14th and Meridian Sts.

Established 1894

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Automobile Hood and Continuous Hinges



These hinges are made in a variety of sizes both as regards width and length, as well as size of hinge pins.

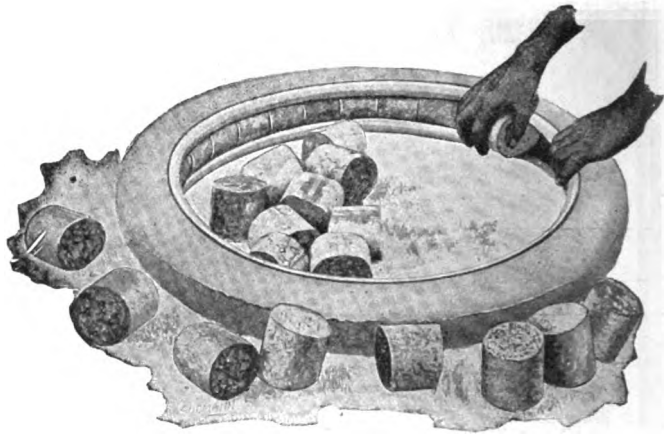
Their range of use is not confined to automobile hoods, but also for **rear deck hinges, shield front sash hinges, tool box hinges, etc.**

The stock widths range all the way from 1" wide when open to 1⅝" wide when open.

Further details with net prices on request.

JOS. N. SMITH & CO., - DETROIT, MICH.

National Rubber Tirefiller



Ends All Tire Trouble—A Perfect Substitute for Air

Made of Pure Rubber, cut in small particles, treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing inner tubes. Doubles the life of the casings—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has all the easy-riding qualities of the air-filled tire, with none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.

NATIONAL RUBBER FILLER COMPANY
208 COLLEGE STREET - MIDLOTHIAN, TEXAS



You can't have full power without quick combustion. Get them both—get cold-weather punch and snap—get greater mileage from your gasoline—by installing

SU-DIG Series Plugs

in connection with your present spark plugs. Firing the gas at two plugs at once, burns it like a flash.

No change required in your ignition system.

Write for booklet, "How To Get More Power."

DEALERS—Every sale brings others.
Get special offer now.

Superior Motor Power Co.
24 Irving Place, New York

Salesmen wanted to represent SU-DIG Plugs as side line.

SU-DIG



Good Business for Live Dealers

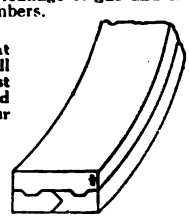
Many car owners would keep their cars in use for winter driving if they thought they could protect themselves against the power losses of cold weather and the winter snows.

K-P PISTON RINGS

offer a way. They give maximum power for winter's demands by utilizing the whole force of each fuel charge. They eliminate power waste by stopping all leakage of gas and oil in the combustion chambers.

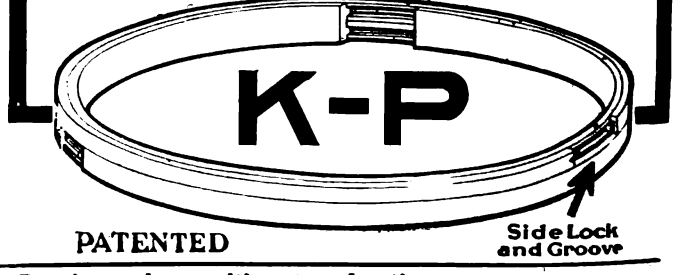
"A Motor Is No Better Than Its Piston Rings."
—Efficiency Ed.

Show the car owner that K-P Piston Rings will protect his motor against winter power losses and you will cash in on your arguments.



Special Inducements to Dealers and Agents.
Rings in All Sizes. Write for Literature.

Keys Piston Ring Co.
3037 Olive St. St. Louis, Mo.



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Add $250.00 A MONTH EXTRA To Your Business

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Sounds like a whole lot of money to clear extra every month. Seems almost impossible, but that is what hundreds of men are doing who have added a Tire Repair Department to their business. **The investment is small, the profit large** and **returns quick and all cash,** besides the demand for tire repairing and retreading is constantly growing. Your garage is by no means complete, your business is not as profitable as it can be until you get in on the Tire Repairing and Vulcanizing end.

THE HAYWOOD TIRE REPAIR EQUIPMENT

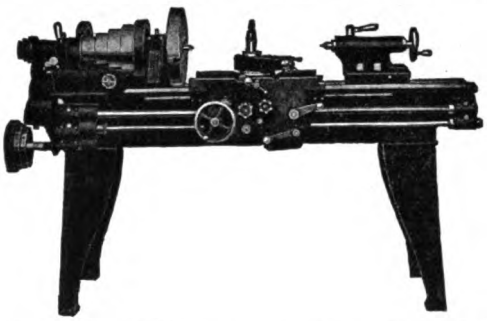
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Other Sizes, 16, 18, 20-Inch

Monarch Lathes are very accurate, rigidly constructed, modern in design and quick and easy to operate. They are recognized by the Automobile Repairmen as the best lathes for Garage use.

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Send today for catalog No. 6 and prices.

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TUTHILL TITANIC SPRINGS

GUARANTEED

FOREVER AGAINST CENTER BREAKAGE



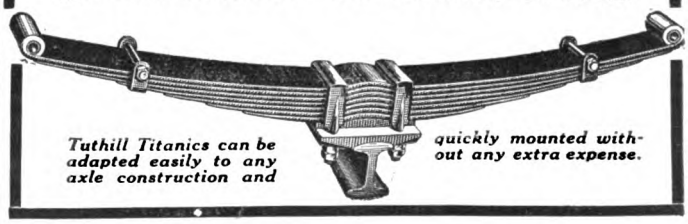
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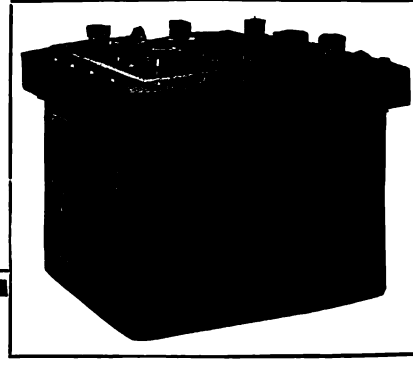
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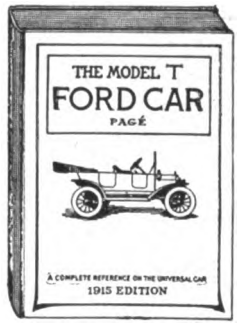
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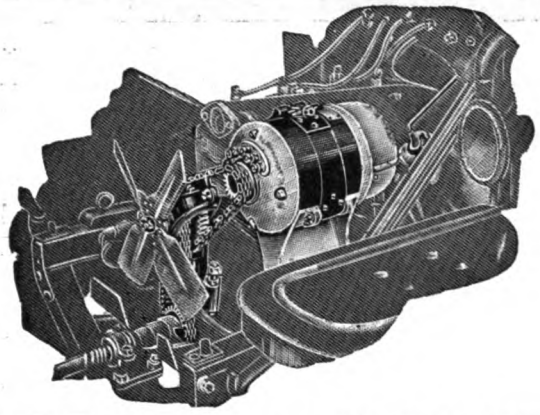
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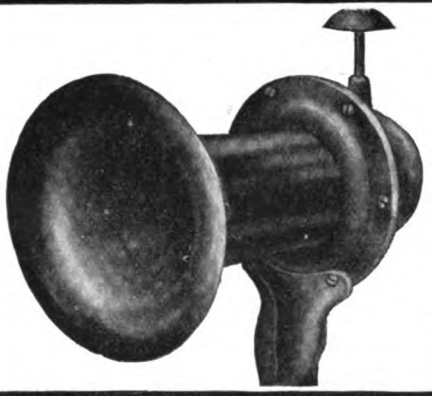


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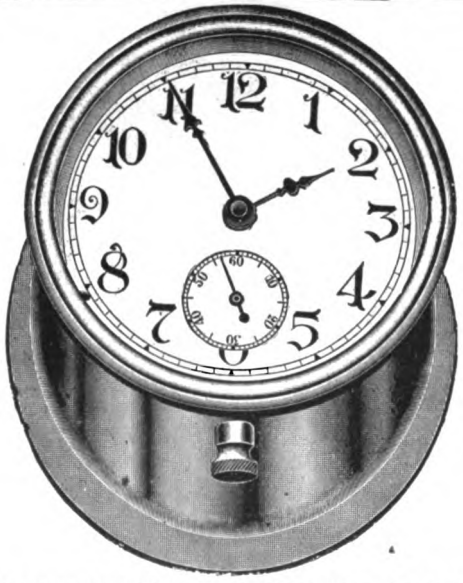
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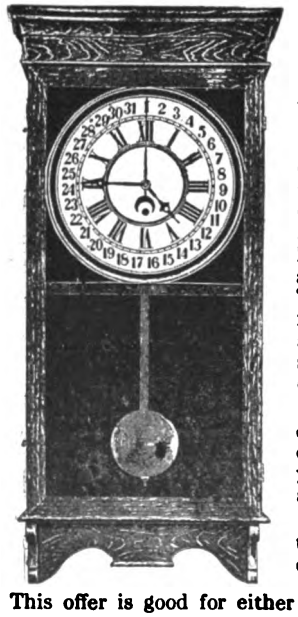
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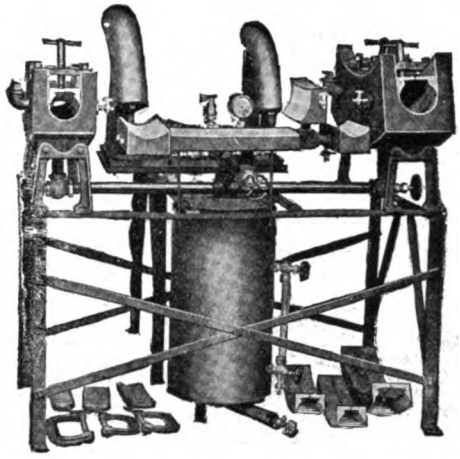
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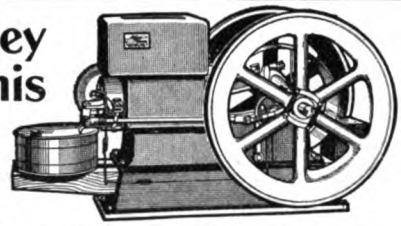
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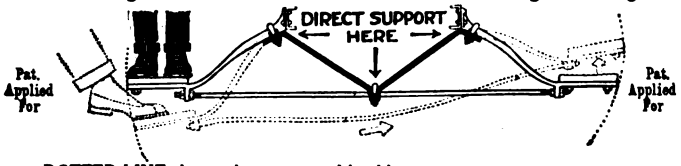
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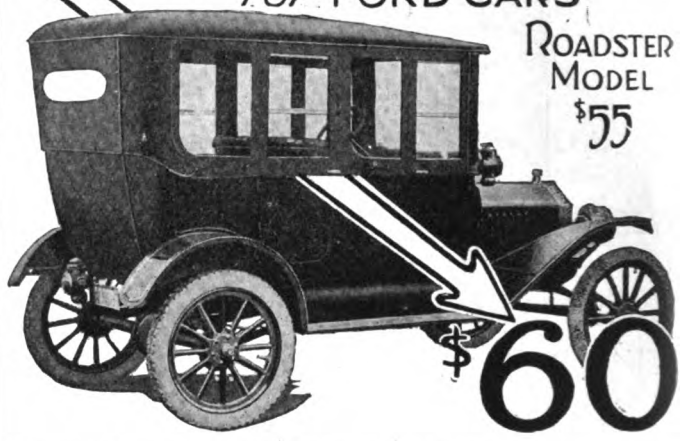
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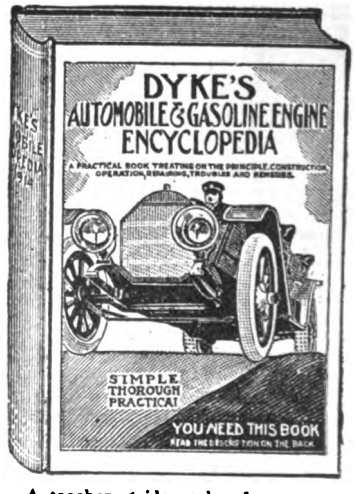
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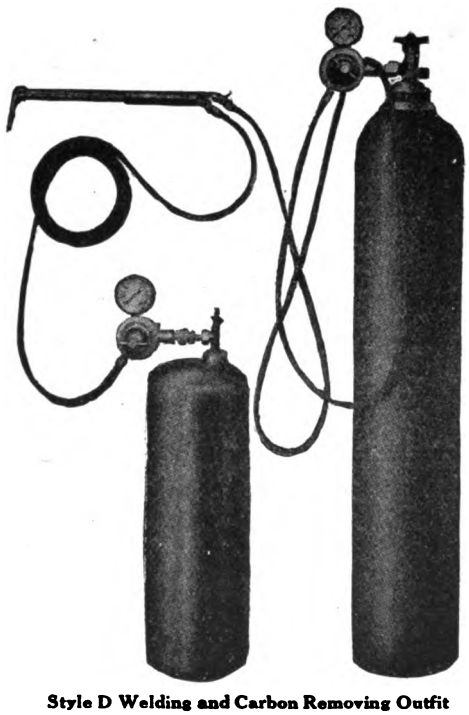
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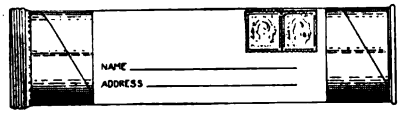
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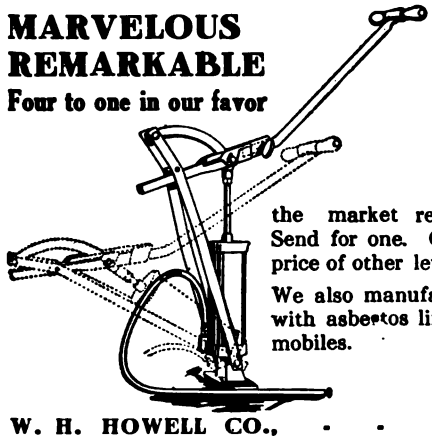
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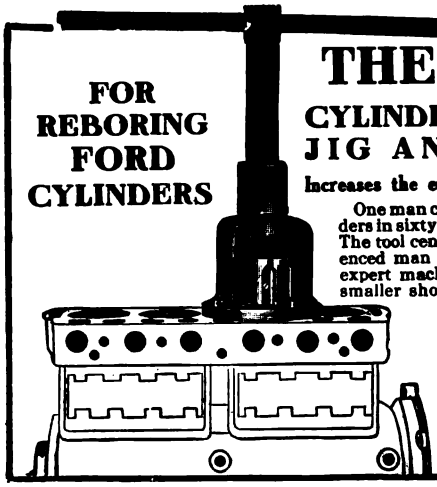


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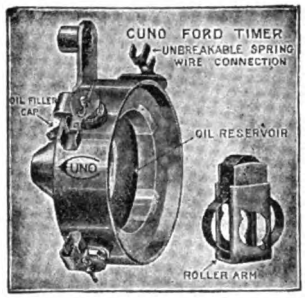
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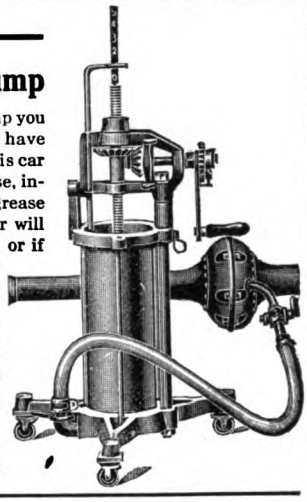
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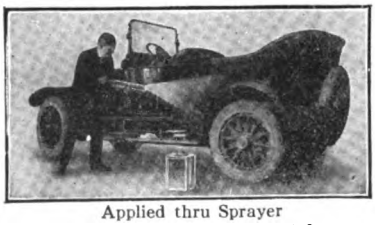
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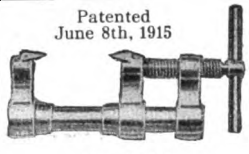
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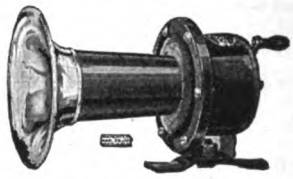
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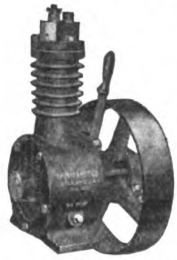
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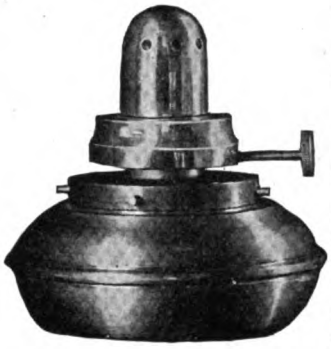
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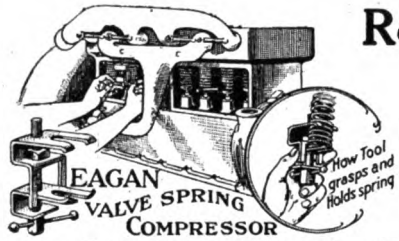
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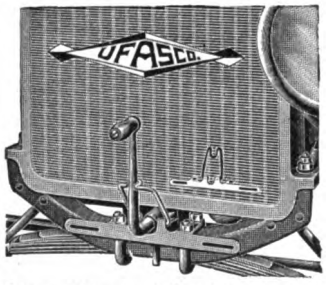


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Ford Owners want it.
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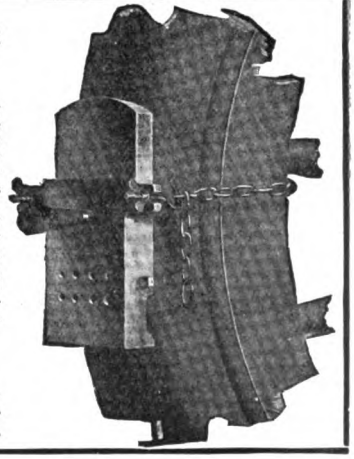
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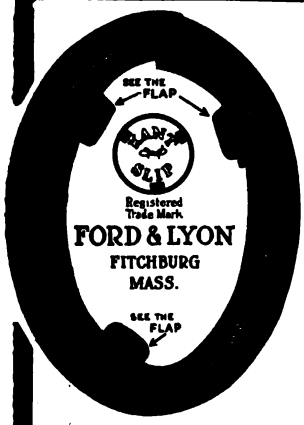


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And cannot slip.

The Kant Slip Inner Liner is also a complete inside fabric reinforcement, extending the full length of the tire from bead to bead.

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That can be relied upon to be accurately machined, and of the highest grade material, to fit all makes of cars,

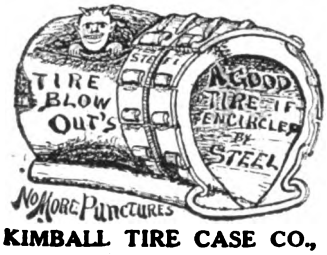
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Furnished by our Belt.

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Not to stretch and is oil proof, made in endless belt style. No chance for defective seams.

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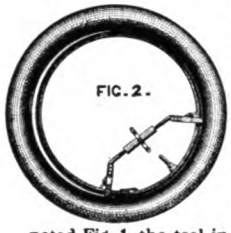
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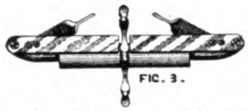
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Simply Cut Notch in Exhaust Pipe and Clamp over it.

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No. 3.	Black	$0.60
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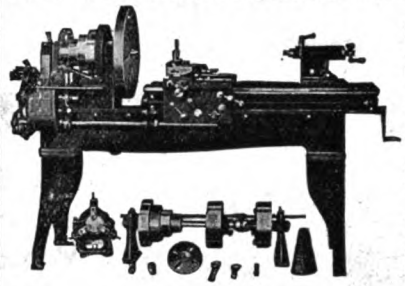


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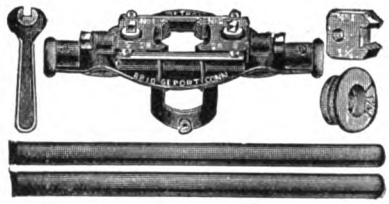
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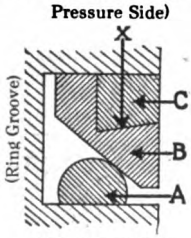


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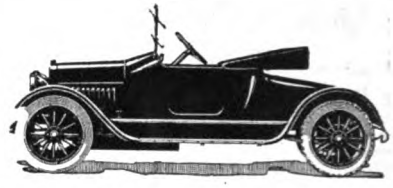
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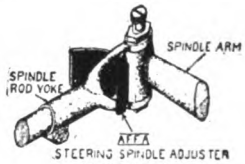
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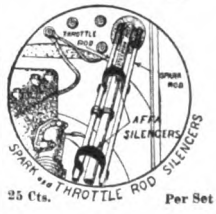


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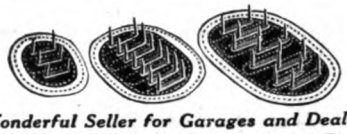
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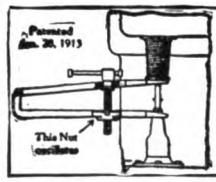
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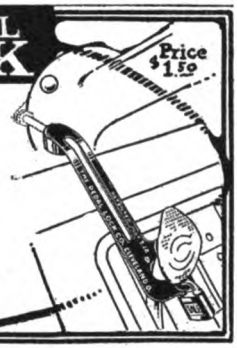


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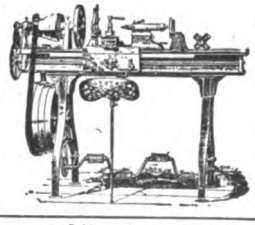
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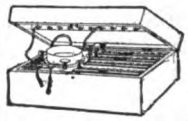
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It will soon get out of repair.

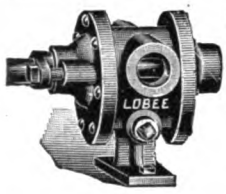
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beats them all in thoroughly cleaning engines.

Once you use one you will wonder how you ever got along without it. Owners and Repair Shop Men will find it invaluable, and it will pay for itself, as it eliminates wear, saving half the repair bill. One quart of kerosene and 6 pounds air pressure removes all dirt, grit and grease from any engine. Quick, economical, thorough, easy, and cleanly to operate. **Write Today for Price.**

Electrical Supplies for All Starters and Dynamos.

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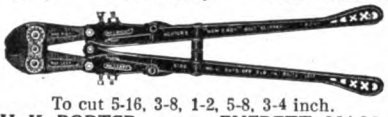


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PORTER'S BOLT CLIPPERS
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To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.
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Most Lubrication—

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can be set at any angle—will stay put in any position. All brass—will not rust. Can be detached and used as trouble lamp. *General Distributors,*

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The Perfect Pump With Perfect Attachments

"Guaranteed Not to Spray Oil with the Air"

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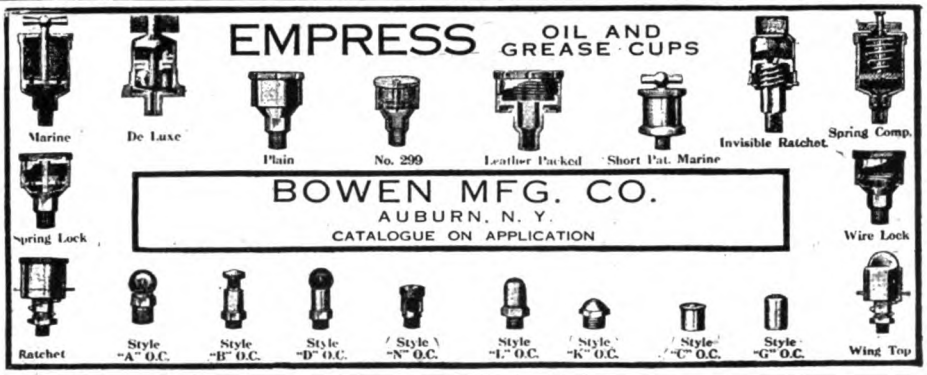
Model 101 with complete attachments	$15.00
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Special Ford Outfit	$9.50

Stock carried by leading distributors and dealers everywhere.

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WE SAVE YOU MONEY
By Specializing. We Make the Following
RIDICULOUSLY LOW PRICES FOR
RE-GRINDING CYLINDERS
4 Cylinders $30.00
Price Includes New Pistons and Rings
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Made to order. Send Blue Print or Sample and let us quote you.

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Chicago New York

SALES have been so enormous on our **National V Type Radiator and Streamline Hood for Ford Cars** that we merely call the dealer's attention to the fact that he is **Missing the Greatest Seller of the Season** if he does not get in on the proposition now. We are doubling our capacity this month and next month we will tell you more about it.

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Dealers' Discount 33 1-3% ; in lots of ten springs, 40%.

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871 Woodward Ave., Detroit, Mich.

Ask for circulars of other low price Ford Specialties

GARAGE HEATER $14

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and protect yourself. Keep your garage as warm as your home! No more shivering; no more numb hands. Order a

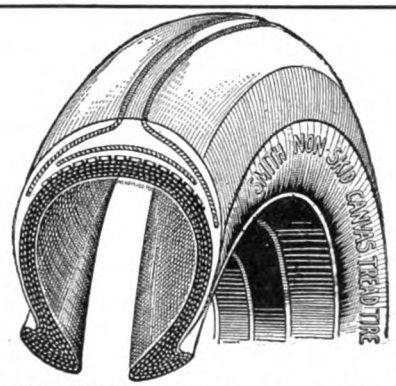
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SMITH'S NON-SKID CANVAS TREAD TIRE construction guaranteed for 5000 miles but average is 10,000 miles. Two strips of rubberized canvas projecting from the inside of the tread to the outside, makes this tread non-skid all the way through, and also acts as a radiator, preventing the tread from heating, peeling off. Also prevents stone bruises, punctures and blow-outs. It draws easier than tires with knobs on the tread and saves 25% in gasoline. **Free booklet describing other important features and agent's proposition.**

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The McCormick Weatherstrip Stops that Leak thru your Wind-shield



The McCormick Weatherstrip is adjustable to any space or thickness of glass. Easily removed. Allows free movement of panes. Will not obstruct vision. Less than half inch wide.

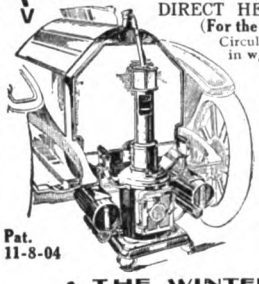
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The Neverout

Radiator and Garage Heater

DIRECT HEATING SYSTEM
(For the unheated garage)



Circulates a current of warm water in water circulating system of motor.

Solves the cold garage problem. Keeps the auto warm in the coldest weather and makes the garage comfortable.

It is portable—drive your car in the garage and attach the heater. Burns kerosene.

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THE WINTER NECESSITY.

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Gentlemen,-

I have your Shock Absorbers on my Ford car, and in four days drove about 875 miles over all kinds of roads. I can only say that I did not know it would be possible for shock absorbers to make so much improvement in the running of a car. We drove at from 20 to 30 miles an hour over roads, which without the shock absorbers would have made it necessary to slow down to 10 or 15 miles an hour.

Please let me know your terms to agents as I believe you have none in this territory.

Yours very truly,

MP/CK

We leave it to your judgment. Would users write us letters like this if the Hassler didn't satisfy them in every way? You buy Hasslers under guarantee of money returned if you can spare them after you have once tried them.

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HUDSON SUPER SIX TRADE NAME REG.

$1375 at Detroit

Patented by Hudson December 28, 1915

Officially Breaking All Stock Car Records up to 100 Miles. Also All Stock Car Records for Quick Acceleration—Under A.A.A. Supervision

100 miles in 80 minutes, 21.4 seconds, averaging 74.67 miles per hour, with driver and passenger.
The previous best record of 72.49 was made by a car with more cylinders, more cylinder capacity and driver only.

75.69 miles in one hour with driver and passenger.
During this trial speed laps were made at 76.75 miles per hour.

70.74 miles in one hour, carrying 5 passengers, with top and windshield up.
The previous best record for stock car similarly equipped was made by a car with more cylinders, more cylinder capacity, and with only two passengers.

From standing start to 50 miles an hour in 16.2 seconds. This 7-passenger stock touring car was driven 1350 miles at speed exceeding 70 miles an hour without discoverable wear on any part.

All the above Hudson records were made with the same stock car, using the same motor, at Sheepshead Bay Speedway in November, under American Automobile Association supervision.

The most powerful motor per cubic inch displacement which the world has known.

We now bring out a motor which has proved itself the greatest in the world.

It has broken—as detailed above—all the worth-while stock car records.

It excels the best of former Sixes by 80 per cent in efficiency.

It has outrivaled Eights and Twelves, erasing all existing reasons for the V-Type motor.

And this marvel motor, which has proved such supremacy, is a Hudson invention, controlled by Hudson patents.

BETTER BY 80 PER CENT

The motor size is identical with our former Light Six. And that, until now, has been the dominant Six. In two years it quadrupled Hudson production.

The best previous Six of like type developed but 42 horsepower. The Super-Six, in same size, develops 76 horsepower.

That enormous increase of 80 per cent is due solely to ending vibration.

THINK OF 76 HORSEPOWER

Think of 76 horsepower from a Six, with cylinders 3½x5.

No extra size or cylinders. No added complications. No forfeiture of simplicity, lightness or economy. And yet almost doubled efficiency.

It means vast reserve power. It means quick response. It means high gear for all speeds, and for nearly all hills. It means matchless flexibility.

And it comes through ending vibration. So it means utter smoothness at any speed. It means flowing power, bird-like motion.

It means all these things in a degree never attained before.

A NEW EMPIRE FOR US

This means a new empire for Hudson.

Any man who wants the superlative car must now buy a Hudson to get it.

Other Sixes must yield to a Six nearly twice as efficient. And no Eight or Twelve can compete with it.

It also means long engine wear. It means minimum fuel consumption. So it makes the Super-Six an economy as compared with many lower-priced cars.

To meet this demand we have doubled our factory at a cost of $1,500,000. And we have bought materials for $42,000,000 worth of Super-Sixes for the coming season.

We have also built superfine bodies—six new styles of luxury cars. So the Super-Six looks its supremacy.

This car will dominate the fine car field this year. No man who knows can doubt it.

7-Passenger Phaeton, $1,375 at Detroit
Five Other Styles of Bodies

HUDSON MOTOR CAR COMPANY
Detroit, Michigan

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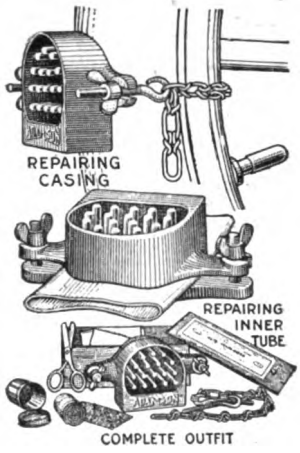
A Million New Customers for 1916

PRACTICALLY every one of the million new cars predicted for 1916 will go into commission without any equipment for repairing tires. Every one of these owners immediately becomes a prospective buyer for that all-important necessity, an "Adamson" vulcanizer.

OVER a million "Adamsons" already in successful use—**more than all other makes combined**—have created a big army of "boosters" and paved the way for immense sales this year.

Get Ready to Sell Them

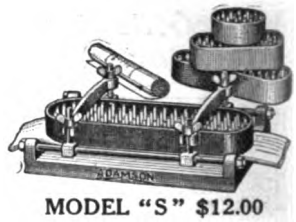
the vulcanizer that is **most reasonable** in price, **quickest and surest** in operation, and the **easiest** to sell—



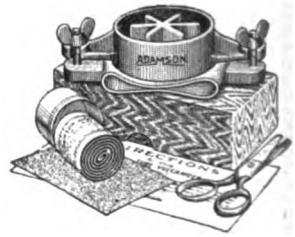
MODEL "U" $3.00
For all casings and tubes

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VULCANIZERS

Complete Line for Car Owners and Garages



MODEL "S" $12.00
For private garages and repair shops



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For tubes 3½ in. and under

Repairs Instantly

by the roadside or wherever you are, and removes the temptation to run on a flat tire. Repairs and seals up cuts and minor tread injuries before they grow larger and cause blow-outs. No steam or electricity—no skill required—the "Adamson" uses common gasoline and is **automatic.**



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No cement is required



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For all sizes of inner tubes

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on complete line for car owner and garage use, also copy of latest booklet, "Repair and Care of Tires."

DEALERS: Get Our 1916 Proposition.

ADAMSON MANUFACTURING CO.
EAST PALESTINE, OHIO

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This photograph, taken in a typical junk shop, shows only one corner of ONE ***of the thousands of junk shops*** located in every nook and corner of this country.

Junkmen buy thousands of cast-off tires every year—tires that have been THROWN AWAY simply because they were tread worn or rut worn—***an enormous waste***—and all they pay for them is about 3c. or 4c. a pound. A ridiculous price when you consider that nearly every one of these tires was good for at least ***5,000 miles more service*** if the owners had done what European motorists have been doing for the last four years.

What European Motorists Do

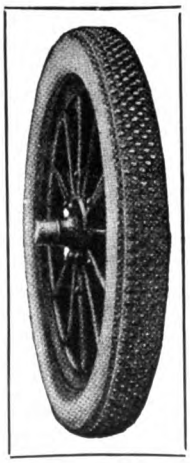
For the last three years European motorists have been getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires instead of being satisfied with 1,000 to 3,000 as American Motorists are—they get this mileage by ***half-soling their tires with Steel Studded Treads*** and in the last eight months over 30,000 American Motorists have followed their example and cut their tire costs nearly in half.

Save $50.00 to $200.00 a Year

The almost unbelievable waste in tires by the American Motorist is not only national—***it is vitally personal.*** It affects ***you—your pocketbook.*** Just consider what it would mean to you to get 10,000, 12,000 or 15,000 miles out of your rubber casings—and without the constant dread of tire trouble, saving enough to nearly pay your yearly gas and oil bills.

Guaranteed 5,000 Miles Without A Puncture

This fact appeals to many motorists far more than the amount of money saved. The constant dread of punctures and blow-outs spoils the joy of motoring—each unnecessary noise, each bump or "pop," makes the motorist think of tire trouble FIRST. Durable Treads are backed by our signed guarantee—***as good as a government bond***—for 5,000 miles of wear without a puncture. Think of the joy of motoring when you know your tires are protected against the roughest roads, and ***can't be punctured.***



No More Skidding

Durable Treads are as sure-footed as a Rocky Mountain Burro—look at the photograph—the sharp edges of the steel studs will grip the ***slipperiest road*** and make skidding almost an impossibility. With Durable Treads on your tires you receive perfect non-skid service while your tires are ***protected instead of injured,*** and you never have to get out in the mud and put on chains.

We Deliver Free

Without a cent deposit—prepay the express and allow you to be the judge. Remember that Durable Treads are gripped tightly by the rim, just the same as the tire—water and sand proof—and easily applied in your own garage in thirty minutes without special tools.

Special Discount

We offer a special discount to motorists in new territory where Durable Treads have not yet been introduced. The sales of Durable Treads (the only practical tread) increased 917% in the United States alone during the past year—over 40% of these sales were unsolicited—made through the recommendations of other Durable Tread users. Tear off the coupon ***right now***—and mail it at once. Don't run your tires barefooted another day—find out how to get at least 5,000 miles more out of your tires—***mail the coupon.***

THE COLORADO TIRE & LEATHER CO.
524 Tread Bldg., Denver, Colorado
A5 Transportation Bldg., Chicago
720-5A Woolworth Bldg., New York

MAIL TODAY

Gentlemen:

Please send me full details about your new Durable Steel Studded Treads, sample and copy of guarantee, and tell me about your special discount terms, without obligation to myself.

Name.....

Address.....

.....

My tire sizes are.....

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THE LARGEST AND MOST COMPLETE LINE MADE



We make several different styles, enabling us to fit all standard makes of cars.

They will stand a more severe shock than any other and are made of specially heat treated stock. The bars can be straightened if bent, and are handsomely finished in black japan, polished brass or buffed nickel plate.

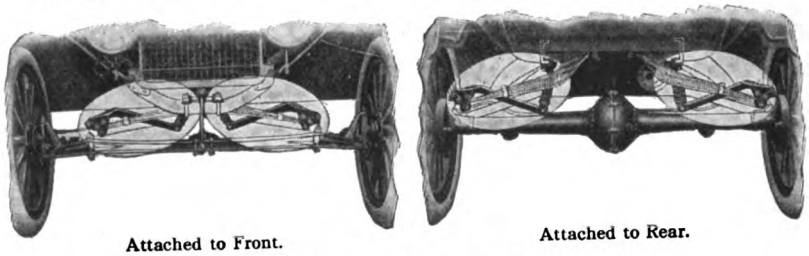
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FOR FORDS

Sold on 30 days trial— Guaranteed for Life of the Car

Make the easiest riding Ford car possible



Attached to Front. Attached to Rear.

Attached in 30 minutes without removing wheels

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Right on the Crank-shaft

In front of the radiator—in the one place where the electric starter has *got* to be to give satisfactory service on a Ford car.

EVEREADY

Front-of-the-Car Direct-Coupled

Starting & Lighting System for Ford Cars

is placed directly on the center line of the car and drives direct on the crank-shaft.

This epoch-making system embodies advantages which are absolutely impossible with starters placed under the hood and connected by chain drive which exerts a side pull on the crank shaft, causing undue wear on the bearings.

It does not disturb the 3-point suspension of the car.

Acting as a second flywheel it eliminates vibration and keeps the car to the road.

It runs at engine speed and instead of acting as a drag on the motor actually increases the flexibility of the car to such a degree that you can throttle down to three miles an hour on high.

It is equipped with the EVEREADY Non-Sulphating Storage Battery—the only battery guaranteed against sulphation, the most common cause of battery trouble.

It can be attached in a few hours without removing any parts or making any changes in the engine or car.

There is no other starter of which you can say as much. When you get a starting and lighting system for *your* Ford be sure it's direct-coupled and located *in front of the car.* In other words be sure it's EVEREADY.

No. 12

American Ever Ready Works

of NATIONAL CARBON COMPANY

Long Island City **New York**

Branches: Atlanta Chicago San Francisco

Canadian Factory: Canadian Ever Ready Works of Canadian National Carbon Co., Limited, Toronto

Send me complete information about EVEREADY Starting & Lighting System for Ford Cars.

Name.....

Address.....

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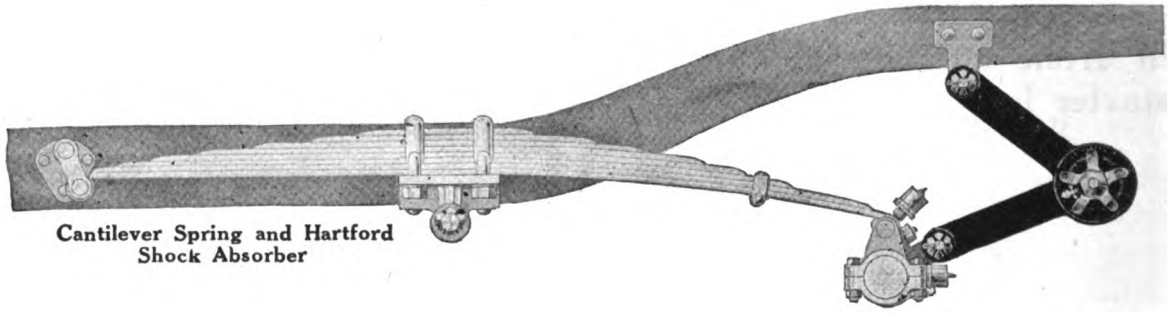
RIDING COMFORT WITH CANTILEVER SPRINGS

When roads grow rough, the activity of the cantilever type of spring requires the effective control of the

Shown at the Auto Shows

*Hartford SHOCK ABSORBER

Shown at the Auto Shows



Cantilever Spring and Hartford Shock Absorber

to insure riding comfort. Dissipation of the surplus energy, by frictional absorption, perfects the function of this type of spring in particular, noticeably improving the traction of the car, absorbing all the small but disagreeable vibrations, and promoting practically perfect results in the riding qualities of the car.

Attachment is simple. The above illustration shows the relative positions of the spring and shock absorber and suggests the harmonious operation of both.

If your car has cantilever springs or other active springs, it needs the Hartford Shock Absorber in order to carry its load with comfort over every road.

HARTFORD SUSPENSION CO. E. V. HARTFORD, President **141 Morgan St., Jersey City, N. J.**

Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

BRANCHES: **Boston,** 319-325 Columbus Avenue; **Chicago,** 2637 Michigan Avenue; **New York,** 1846 Broadway and 212-214 West 88th Street; **Indianapolis,** 425 North Capitol Boulevard.

DISTRIBUTORS: Chandler & Burbery, 332 Broad St., Newark, N. J.; Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; Dyke Motor Supply Co., 600 Grant Boulevard, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Fred Campbell, 1109 Locust St., St. Louis, Mo.; Charles Rubel & Co., 1312 Fourteenth Street, N. W., Washington, D. C.; Canadian Distributors, Hyslop Brothers, Limited, Toronto, Canada.

* Formerly Truffault-Hartford.

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OWNING A WATERHOUSE IS LIKE FINDING A BURIED TREASURE



It's the handiest tool in the world. With it you can weld anything, anywhere, at any time.

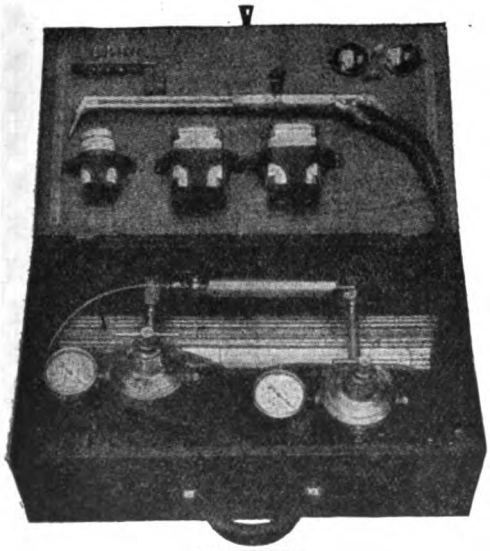
Every repairman in the United States should have a copy of our new catalog and learn all about the wonderful process of welding.

Thousands of Waterhouse Equipments are making and saving for their owners, put one to making and saving for you.

Every jobber in the United States and Canada should know all about our new line.



AT WORK



PACKED

No Garageman, Repairman, Manufacturer or Metal-worker of any description can afford to be without a Waterhouse any longer than the time required to send in his order.

Waterhouse Equipment complete $42.00, 5% discount for cash. If Welding materials are desired add $4.50, less 5% for cash.

Either order through us or your jobber. Only be sure to specify Waterhouse.

WATERHOUSE WELDING COMPANY

16 Pelham Street, BOSTON, MASS.

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You Can Leave the Switch On

Even after Stopping Your Motor if equipped with



Atwater Kent Ignition

Did you ever put up your car after an evening spin and go peacefully to bed and—sometime in the stilly watches of the night—pop wide awake and say:—

"There! By George, I left that ignition switch on! That's the second time I've forgotten it, and the last time the battery had to be removed from the car and overhauled. The starting crank for mine in the morning!"

That little "I wonder" imp can never disturb your mind if you use Atwater Kent Ignition. One of the features of this system is that it *cannot stop* with the contact points touching, no matter in what position the engine may come to rest.

The action of the Atwater Kent contact-maker is similar to the shutter of a camera, which, once released, must finish its work by *opening and then shutting*. So the Atwater Kent contact-maker must finish its work by first making, *then breaking* contact.

No automatic protective device is needed to safeguard the battery or wiring and except for stopping the motor the ignition switch may be forgotten. Current is consumed only when the engine is running and then only during the exceedingly *brief instant* of the spark.

This is but one of many big advantages obtainable only in Atwater Kent Ignition. An absolutely uniform intensely hot spark from cranking to racing speeds—easier and safer starting—greater power at low speeds—increased flexibility and ability to drive the car with the throttle alone—no necessity for touching the spark lever—all these and many other features are found in this system alone.

Specify Atwater Kent on the car in which *you* are interested. Write us for data.

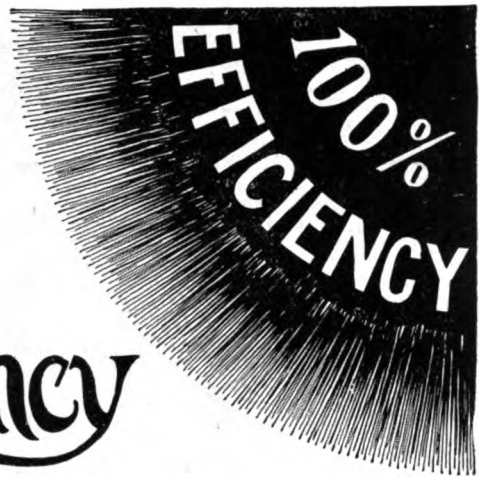
See us at the auto shows—New York, Space C-38—Chicago, Coliseum Gallery, Number 22.

Atwater Kent Mfg. Works

PHILADELPHIA, PA.

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Step by Step to Garage Efficiency

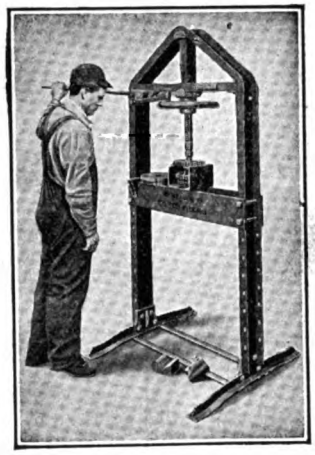


EACH new addition to the "Weaver" Line brings the garage another step closer to the 100% efficiency mark.

The profit upon the time and labor saved through the employment of

WEAVER GARAGE EQUIPMENT

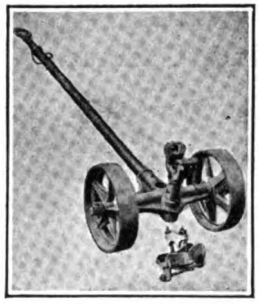
has been the means of putting the bank balance upon the right hand side of the ledger for thousands of garages and repair shops.

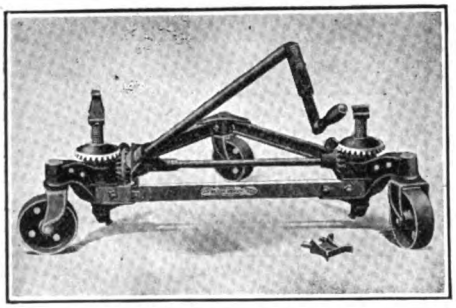




SEE OUR EXHIBITS

Chicago Show—Booths 159 to 161
(Coliseum Annex, Accessories Section)





WEAVER AUTO TWIN JACKS

Combine all the service of Turn Table—Lifting Jacks—Transport—and Tire Rests. Ball and Roller bearing—strongly constructed—convenient to operate.

Made in two sizes. Capacity 4,000 and 8,000 lbs.

Price, Set (Two) $20.00 and $36.00

WEAVER AUTO AMBULANCE

A scientifically designed truck for towing in disabled cars. Enables one man to do the work of three.

Roller Bearing Cast Steel Wheels — Telescoping Tongue—attaches to either axle of the car.

List Price, $30.00

WEAVER GARAGE PRESS

20 Ton Capacity

This Press will save two-thirds of your shop labor and enable you to make a satisfactory profit on your repair work.

CONSTRUCTION

The frame is one piece of heavy channel steel—hand wheel is 15 inches in diameter—carried upon ball bearings—width between frame 32 inches—height of frame 74 inches—floor space 36x36 inches — weight crated for shipment, 450 lbs.

Net Price, $48.00

WEAVER VALVELESS BUCKET PUMP

Capacity 25 lbs.

One great advantage of the Weaver Bucket-Pump is the fact that our valveless construction permits lubricants to be handled in "three ways."

FIRST—The lubricant can be forced out of the Bucket and into the desired receptacle. SECOND—Grease or oils can be sucked out of the differential, transmission, housing, etc. THIRD—The barrel or chamber of the Bucket may be sucked full of foreign lubricant and discharged again through the hose into a third receptacle without disturbing the contents of the Bucket.

SELF-MEASURING

The lubricant is measured as delivered.

STEEL HOSE

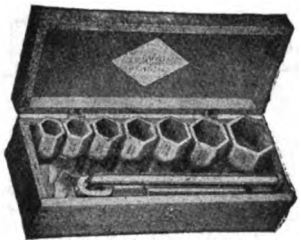
The Weaver Bucket-Pump is equipped with ¾ inch Flexible Steel Hose which cannot be affected by the grease.

List Price, $12.00

WEAVER MANUFACTURING COMPANY

2175-79 SOUTH NINTH STREET **SPRINGFIELD, ILLINOIS**

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No. 6 A $2.20



No. 16 $6.00



No. 10 $8.00



No. 14 $12.00

The "Complet-est" Set

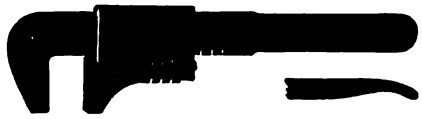


Pliers that are absolutely guaranteed.

Ask for Wrench Book No. 181B



Mossberg No. 7—The sturdiest 6 in. wrench 36c



Mossberg Auto Wrenches

8 in., 9 in., and 11 in. long



Thin model small adjusting wrenches

An Ideal Realized

For 18 years Mossberg Co. has faithfully tried to manufacture the most desired wrenches and tools in the best possible grade of material and labor and yet sell them

At Lowest Prices Consistent with an **Absolute Guarantee**

Judge for yourself if we have not succeeded in considerable degree.

Just write us your wrench troubles. We will be mighty glad to help you all we can.

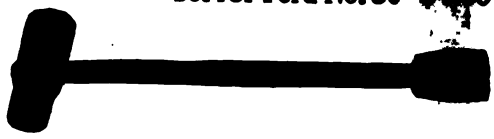
MOSSBERG
Means Wrench Service



Set for Ford No. 17 $2.00



Set for Ford No. 30 $4.00



No. 630 for Fords 26c



Hub Cap Wrench for Ford, 10c



Ratchet Transmission Wrench for Fords, 50c



Kit Wrench for Ford 16c



Transmission Wrench for Ford, 12c

Any of these items sent prepaid on receipt of price, if you cannot get them at your dealers.



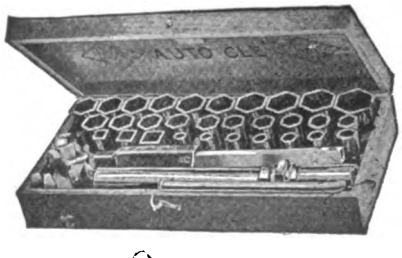
Valve Grinders for Ford, 25c

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

LIST OF BRANCH OFFICES.
Chicago, Ill., 180 No. Market St.
Los Angeles, Cal., 504 Equitable Bldg.
Seattle, Wash., 214 Maritime Bldg.
San Francisco, Cal., 425 Underwood Bldg.
Waynesville, N. C.
Dallas, Texas, Box 927.

The Reliable Auto Cle, $10





Thin model open end Engineers' Wrenches at really reasonable prices.





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1910 1916

Announcement

The mightiest evidence that Tire-Doh is the handiest, most economical TIRE REPAIR is that for 6 years it has been used by steadily increasing thousands of car owners for making all kinds of repairs in inner tubes and casings.

Today over 250,000 car owners use Tire-Doh, and more than 10,000 dealers, and close to 300 jobbers sell Tire-Doh

The new sizes which we announce for sale will make thousands of new friends for Tire-Doh.

NEW SIZES

Complete Outfit Big size	**$1.00**
Complete Outfit Junior size	**.50**
Tire-Doh (alone) 2-oz. can	**.50**
Tire-Doh Cement (alone) 4-oz. can	**.25**



TIRE-DOH

Has Come to be the Standard Repair

It is simple to use—anyone who can drive a car can make successful repairs with Tire-Doh.

It is convenient—can be used any time, anywhere, on the road—in the garage—without heat—without tools.

It is economical—two cents worth of Tire-Doh repairs the average inner tube puncture. It can be used for smallest punctures or biggest inner tube tears. Used to fill cuts or holes in casings before they grow into blowouts, will increase the mileage of any tire—and Remember

Tire-Doh Repairs Are Permanent Repairs

Made only by the

ATLAS AUTO SUPPLY CO., - 612 West Austin Avenue, Chicago, Ill.

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STA-TITE

THE RING *that holds the* KEY

to your MOTOR TROUBLES

DOES YOUR MOTOR LACK POWER?
Increase by using ☞

DOES YOUR MOTOR LOSE COMPRESSION?
Prevent by using ☞

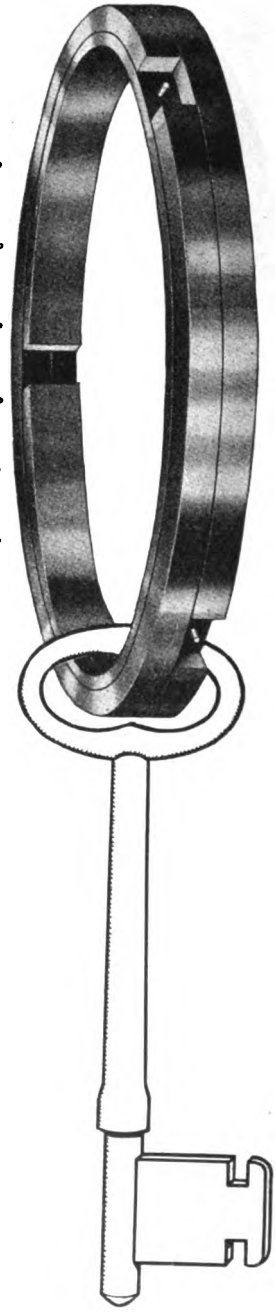
DOES YOUR MOTOR USE TOO MUCH GAS?
Decrease by using ☞

DOES YOUR MOTOR WASTE OIL?
Save by using ☞

DOES YOUR MOTOR SMOKE?
Stop by using ☞

DOES YOUR MOTOR FORM EXCESSIVE CARBON?
Eliminate by using ☞

DOES YOUR MOTOR FOUL ITS SPARK PLUGS?
Correct by using ☞



Liberate yourself from these troubles
We have given you the KEY

STA-TITE

The Eternally Tight Ring

THE PISTON RING COMPANY

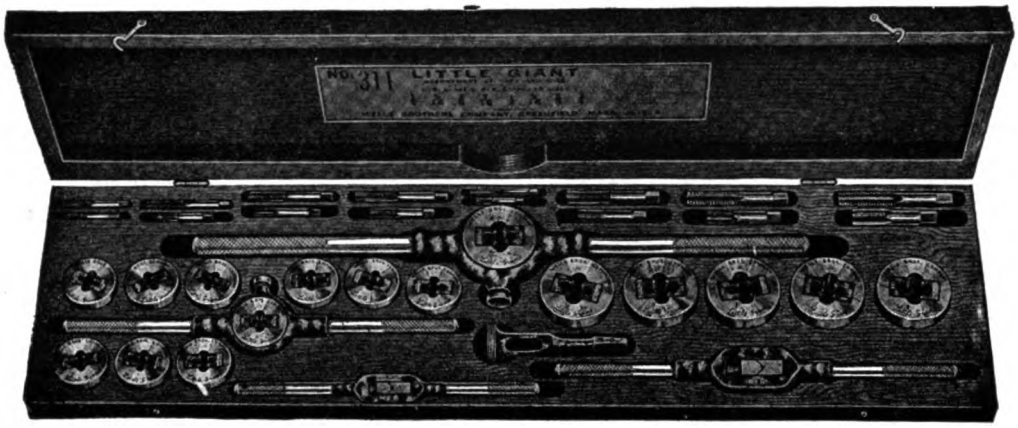
Specialists in Piston Rings

MUSKEGON, MICHIGAN

If not to be had from your dealer, write us direct

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How Complete is Your Screw Threading Equipment?



No. 311. *Little Giant* Combination Screw Plate

Every need of the garage and repair man, or the car owner who makes his own repairs, for tap and die assortments can be supplied from the diversified line of the Greenfield Tap and Die Corporation. For instance, the

Little Giant Combination Screw Plates

(Shown above)

contain both United States and S. A. E. standard taps and dies; each die is contained in its own collet and is adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in hard-to-get-at places.

A few more assortments are shown below.

Send today for the bulletins:
"Tools for the Automobile" and "First Aid in the Up-Keep of the Automobile."



No. 2501
Lightning Garage Repair Set
For Ford Cars

Seven sizes taps and dies. Two reamers for important bushings. Die stock and tap wrench.
A new set that is meeting a real demand.



No. 308
***Little Giant* Screw Plate**
In Leather Roll

Seven sizes taps and dies. Stock and tap wrench. Very convenient and compact for emergency cases.

Look for one of these trade marks on any screw plate you buy.

Little Giant

LIGHTNING

GREENRIVER

SMART

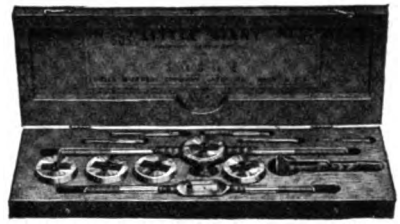
Greenfield Tap & Die Corporation

GREENFIELD, MASS.

Wells Brothers Co. Division
Wiley & Russell Mfg. Co. Division
A. J. Smart Mfg. Co. Division

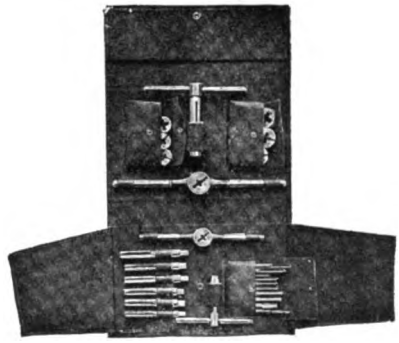
New York, 28 Warren St.
Chicago, 13 So. Clinton St.
Philadelphia, 38 N. 6th St.
Detroit, 55, 57, 59 Wayne St.
London, 149 Queen Victoria St.

In Canada
Wells Brothers Co. of Canada, Ltd.,
Galt, Ontario



No. 305
***Little Giant* Screw Plate**
One of the most popular assortments.

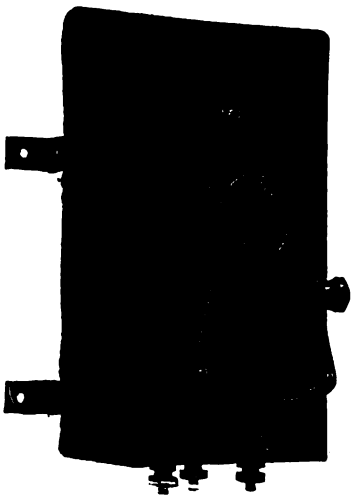
Five sizes taps and dies. Die stock, tap wrench and bit brace die holder.



No. 2500
Lightning Emergency Kit
For Ford Cars

Sixteen sizes taps and dies—being practically every screw thread on Model T Ford that ever needs replacing. Thousands of these are in use.

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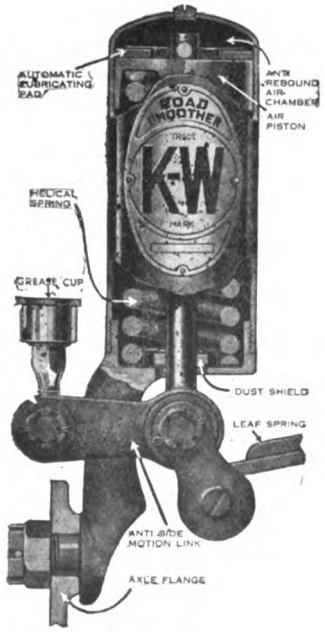
$15 With Regular Kick Switch

$16 With K-W Autolock Switch



K-W Autolock Switch

$3.50 Complete



K-W Road Smoother

$15 Set of Four One for Each Wheel

TRADE K-W MARK

PROTECTION

The name K-W is really a symbol of protection for both the motorist and the dealer.

To The Ford Owner

The K-W Autolock Switch protects your Ford car absolutely against theft or tampering when left in garages or in the street.

The K-W Master Vibrator protects you from the annoyances of poor ignition. It gives you surer and better ignition than high tension magneto—easier starting in cold weather—one adjustment instead of four—more power—a hotter spark—cleaner spark plugs, and all on less gasoline.

K-W Road Smoothers protect you and the parts of your car from the jolts and bumps common to riding over rough, rutty, frozen roads. They smooth out the kicks and worries of the road. Where you ride there are no jolts—no jars. They are so constructed that they absolutely do not interfere with the steering. They prevent side motion and rocking.

Right in your neighborhood you will find a Ford car equipped with a K-W Master Vibrator,—Autolock Switch or Raod Smoothers. Ask the owner what they are doing for him every day. He can tell you better than we of the efficiency, economy, and reliability of K-W products.

K-W products are the Standard of Excellence all over the World. They are sold by dealers who know the difference, everywhere. If yours is out sent prepaid on receipt of price.

To The Dealer

The integrity of the name K-W prohibits exaggerated claims and promises. It is a symbol of fair dealing, as important to you as this mark on K-W apparatus is a guarantee to the user of quality, reliability and service. This broad, square-deal K-W Policy protects you, Mr. Dealer.

The K-W line is a profitable one for live dealers. Write for our liberal sales plan today.

Visit Our Booth at the Chicago Automobile Show—No. 22, Armory Balcony.

TRADE THE K-W IGNITION Co. MARK

2817 CHESTER AVENUE CLEVELAND, OHIO. U.S.A.

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A Selected Market 700,000 Strong

Ready and Ripe

Ford Owners want these LYNITE Aluminum Pistons. They want the liveliness and snap, high speed, increased power, quicker acceleration; the decreased vibration and longer bearing life; the fuel economy and freedom from carbon trouble.

Our advertising will put our story before all the Ford Owners in the country. Those right there in your own community are going to ask you about these

LYNITE PISTONS
ALUMINUM

Equipped with

McQUAY-NORRIS LEAK-PROOF PISTON RINGS

Snap
Speed
Power
Silence
Economy

The Dealer who is best posted on the proposition—ready and able to answer questions—advise and explain, will beat his competitors in securing the cream of the whole trade.

Write us for full particulars—learn all about it. It's a winner. Don't miss such an exceptional opportunity.

Send for new illustrated folder on LYNITE Aluminum Pistons—full of valuable information. Also FREE booklet, "To Have and to Hold Power"—the standard handbook on gas engine compression. It tells what LEAK-PROOF efficiency means. Write Dept. R.

McQuay-Norris Mfg. Co., St. Louis, U. S. A.

Canadian Factory:
W. H. BANFIELD & SONS, 372 Pape Avenue, West, Toronto.

Branch Offices:

New York	Chicago
Philadelphia	Pittsburgh
San Francisco	Los Angeles
Seattle	Cincinnati
Kansas City	St. Paul
Atlanta	Denver
Dallas	

4 PISTONS Fully Equipped $30.00



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An Automobile Necessity

That should be in every auto kit and will save you many a dollar at garage and repair shops. It will also do away with the carrying of extra wheel or shoe attached to the car.

That Means The End Of Tire Troubles

as it will enable you to fix instantly, while on the road, or in your garage, any puncture or blow-out, from a pin-head to an ugly gash,

Without A Change Of Wheel Or Tire

or taking the auto to a garage for repairs, that make you dig down deep in your pockets.

The Worcester Automatic Vulcanizer

"Worcester Made"

requires no experience to operate. Every machine is guaranteed, adjusting all tire troubles in the shortest possible time, avoiding all road delays, making permanent repairs in Tube or Shoe, that are lasting, cost little, safe, speedy and strong.

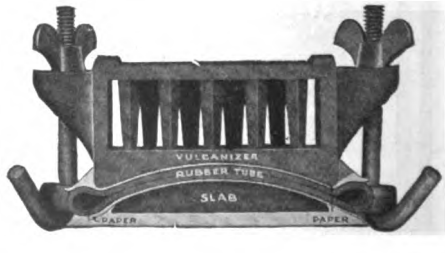
Price $3.50

Money back if not as represented.

Write today or see your dealer.

WORCESTER MFG. CO.

18 Grafton Street, Worcester, Mass.



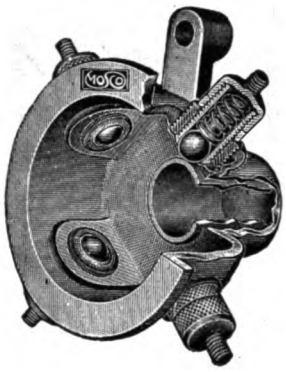
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CATALOGUE NOW READY

MOSCO

SPECIALTIES

FOR 1916





TIMER SHAFT EXTENSION



Bemus Timer Patents { Sept. 24, 1907 / Dec. 17, 1907 / Feb. 16, 1915 / Apr. 27, 1915 } Others Pending

WHY were tens of thousand of these Timers sold in 1915? Why were we able to obtain a national distribution in a phenomenally short time? Why did 1,000 dealers from Boston to San Francisco look to us exclusively in 1915 for Timers for Ford Cars? **BECAUSE**

THE BEMUS BALL CONTACT TIMER

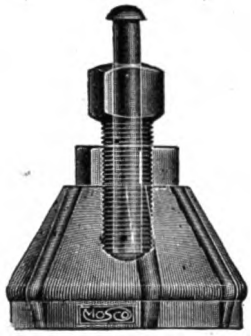
STOPS THAT SKIP. By reason of the method of mounting—on the time shaft—the main cause of skipping is eliminated. You will be surprised at the improvement here.

SMOOTHES OUT THE RUNNING to a degree which you would have believed impossible.

GIVES THE MOTOR MORE POWER, MORE SNAP, STEADIER PULLING, AND DOES AWAY WITH THAT JERKY RUNNING ON LOW THROTTLE.

PRICE $2.25

Reinforcement of advance arm by moulded-in steel bushing is a late feature.



Patented { Mar. 24, 1913 / Dec. 15, 1914

WHEEL PULLERS

(Loose Plunger Type)

For Ford, Overland, Buick, Maxwell and Chevrolet Cars

Every practical man knows that the only way to start a wheel which is stuck or "frozen" to the axle is to drive back the axle while pulling the wheel. Two men are required by the old method—the ordinary wheel-puller will never take off a stuck wheel—one man can do it easily with the MOSCO puller. They have loose plungers extending through the screws—and bearing on the end of the axle. A blow with a hammer on the plunger, a turn of the screw, another drive with the hammer, and the wheel is off—no matter how long it has been on, nor how fast it is stuck. Information and prices on request.



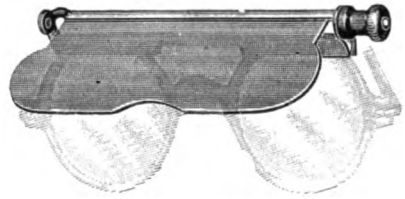
MOSCO Valve Grinder

The working principle of this tool is entirely different from that of any other grinder, having an automatic reversing motion that eliminates all danger of rotating the valve too far in one direction. It is twice as quick as any other tool, and insures safety of valves even when grinding is done by inexperienced persons. The superior finish which is produced is a delight to every user. Now furnished with two forged tools—one for Ford valves and a standard universal tool for other engines. This is one of the best specialties we have ever made. Should be in every tool kit.

PRICE $1.50 EACH

MOSCO Adjustable Eye Shade

Fits All Goggles and Eye Glasses



Readily Applied by the User

LIGHT — COMFORTABLE — CONVENIENT — SAFE

The first and only real solution of sun glare and night driving problems.

This attachment provides a convenient and inexpensive means for protecting the eyes from any blinding glare from any source, especially from automobile headlights by night and from sun rays by day. It is in the nature of a visor, but is adjustable to any angle to meet rays of varying heights. The shield is made of transparent material which subdues blinding lights without obstructing the view.

Price (in paper carton), 50c. each
Price (in leatherette case), 75c. each

MOTOR SPECIALTIES COMPANY

MANUFACTURERS, WALTHAM, MASSACHUSETTS

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Look Well Into Burd Rings

SPEED 102.25 MILES PER HOUR

"The Surprise of the Day," said the reporters when the Packard Twin Six, equipped with 36 Burd High Compression Piston Rings, circled the Sheepshead Bay track at the rate of 102.25 miles per hour.

No stock car driven by a non-professional had ever traveled that fast.

Surely such an achievement naturally would occasion surprise.

Yet when you stop to consider the construction of the Burd Ring, and come to realize how it conserves every atom of power generated by the motor, you may well appreciate why the engineering department of the Packard Motor Car Company adopted Burd Rings as standard equipment.

The Metallic Guard effectually closes the ring opening against escaping gas and maintains the maximum compression the designer intended the motor should have.

These two elements mean more power, and power is, of course, the first essential necessary to speed.

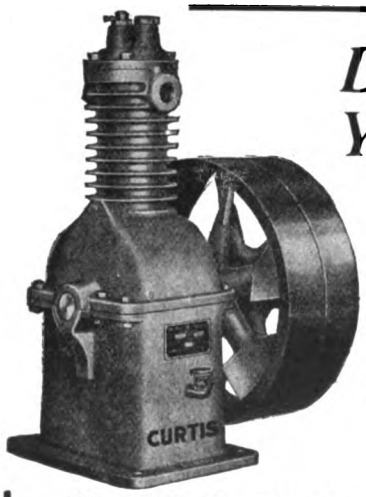
You will do well to look well into Burd Rings when overhauling your own or your customer's car.



BRANCHES AND SALES OFFICES

Buffalo, N. Y.	810 Iroquois Bldg.
Chicago Branch	1427 Michigan Ave.
Dallas, Texas	819 Wilson Bldg.
Detroit Branch	736-8 David Whitney Bldg.
Grand Rapids, Mich., Branch	313 Murray Bldg.
Independence, Iowa	Gidney Hotel Bldg.
Kansas City, Mo.	216-217 Rialto Bldg.
Los Angeles, Cal.	316-317 Hass Bldg.
Milwaukee, Wis.	403 Jefferson Bldg.
Minneapolis, Minn.	904 Marquette Ave.
Peoria, Ill., Branch	223 Masonic Temple
Portland, Oregon	816-817 Lewis Bldg.
St. Paul, Minn.	195 W. Sixth St.
San Francisco, Cal., Branch	847 Phelan Bldg.
Seattle, Washington	538 Central Bldg.

BURD HIGH COMPRESSION RING CO., Rockford, Illinois



We sell the Compressor alone or complete outfit.

Don't Shoot Oil Into Your Customers' Tires

IT WILL SHORTEN THEIR LIFE AND IT'S NOT NECESSARY—USE A BETTER COMPRESSOR—

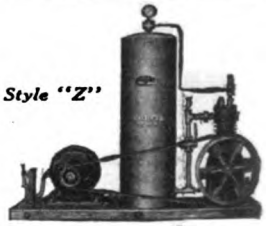
: : : : USE A : : : :

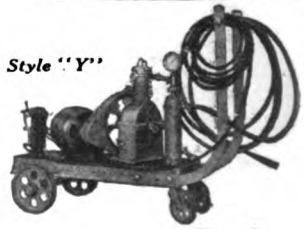
CURTIS
Garage Air Compressor

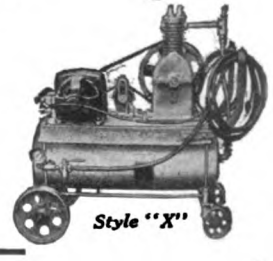
IT WILL FURNISH

Air Free From Oil









Made in five sizes and seventy different combinations. There's one to fit your requirements.

Many features vital to the garage man found on Curtis compressors are not found on other makes, for instance—the controlled splash lubrication system that insures proper lubrication without oil getting into the air line and means better service to your customer at less cost; the unloading device that saves power and permits use of smaller motor (cheaper air); the fan flywheel which means cooler discharge air, and higher efficiency at less cost; safety cage so a broken valve cannot damage the machine; inspectable valves and head removable without disturbing pipe connections; adjustment, die-cast, anti-friction bearings and oil level indicator. We aim at giving you more for your money.

Ask your jobber for prices and data
If he cannot supply it, write us : :

CURTIS PNEUMATIC MCHY. CO., 1530 Kienlen, St. Louis, Mo.

NEW YORK: 30 Church Street

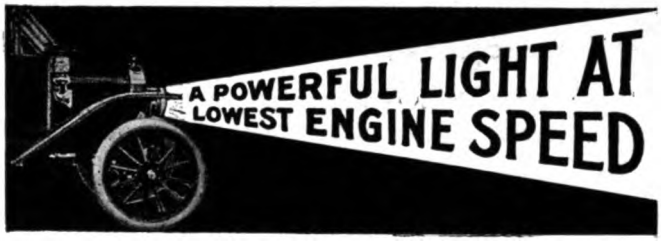
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Our line of accessories for the Ford car comprises only articles that the owner really requires and which he can EASILY install

LONG specializing, extensive advertising, and the production of many patented devices for this particular car of which we are exclusive manufacturers has made our product a by-word in the home of every Ford-owner.

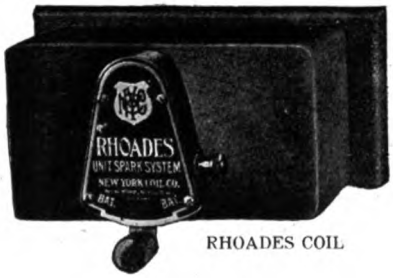
Live dealers everywhere are cataloging our goods—if *pou* fail to do so "we both lose money." We will be glad to furnish you electros, advertising copy, and jobbers' prices for your catalogue. May we do so?

The New York Automatic Head Light Controller for Ford Cars



PRICE $5.00 COMPLETE

This is positively the only device on the market that has solved the problem of operating electric lights satisfactorily from Ford flywheel magneto. It produces a light equal in power to the best storage battery-dynamo systems; as the value and necessity of this system is so great every Ford owner is a prospective customer. Furnished complete and strictly guaranteed.



RHOADES COIL

The New Rhoades Ignition System with Fittings for Ford Cars

PRICE $20.00



RHOADES UNIT SPARK SYSTEM

The Rhoades new battery ignition system increases the value and efficiency of the Ford car to an extent almost unbelievable. It dispenses entirely with the troublesome vibrating coils and supplies a magneto-type spark which insures a wonderful increase in power, a remarkable smoothness in flexibility and transforms the Ford into the class of the most expensive cars. It is operated entirely by six dry cells, which supply sufficient current for 2,000 to 4,000 miles running. Six years of hard service has proven it to be superior to the best high-tension magneto—or any existing ignition system. Price $20.00 *complete* with instructions enabling anyone to successfully install in one hour.



New York Model "TX" Master Vibrator

LIST PRICE $8.00

Our famous Model "T" Master Vibrator is recognized by all Ford owners as the most valuable accessory possible to procure. Its use eliminates hard starting and dispenses with all necessity of keeping vibrating coils in adjustment.

A hot powerful spark is delivered which both increases power and speed and relieves the owner of all ignition trouble and replacement of vibrators.

It has been recognized for years as the standard in its class.

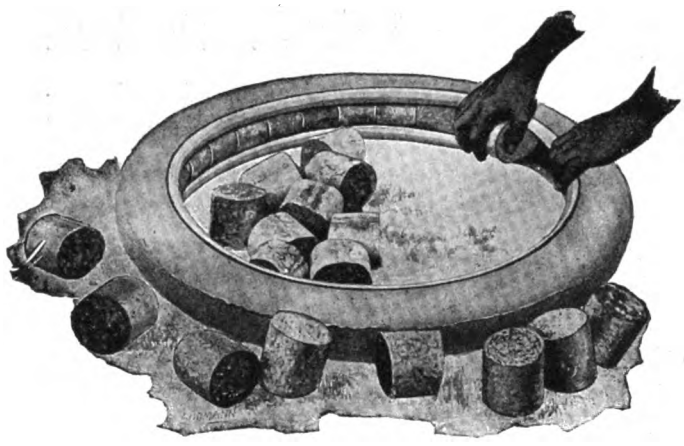
NEW YORK COIL COMPANY, 341 Pearl St., New York, N.Y.

WESTERN BRANCH: 1461 Michigan Avenue, Chicago, Illinois

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NATIONAL RUBBER TIREFILLER

Ends All Tire Trouble—A Perfect Substitute for Air



Made of Pure Rubber, cut in small particles, treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing inner tubes. Doubles the life of the casings—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has all the easy-riding qualities of the air-filled tire, but none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.

National Rubber Filler Company

208 College Street - - - Midlothian, Texas

A SCIENTIFIC OIL PACKING PISTON RING
BUILT BY PEOPLE WHO KNOW HOW



Our Customers Our References

More power, less oil, less gasoline, less friction, less repairs.

A Saving On Every Count

Write for folder, ask for special trial offer.

Distributors wanted, good territory still open.

Write for special proposition

High Efficiency Low Cost

Beware of Infringements

Automobile Accessories Co.

816 West North Avenue

Baltimore, Maryland

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The Nite-Lite

Searches out DANGER
Reads SIGNS

An Absolute Necessity for Night Driving

21, 40, 50, C. P.
Nitrogen Bulb included

The DETROIT Limousine TOP

For Ford Cars

Write for All Particulars

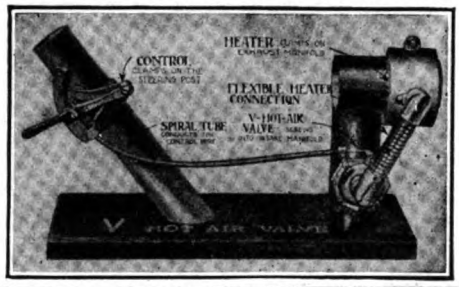


The "Detroit" Top showing operation of Barbour Flexible Doors

The V HOT AIR VALVE

Screws into the intake manifold just above the carburetor so it will admit superheated air into the gas as it passes from the carburetor to the cylinders, PREVENTING ALL CARBURETOR TROUBLES. SAVES ONE GALLON OF GASOLINE OUT OF EVERY FOUR, AT THE SAME TIME INCREASING THE POWER OF YOUR CAR. **WRITE ABOUT THIS TODAY—IT IS IMPORTANT.**

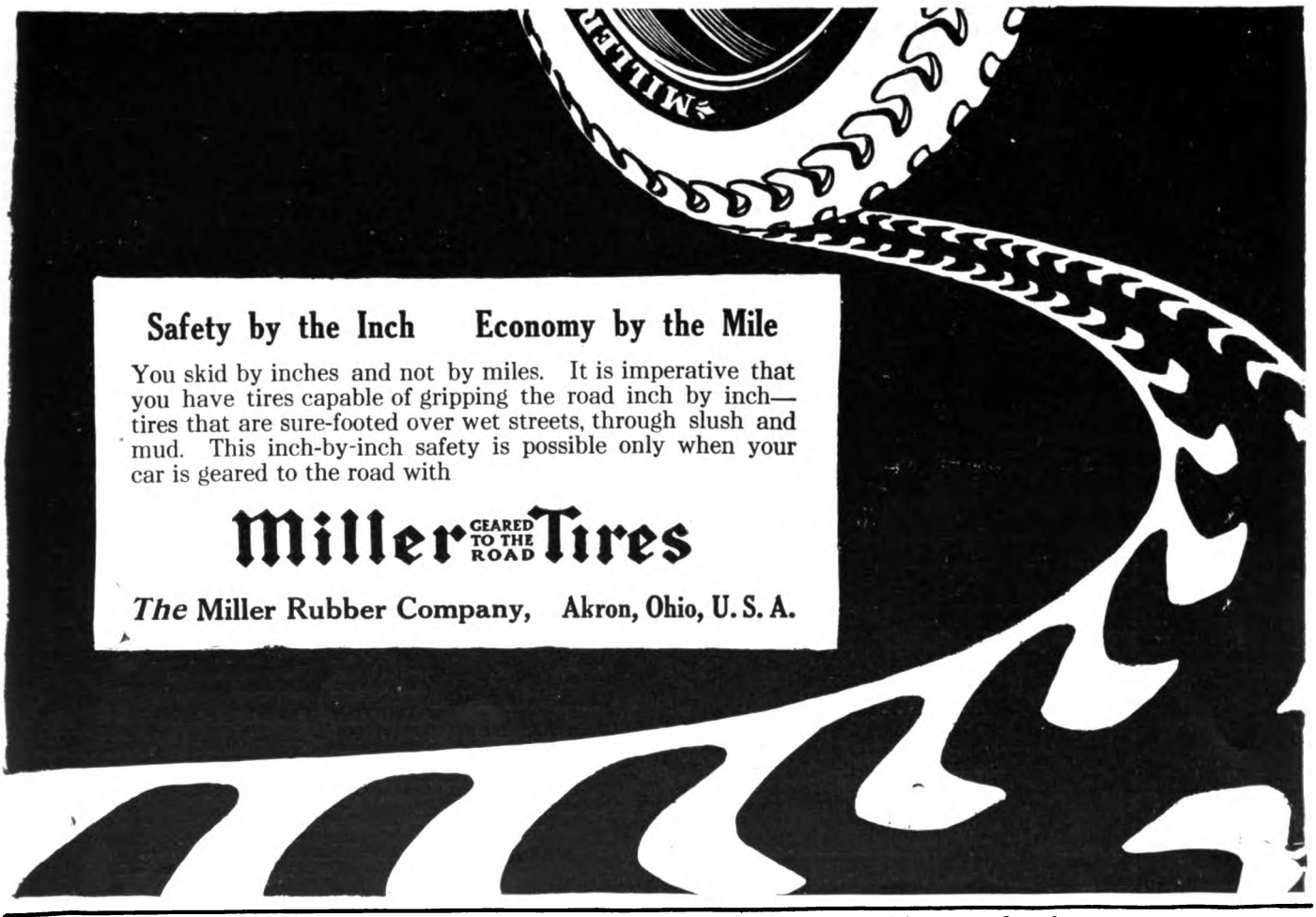
We also carry a general line of accessories.
CARBON REMOVED by oxygen process.



Manufacturers Distributing Company of America

BATTERIES REPAIRED RECHARGED REPLACED

246 West 56th St. NEW YORK



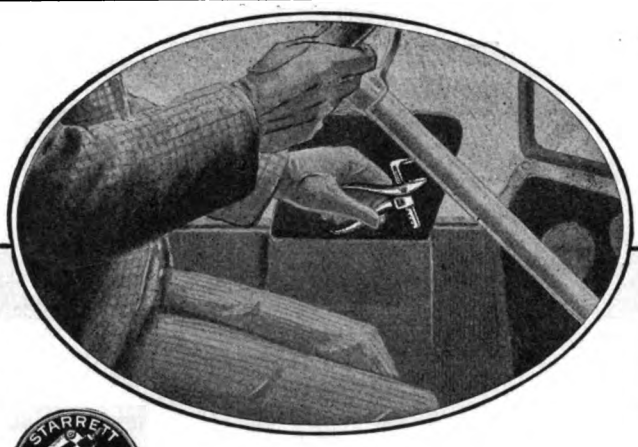
Safety by the Inch Economy by the Mile

You skid by inches and not by miles. It is imperative that you have tires capable of gripping the road inch by inch—tires that are sure-footed over wet streets, through slush and mud. This inch-by-inch safety is possible only when your car is geared to the road with

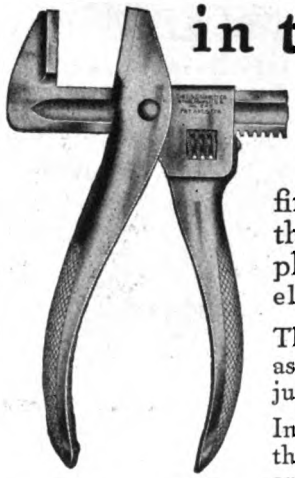
Miller GEARED TO THE ROAD Tires

The Miller Rubber Company, Akron, Ohio, U. S. A.

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Put These Tools in the Pocket of Your Car



Every motorist will find dozens of uses for the Starrett expansion pliers and the Starrett electricians' screwdriver.

The expansion pliers act both as pliers and as a quick adjusting wrench.

In the hard rubber handle of the electricians' screwdriver are four sizes of bits. Handy for tightening up the screws on the instrument board or for fixing up the connections of the ignition system.





Starrett Tools

include other items of value to motorists.

The Starrett wrench set, hack saws, center punches, should have a place in every tool kit.

Hardware stores and garages find Starrett tools quick sellers.

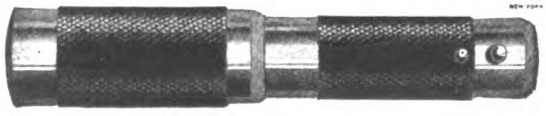
Write for free catalog No. 20-DC, prices and terms.

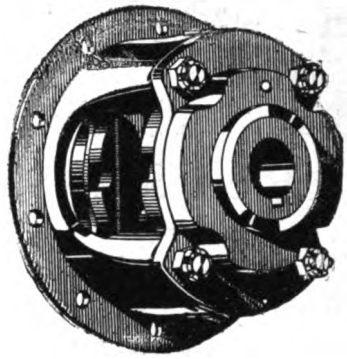
The L. S. Starrett Co.

"The World's Greatest Tool Makers"

Athol, Mass.

New York London Chicago





BAILEY GEARLESS DIFFERENTIAL

Ford, Overland and Chevrolet. 490 Replacements Now Ready.

Laugh at Snowy, Slushy, Slippery Roads

That's what thousands of motorists will do this winter—what you can do as well if you equip your car with the Bailey Gearless Differential.

It will pull your car through bad spots where you'd be hopelessly stalled without it. For all the power is always delivered to the wheel having traction. The loose wheel doesn't spin around, "sand-papering" the tire.

It makes skidding, slipping and sidesway things of the past. Thousands are in use—every one sold on a 30-day money-back offer.

See your dealer, or write for circular.

GEARLESS DIFFERENTIAL CO.

866 Woodward Avenue DETROIT, MICHIGAN

Jobbers Carrying Stock:

Chanslor & Lyon Co., San Francisco, Cal., and Branches
James S. Remick Co., Sacramento, Cal.
Auto Equipment Co., Denver, Colo., and Branches
Harry Horton, New Haven, Conn.
Post & Lester Co., Hartford, Conn., and Branches
Marshall Field & Co., Chicago, Ill.
Motor Car Supply Co., Chicago, Ill.
Hippee Motor Supply Co., Des Moines, Iowa
Tri-City Electric Co., Davenport, Iowa
Auto Supply & Tire Co., Wichita, Kansas
Southwick Auto Supply Co., Topeka, Kansas
C. A. Harberg Rubber Co., Wichita, Kansas
Henderson Garage Co., Shreveport, La.
Tisch Auto Supply Co., Grand Rapids, Mich.
Electric Manufacturing Co. St. Paul, Minn.
Janney, Semple & Hill Co., Minneapolis, Minn.
Minneapolis Iron Store Co., Minneapolis, Minn.
Nicols, Dean & Gregg, St. Paul, Minn.
Reinhard Brothers Co., Minneapolis, Minn.
W. S. Nott & Co., Minneapolis, Minn.
Omaha Rubber Co., Omaha, Nebr.
Williams Hardware Co., St. Paul, Minn.
Kansas City Automobile Supply Co., Kansas City, Mo.
Motor & Machinists Supply Co., Kansas City, Mo.
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Motor Car Equipment Co., New York City, and Branches
Wood Auto Supply Co., Inc., Utica, N. Y.
Paxton & Gallagher, Omaha, Nebr.
U. S. Automobile Supply Co., Omaha, Nebr.
N. J. Engineering & Supply Co., Passaic, N. J.
M. & M. Supply Company, Cleveland, Ohio
Pennsylvania Rubber & Supply Co., Cleveland, Ohio
Burwell Smith Supply Co., Oklahoma City, Oklahoma
Ballou & Wright, Portland, Ore., and Branches
Consumers Auto Supply Co., Pittsburgh, Penna.
Specialties for Ford Cars Co., Philadelphia, Pa.
Congdon & Carpenter Co., Providence, R. I., and Branches
Chemi Co., Richmond, Va., and Branches
L. & L. Motor Supply Co., Sioux Falls, S. D.
H. F. Brownell & Co., Sioux Falls, S. D.
Ferris-Dunlap Auto Supply Co., Dallas, Texas
Tri-State Motor Company, El Paso, Texas
Capital Electric Co., Salt Lake City, Utah, and Branches
Kilmer & Sons Co., Spokane, Wash.
Spokane Cycle & Auto Supply Co., Spokane, Wash.
Julius Andrae & Son Co., Milwaukee, Wisconsin
C. J. Smith & Co., St. Paul, Minn.
Reed Motor Supply Co., St. Paul, Minn.
Syracuse Auto Supply Co., Syracuse, N. Y.
Walkerville Hardware Company, Ltd., Walkerville, Ont.
John Millen & Son, Ltd., Montreal, and Branches
Morris Russell Co., Ltd., 75 Curtain Road, London, E. C.

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Firestone

Hook-On Boots for Clincher or Straight Side Tires
Lace-On Boots
Blow-Out Patches
Cementless Tube Patches
"Cure-Cut" Cement
Air Pressure Gauges
Tire Tape
Tire Mica, Etc.

The Keystone to Good Motoring Trade

EVERY dealer knows that the emergency help is the kind that motorists value most. The biggest hit you can make is to give help in time of trouble—and that is the "long suit" of the dealer who sells

Firestone

ACCESSORIES

Their prompt use often adds hundreds of miles after the tire would ordinarily reach its age limit. They are the surest economy for car owners and mean a satisfied trade for you.

There is no other line of accessories to compare with Firestone in quality, completeness, public confidence and trade value to dealer.

With over two million automobiles and motorcycles operating, this business has assumed tremendous proportions.

Write for catalog and description of entire line.

Firestone Tire and Rubber Company
"America's Largest Exclusive Tire and Rim Makers"
Akron, Ohio—Branches and Dealers Everywhere



Every little item pays a big profit

That's why you, Mr. Dealer, should stock the "Chemically Correct" line.

First in the list is

SE-MENT-OL

The Original Self-Acting Radiator Cement



Absolutely scientific, yet is simple as A, B, C. "Finds the leak and fixes it in fifteen minutes." Dissolves in the water and congeals into a cement at the edge of the leak.

Retail price, 75c.

CARBONOX

The "Chemically Correct" carbon remover. Loosens the carbon and it is blown out thru the exhaust. Should be used regularly about twice a month to keep cylinders sweet and clean and engine running at its best. Far superior to the old way of allowing carbon to accumulate until drastic mechanical methods are necessary.

Retail price, 75c.

PIONEER Valve Grinding Compound

Made from the highest grade abrasive material, contains no ground glass or powdered emery. Coarse, fine and medium. Put up in a variety of containers, most popular of which is the double end box containing two ounces of coarse and two ounces of fine, **retailing for 25c.**

Other "Chemically Correct" Products

SKALEX—Radiator Cleaner
NORWESCO Graphite Coating
THERMITE-Anti-freeze
PIONEER Rim and Gasket Shellac
PIONEER Clutch and Brake Compound
NORWESCO Spring Leaf Compound
KL-ENS-OL—Liquid Soap
NORWESCO Hand Soap
NORWESCO Prussian Blue
BRASS-KOTE—Air-Drying Enamel
NORWESCO Retouching Lacquer
NEVER-BURN—Engine Enamel
NORWESCO Leather Top Dressing
NORWESCO Mohair Top Dressing
NORWESCO Upholstering Dressing
NORWESCO Auto Top and Lining Dye
NORWESCO Ford Painting Outfit
NORWESCO Color Varnishes
NORWESCO Aluminum Bronze
TIRE-LAC—Tire Paint

Write for Literature.

The Northwestern Chemical Co.
Marietta, Ohio

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DU PONT FABRIKOID

How Many Cars Have Hides?

a sequel to

"How Many Hides Has a Cow?"

MORE cars are now upholstered in Du Pont Fabrikoid than in any other material.

The number of automobiles upholstered in hide leather counting all grades, *real grain leather* and *splits* or so-called "genuine leather" is steadily diminishing.

About 20% of the new pleasure cars sold in 1915 were upholstered in hides or hide splits. About 10% were upholstered in cloth. Of the remaining 70% upholstered in leather substitutes the majority were in Du Pont Fabrikoid, Motor quality.

Four years ago nearly all automobiles were upholstered in good leather, *but* 1915 production was just about twice that of 1912; in the meantime the hide supply has been steadily decreasing, and finally the war demand for shoe and harness leather has made prices soar.

The attempt to meet the famine in real grain leather, by splitting the hides and selling the coated and embossed splits as "genuine leather" has been a failure.

The public has learned by experience that there is a vast difference between real grain leather and so-called "genuine leather." Today automobile manufacturers face the choice of real grain leather or its nearest popular competitor, Du Pont Fabrikoid.

Real grain leather, because of its scarcity and high price is out of the question for popular priced models that are produced in any considerable quantity. Therefore, since coated splits, masquerading as "genuine leather," have proved impractical, the decision of the greatest makers of popular cars has been in favor of Du Pont Fabrikoid, Motor Quality, proved the most desirable after several years use on hundreds of thousands of automobiles.

Du Pont Fabrikoid is not leather, but a scientific substitute therefor, which has made good. It has the artistic appearance and luxury of real grain leather, and in addition is waterproof, washable and will outwear the grade of "genuine leather" used on 90% of the cars that "have hides."

Fabrikoid Rayntite Tops are guaranteed one year against leaking. They do not get shabby, because they are washable and fadeless, and will not hold grease nor dust.

Booklet and small sample of Motor Quality sent free. A usable piece, 18x25 inches, sent postpaid for 50c.



Du Pont Fabrikoid Co.
Wilmington, Delaware

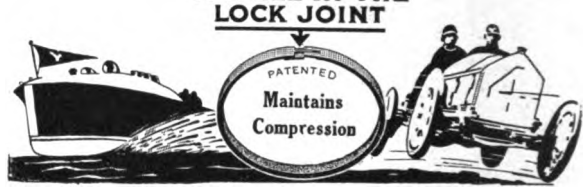
World's Largest Producer of Leather Substitutes

(Works at Newburgh, N. Y.)

Canadian Sales Office, Toronto

PEERLESS
PISTON RINGS

IT'S ALL IN THE LOCK JOINT



Mud, Snow and Gravity Conquered

On the big hills, with rough going over mud and snow, sticky and heavy roads, everything contributing to hold the car back. That's when the car needs every ounce of energy the motor can develop. It is precisely under such conditions that Peerless Piston Rings prove their value most conclusively. The car will make good if the engine is given a fair chance. Peerless Piston Rings give every cylinder a square deal, keeping compression where it is wanted and making combustion clean and effective.

A motor can develop its rated horsepower only as long as its piston rings remain tight. When compression leaks power efficiency goes down. Nevertheless, it costs just as much as if the full power were delivered—costs more in fact, for leaky piston rings result in steady deterioration and ultimate repair bills. That's why it's cheaper to use the best—

PEERLESS

PISTON RINGS

MADE IN CHICAGO



They conserve efficiency by keeping the motor *permanently* compression tight and carbon proof. This is accomplished by means of superior construction. It is one piece and still flexible—a result attained by the exclusive patented *Lock Joint*. The ring exerts an even pressure all around. Not a particle of compression can escape.

Peerless Piston Rings are an investment that pays interest on every mile of rough going. They put new life into old motors, making them as good as the day they were built. Years of compression practice has proven to engine builders that an eccentric piston ring with the original foundry scale of the metal left on the inner surface is the only type that is mechanically correct. It has but one defect—*it leaks*—this defect is obviated by the Patent Lock Joint in this ring.

Dealers: Our money back proposition clinches sales. We make good—so do the rings—That's why they don't come back. Liberal terms—fast sales—will you have details?

LARSON & HILKER,

Distributors,

19 So. La Salle St., Chicago, Ill.

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"NORMA"

"NORMA" BALL BEARINGS

(Patented)

Poor bearings may ruin the performance of an otherwise good magneto—or lighting generator—or starting motor. You can't afford to let one of these accessories that comes to you for repair, leave your hands carrying within its bearings the possibilities of trouble.

For your guidance in selecting bearings, recall the fact that practically all the high-grade magnetos, lighting generators and starting motors adopted for their dependable service qualities by the best car builders, are regularly fitted with "NORMA" Ball Bearings. You want that same service quality.

Have You the "NORMA" Catalog?

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust, Combination Bearings

"NORMA"

No center bolt

Outlasts all others

TUTHILL'S TITANIC
NO CENTER BOLT
Patented Feb. 15, 1910
Guaranteed Forever Against Center Breakage

Outsells all others

Tuthill Titanic Springs

Read what this Taxicab Company says:

Ever been in Saginaw, Mich.? If so, you know it's a pretty tough place on automobile springs—especially in a public taxicab service. Here's what the Lett's Auto & Taxi Co., of Saginaw, say regarding Tuthill Titanic Springs:

"Up to date we have not had one broken spring or leaf, and the first Tuthill Springs we purchased about two years ago are still in use and apparently are as good as ever.

"On the other hand, many new springs furnished as stock equipment have broken at the hole in the center and we have had to replace them with Tuthill Springs within two or three months."

This is only one of many letters we receive from satisfied users.

No weakening center hole—
No weakening center nib

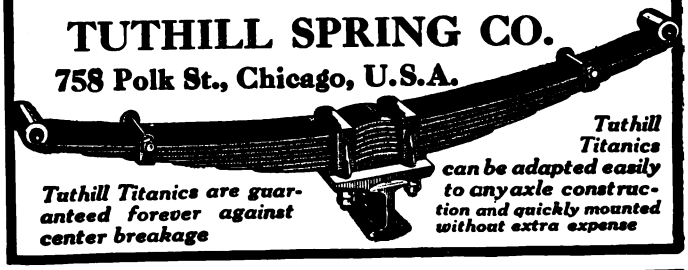
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Get in touch with your nearest Tuthill Distributor—or write at once for our "Best Sellers." You can't afford to miss this profitable replacement business.

See the Tuthill Exhibit at the Chicago Auto Show

COLISEUM ANNEX
Second Floor, Booths 156-157

TUTHILL SPRING CO.
758 Polk St., Chicago, U.S.A.



Tuthill Titanics are guaranteed forever against center breakage

Tuthill Titanics can be adapted easily to any axle construction and quickly mounted without extra expense

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Edelmann Specialties of Merit

HIGHEST GRADE — E & E — CHICAGO — E. EDELMANN & COMPANY — & CO — AUTOMOBILE SPECIALTIES

The Life of the Auto Accessory Trade

LOOK FOR THIS TRADE MARK

MR. LIVE DEALER: Your Jobber carries "Edelmann" Accessories! Ask him and see if he doesn't!!

This is the "JUMBO GREASE GUN"

Needs No Introduction. A "Regular" Grease Gun. Holds 15 oz. grease and is always "On the Job."



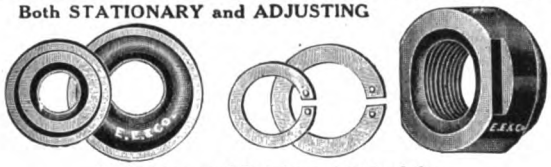
Retail Price $2.25

It's honestly made—all brass and lots of it.

We make and are in position to deliver

FORD BALL RACES, RETAINERS, CONES

Both STATIONARY and ADJUSTING



Ball Races and Retainers for Ford Cars

Prices Are Right — Highest Grade Material

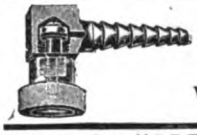
FOUR IN ONE SCREW DRIVER



The Handiest Ever.

Retail Price, 50c

Own one and realize its good points.



This is that well-known

No. 47 AUTOMATIC AIR CHUCK

Dealer's Net Price, 75c.

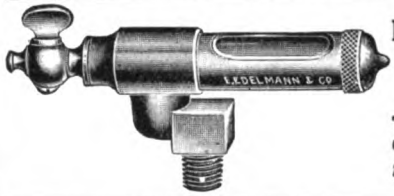
Wanted by all Tire Shops, Garages, Free Air Stations. Supply **Automatically!** It is Guaranteed.

This is the "BREAK-NOT" Battery Syringe Hydrometer



Users say, "What a big improvement over others! Yet they cost no more."

RETAIL PRICE is $1.00, prepaid to any part of United States or Canada.



No. 44 Ford Oil Gauge

See the Heavy Cast Base

Retail Price is 60c.

The day of cheap Ford Oil Gauges is over. Here is a good one.



ROBE RAILS

For All Cars

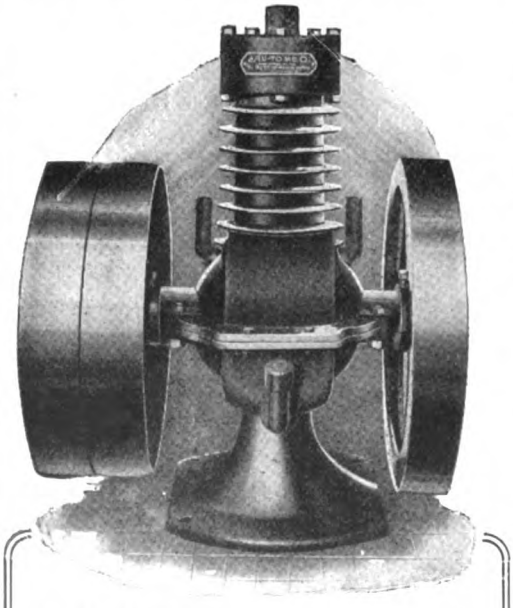
Solid—Hollow

Black—Nickel

Our 1916 Catalog tells about some 200 articles we make. All are sold by dealers and merchants who handle auto accessories.

E. EDELMANN & CO., - - - - 343 E. Ohio Street, Chicago, U. S. A.

It Puts the *air* in Rep*air* Shop!



AIR for every purpose from inflating tires to cleaning the inaccessible parts of an engine,—air at any pressure up to 300 pounds and in quantities as desired,—you have it, at little cost and with no trouble, when you install

The AU-TO Air Compressor

Small in Size and Price—Large in Capacity

It is all metal, air cooled, simple and practically fool-proof. It takes up very little floor space, it is light in weight and is guaranteed to do the work required of it.

The AU-TO is an absolute necessity in every garage, machine shop and repair plant. Our catalog tells what you want to know. Write for it—the sooner the better.

THE AU-TO COMPRESSOR CO.

Dept. 62, Wilmington, Ohio, U. S. A.

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DISTRIBUTING AGENTS WANTED

Big, live concerns, with competent sales forces, to take entire charge in their states or cities of the sale of JOVO.

Every one who has used JOVO is thoroughly pleased and satisfied with it.

Seven years of experiment and test back of it.

JOVO

STOPS PUNCTURES.

JOVO is not a filler. JOVO is liquid and ***remains*** liquid in the tube. Does not freeze or become stale. The contents of a can are placed in a tube—the revolution of the wheel distributes JOVO like a film over the inner surface of the tube—when a puncture occurs the air pressure instantly and automatically forces JOVO into the puncture and seals it permanently.

WE PROVE THIS

Liberal contracts are being made for exclusive territory rights—we want big, live organizations to handle this ***Airtite Rapid Tire Seal.*** Sells when demonstrated and repeats through word-of-mouth advertising.

A big advertising campaign is now under way and enquiries are coming from motorists everywhere.

JOVO STOPS PUNCTURES WE PROVE IT TO YOU Write, 'phone or wire

THE JOSEPH A. VOGEL COMPANY, Laboratories, WILMINGTON, DELAWARE

MILLER'S TIRES

MADE IN ANDERSON, IND., U. S. A.

"There is More Fabric in Miller's Tires"

EXTRA HEAVY

Black or White Treads — ***Non-Skid "Cog" Tread*** — Red or Gray Sides

(Patented Feb. 16, 1915)



Write for Exclusive Agency.

MILLER'S REPAIR MATERIALS

Effective August 10th, 1915

Common Tread Stock, per lb.	$0.40
Standard Tread Stock, per lb.	.55
High Grade Tread Stock, per lb.	.65
Cement Stock for Casings	.80
Cement Stock for Tubes	.95
Inside Tube Patching Rubber, cured one side, per lb.	1.10
No-Cement Patches, per dozen packages	2.50
High Grade Cushion Stock	.85
Fabric Sea Island Cotton, 17½ ounces, one or two sides	.85
Fabric Common Tire Cloth, 18 ounces, one or two sides	.50
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides	.65
Pure Fine Para Gum for making acid Cure or Cold Patching Cement, washed and dried....Net,	1.10
*Miller's Three in One Repair Stock	.80

*This stock repairs casings and tubes and makes Cement, and eliminates the necessity of carrying a large variety of repair material.

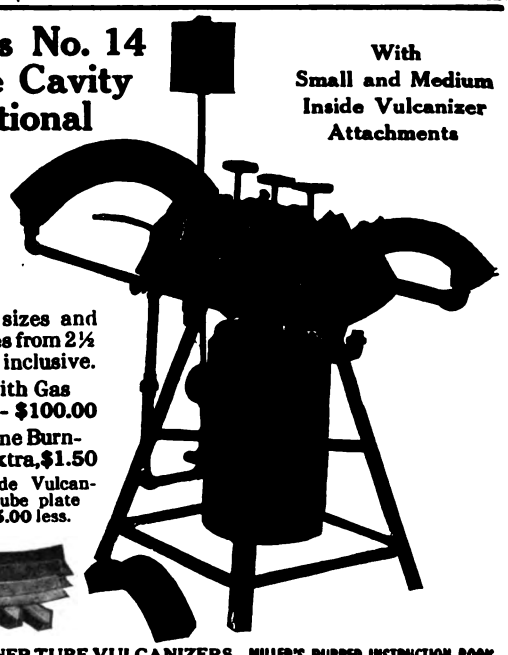
The above prices subject to 5 per cent. discount for cash with order, or in 50 lb. lots or over, 10 and 5 per cent. On 100 pound orders, Freight Paid.

Miller's No. 14 Three Cavity Sectional

One of the 53 Styles We Make

Patented July 21, 1908

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - $100.00

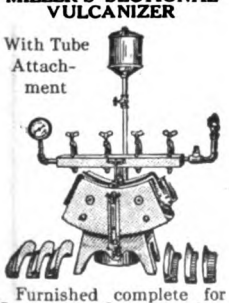
With Gasoline Burner Outfit, extra, $1.50

Without Inside Vulcanizers and tube plate instead, $5.00 less.

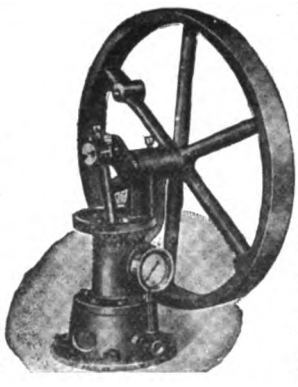


MILLER'S SECTIONAL VULCANIZER

With Tube Attachment



Furnished complete for Steam Line, Gas or Gasoline Burner. Complete with High Stand and Gasoline Outfit - - $36.50



MILLER'S HIGH PRESSURE AIR PUMP

is Oil Cooled with our Fountain Oiling system. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight 200 lbs. This pump will easily compress air to 300 lbs. pressure.

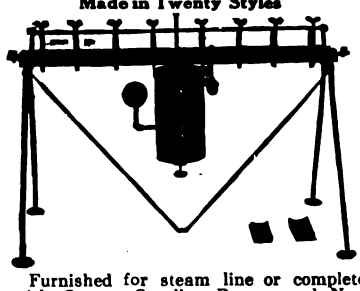
Write for details.

Junior, Single, $25.00

Pump Only, Price, Single, $35.00

MILLER'S INNER TUBE VULCANIZERS

Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

MILLER'S RUBBER INSTRUCTION BOOK

Price Prepaid, $1.00, Net

Free Instructions with each outfit.

FREE—*Write for our 1916 catalog which lists Vulcanizers of* All Sizes *and* Styles, *and Equipment for Tire Shops. Write for prices on* Miller's Heavy Wrapped and "Cog" Tread Tires *and* Heavy Red Tubes.

Address Dept. D.

CHAS. E. MILLER

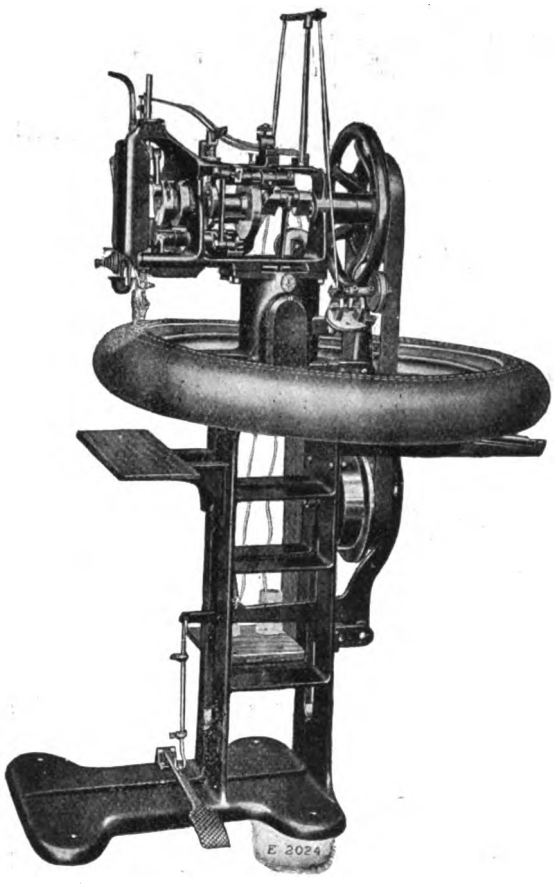
ANDERSON RUBBER WORKS

ANDERSON, IND., U. S. A.

Cor. 14th and Meridian Sts.

Established 1894

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Singer Machine No. 98-2

THE ONLY PRACTICAL

DOUBLE TREAD TIRE STITCHER

IS THE

SINGER SEWING MACHINE

This machine is especially designed for double tread tire stitching by the largest, the best known and most reliable makers of sewing machines in the world.

BUY THE SINGER

and the retreading of old tires will be quickly and efficiently accomplished with the strongest lock stitch that can be produced.

SATISFACTORY EVERYWHERE

WRITE PROMPTLY TO

SINGER SEWING MACHINE COMPANY

Room 3508 Singer Building

NEW YORK CITY



THIS IS IT

Actual Size

A GASOLINE SAVER THAT SAVES.

The Aerofram

Which feeds air automatically into the intake manifold after the mixture is formed.

One Gallon Tests Increases the Mileage

on 10 automobiles. The lowest added mileage was 2.4 and the highest 5.7 miles per gallon.

The Aerofram makes motors run more smoothly when throttled low.

A GUARANTEE IN EVERY BOX
Money Refunded If Not Satisfactory

Agents Wanted — Big Discounts

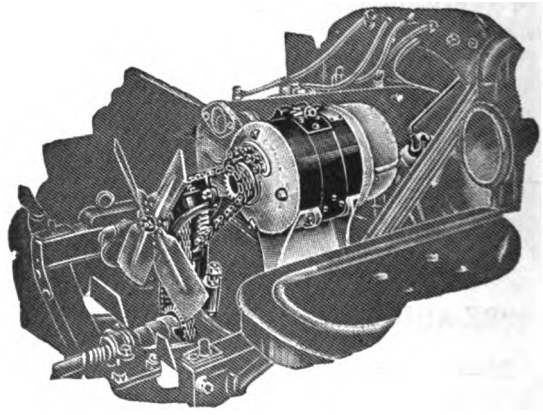
COSTS ONLY ONE DOLLAR

Can be attached to any car in 10 minutes

Nothing to Adjust — Positively Automatic

THE AEROFRAM CO.

755 BOYLSTON ST. - BOSTON, MASS.



North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.

Ask for Bulletin 33-A

North East Electric Company

ROCHESTER, N. Y.

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ATTENTION, FORD OWNERS!—

SAVE Your Car and SAVE Money.

CUT the expense of the upkeep, gasoline and oil by using **R & M Aluminum Alloy Pistons** fitted with R & M Conform Piston **Rings,** the ring that has not only sealed joints but has the power of conforming to irregular and worn cylinders, the essential feature of a compression ring.

Get **Results** by using this combination, then, tell others.

This combination, four R & M Aluminum Alloy Pistons fitted with R & M Conform Piston Rings for only - - - - - $30.00

The R & M Conform Piston Rings are suitable and most economical for all kinds of pistons, such as are used in automobiles, marine engines, steam packings, oil pumps and all air appliances where rings are used.





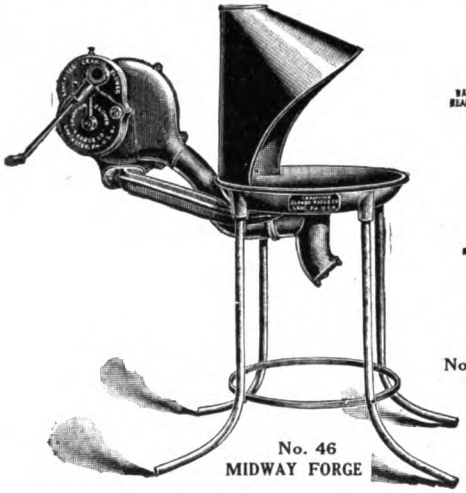
Distributors

SUPERIOR AUTO PARTS CO.

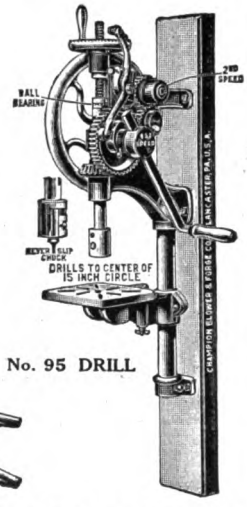
938 Ft. Wayne Ave., INDIANAPOLIS, INDIANA

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Garage Tools of Quality



No. 46 MIDWAY FORGE

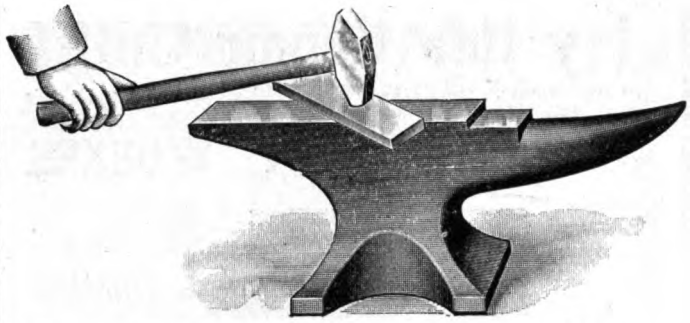


No. 95 DRILL

We manufacture a full line of Garage Forges Drills, Grinders, Screw Plates, Etc., Etc.

Write for our handsome Free 350 page catalog. It means not only a saving in labor but in money. Our tools sell because they satisfy.

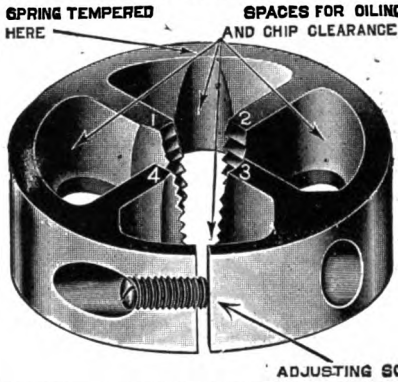
CHAMPION BLOWER & FORGE COMPANY
LANCASTER, PENNA.



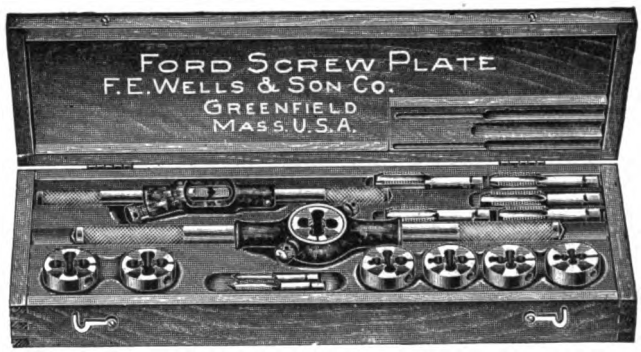
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

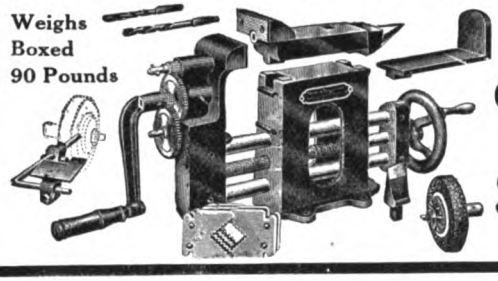
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Try this Repair Outfit

At Our Expense. Every GARAGE, PUBLIC or PRIVATE, needs this BIG, STRONG, COMBINATION OF TOOLS called the

STEWART HANDY WORKER

Weighs Boxed 90 Pounds



Price Complete Only $12.50

If you bought all the tools you get with it, of the same high quality, strength and durability, and the equipment to operate them, they would cost you at least $25 at wholesale price.

A complete, compact workshop that you can attach to a table or bench anywhere about the garage and make it pay you big profits.

NOTE WHAT IT INCLUDES

A strong, practical anvil; powerful vise, up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ inch pipe; a Corundum grinding wheel, 5 inches x 1 inch; a two speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing the handle grip. It operates grinding wheel, buffing wheel and many other similar tools. With the Stewart "Handy Worker" you can do much of your own car repairing, etc., blacksmith work, home repairing, make plumbing repairs, keep knives and other cutting tools sharp and in good working trim.

READ OUR SPECIAL OFFER

Send for one of these great combined outfits today with the understanding that if you don't like it in every way you can ship it back and we will return every cent you paid out. Of all the thousands shipped, not one customer has made a single complaint. It pleases every customer, but our standing offer to return every cent paid out holds good to each purchaser.

SEND ONLY $2.00 WITH YOUR ORDER and pay the balance when it arrives. ORDER TODAY OR WRITE FOR BOOKLET.

CHICAGO FLEXIBLE SHAFT CO., 620 No. La Salle St., Chicago

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

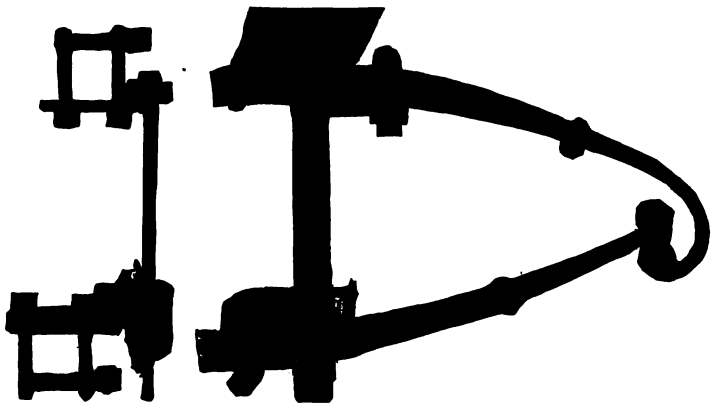
When you buy a lathe, say "Sebastian"

Address (for the catalog)

THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



SEBASTIAN 15-inch Lathe



FRONT VIEW SIDE VIEW

THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.



A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge. Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline. A Great Comfort Particularly In Stormy Weather.

If You Once Install a *"Fillometer"* You'll Never Part With It

THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

APEX ELECTRIC MFG. CO.,

1410-12 W. 59th STREET, CHICAGO, U. S. A.

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Cold Weather Starting Made Easy



Fig. 3—No. 51-D Straight Dash Type.

Here is a simple, easily installed device that throws a rich mixture into the Manifolds and enables you to start your engine on the first turn over in **cold weather.** On cars equipped with Self-Starters, the

IMPERIAL "PRIME-UR"

(It gives you the spray—you start right away)

prevents exhaustion of storage batteries, eliminates bother and loss of time in priming, while its advantages are instantly apparent to anyone who has cranked a stiff engine by hand in cold weather.

Furnished complete with tubing and connections, ready to install—no soldering, flaring or threading necessary.

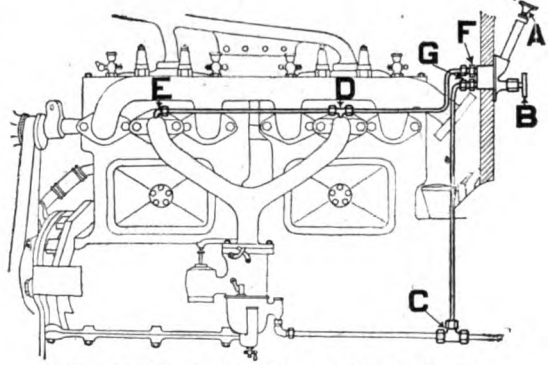
It is endorsed by thousands of satisfied users.

Live dealers everywhere are selling the Imperial "Prime-ur"—Write today for liberal dealers' proposition.

We also Manufacture Imperial Welding, Cutting and Decarbonizing Outfits.

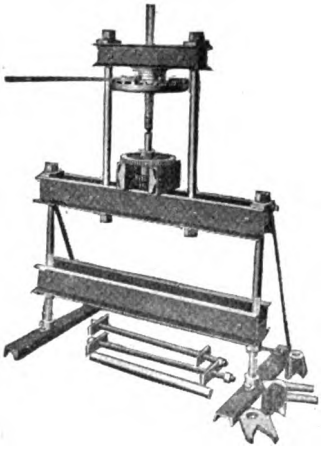
Imperial Brass Mfg. Co.,

520 So. Racine Ave., Chicago.



Showing No. 51-D Installed on Straight Dash.

TOOLS NECESSARY IN YOUR GARAGE



THE UNIVERSAL AUTO PRESS

Capacity 20 Tons. The Screw does not revolve. It is 2 inches in diameter, 4 pitch thread, highest grade of steel. The most practical Garage Press ever brought out, with its capacity of 42 inches for the largest truck wheels. It will handle all your work, big and little, quicker and better than any press at any price.

Complete equipment furnished as shown in cut.

LIST PRICE, $55.00



THE EVERY WAY ENGINE STAND

A most practical support for engines in overhauling, etc. Can be revolved to any position, 100 if desired. Rigidly locked instantly in each position. You can get at every part of the engine with the greatest ease and the least obstruction. Cross bars included in the price for three point suspension motors which are universal in all adjustments.

Any kind of motor can be mounted from the smallest to the largest.

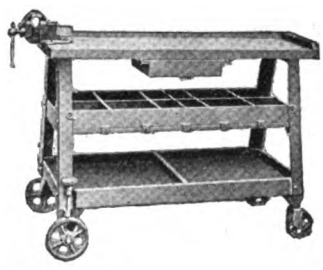
List Price $32.00



THE HILITE PORTABLE CRANE

It is not top heavy. A necessity in every Garage, it will handle the work such as no other method can, quicker, better and without danger. One man is all you need with this Crane for any job. The Hilite Crane is built with a cast iron base and light steel superstructure and has the lift and overhang that is necessary for Garage Work. It therefore has less weight, less bulk and is stronger than other cranes. Built in one and two ton capacities with four lifts from 6' 6" to 8' 0".

LIST PRICES:
From $64.00 to $82.50



QUICK ACTION PORTABLE BENCH

Push it easily and quickly to any car in any part of the garage for small repairs. All the tools and supplies at your finger tips. Just right in size for practical work. After once in use you will find this bench the handiest thing in your garage. Invaluable for tearing down a car, keeping all the parts together.

LIST PRICE $27.50

THE UNITED ENGINE & MFG. CO., - - Hanover, Pa.

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Automobile Accessories Worth Knowing About



TROUBLE-PROOF TIRES

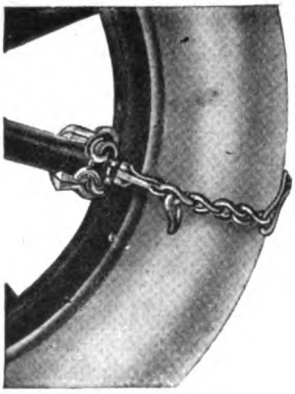
The Woodworth Trouble-Proof tires have a leather strip in them which makes them puncture-proof without making them at all stiff or hard riding. They are guaranteed against punctures or blow-outs for 5,000 miles, and on light machines they generally last 10,000 to 15,000 miles. Woodworth Trouble-Proof Tires are carefully hand made from the very best materials obtainable and will not only give trouble-proof service but will last so much longer that they are much cheaper to use than ordinary tires.

Send for our new Booklet entitled "*Trouble Savers for Tire Users.*"



WOODWORTH TIRE OVERSHOES

A light weight tire covering completely enclosing the tire, fastened to the rim. Made of leather that is absolutely water-proof and guaranteed not to stretch when wet. The Overshoes are finished on the inside with a special finish which makes them adhere to the tire, preventing friction and wear on the rubber. They are puncture-proof, protect the tires from all outside injury and road wear and do away with the bother of chains for wet and muddy roads. They are very low in price and will save much more than their cost besides doing away with punctures and skidding.



EASYON CHAINS

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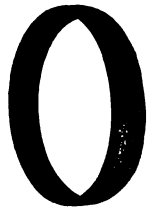
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TIMING THE VALVES.

Highly Important That It Should Be Correct to Secure Good Results.

BY C. P. SHATTUCK, M. E.

The price of gasoline has nearly doubled since June and predictions are made that a gallon of motor fuel will cost 35 or 40 cents by next spring. Various reasons are advanced for the increased cost, but unfortunately the motorist is confronted by a fact not a theory, and the fact is that the fuel bills will have increased over 200 per cent. by the time warm weather arrives.

The average motorist believes that if nothing can be done to lower the price of gasoline its high cost necessarily involves economy of operation. There is, however, a remedy. It is not applicable to the brand new car but it can be successfully applied to a machine that has seen considerable service. The remedy is to thoroughly overhaul the valve mechanism of your motor and time it accurately.

The writer holds that the majority of motors that have been in operation for several thousand miles without attention are running out of time. This is meant to apply particularly to four and six-cylinder motors. Accurate timing of an internal combustion engine is highly important if maximum efficiency is

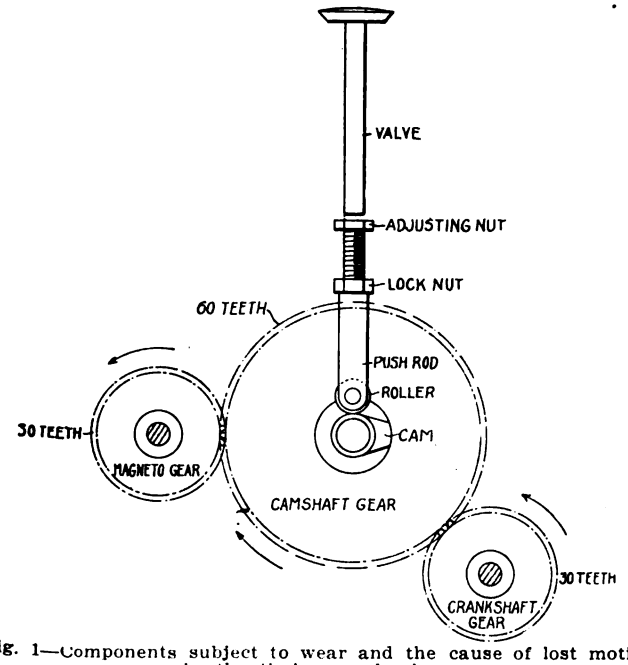


Fig. 1—Components subject to wear and the cause of lost motion in the timing mechanism.

to be obtained from the fuel. The falling off in power and decreases in mileage a gallon of fuel is generally so gradual that the average owner does not notice it. When it is discovered that the mileage is below that formerly obtained many owners blame the carburetor or ignition, and while they may be factors they are negligible when compared to faulty valve action and timing.

The reason why it is important that the motor be timed accurately is based upon the necessity of igniting the mixture between the interval of inspiration and that represented by the power stroke. The best results are not to be obtained if the mixture be allowed to burn during the power stroke which should be devoted entirely to the expansion of the gases. On the other hand the ignition should not

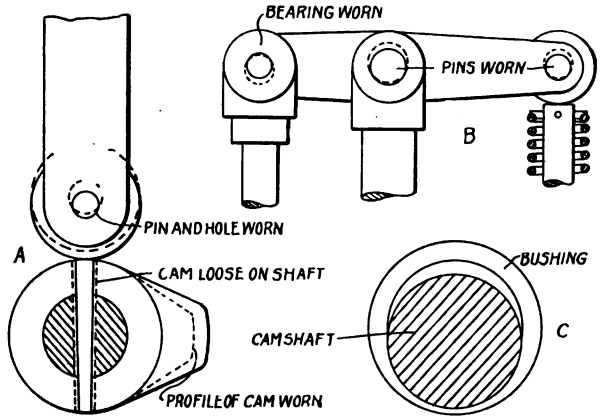


Fig. 2—Illustrating common causes of play in valve timing, the dotted lines indicating lost motion.

occur before the completion of the intake stroke. In poorly timed motors the gas being taken in is reduced below the best level and the work that the compressed mixture is capable of doing falls below par because the burning of the mixture is prolonged into the power stroke.

Incorrect timing is responsible for poor carburetion and induction due to the intake valve opening too early, allowing the exhaust gases to affect the mixture and to the exhaust gases not being completely expelled before the intake valve opens. A late opening of the exhaust valve or a too short a period will bring about the last named condition. These defects are more prevalent at high motor speeds and result in the cylinder not being filled with the mixture and are caused by too short an intake period or to a late opening or closing. When the opening is late counter currents are induced in the branches of the intake manifold caused by the piston that has completed the suction stroke and is compressing, forcing a part of the mixture back. When the exhaust period is too short or the valve is late in opening, some of the gases occupy space that should be given over to the incoming fresh mixture. The presence of burned gases not only impairs the burning of the charge, but they affect the output of the motor because of the presence of carbon dioxide in the exhaust.

The writer does not wish to convey the impression that the factory timing of the motor can be improved or altered and good results obtained. But the components responsible for faulty timing can be adjusted and if these be worn, restored to an efficient condition. The work will usually involve other than grinding in the valves and readjusting the valve

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tappets to offset the space occasioned by natural wear of the valve mechanism. While such work will improve the operation of the motor in that the timing will be improved, there are several other factors that should not be overlooked, especially with an old motor. Good results can only be expected when the work includes a thorough overhaul of the valve mechanism, particularly the guides and valve stems. Worn guides are responsible for much needless

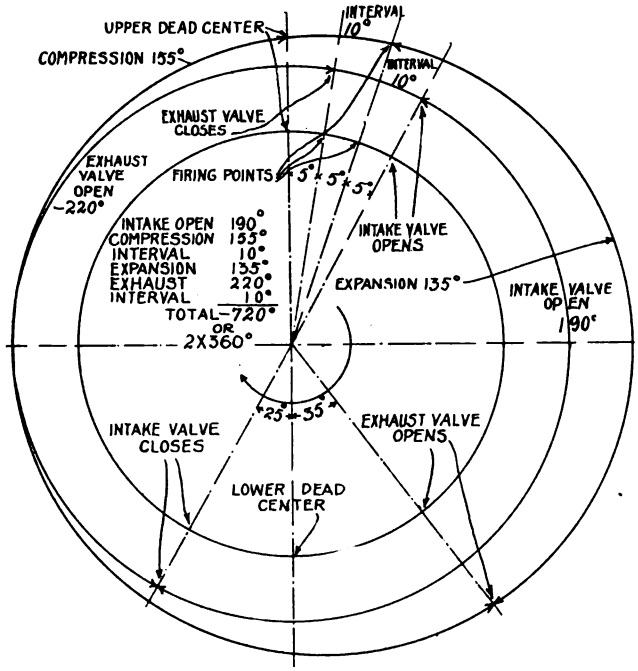


Fig. 3—Timing chart for two and four-cylinder motors with strokes laid off in degrees.

waste of fuel in that they admit extra air diluting the mixture and particularly at low speeds. To compensate for the extra air the fuel supply is increased, obtaining an excessively rich mixture at operating speeds.

The necessity of the valves seating properly is too well known for comment, but it is suggested that the springs be carefully examined, especially those having the same diameter throughout their length. These are not always square at their ends, and exerting an uneven pressure on the valve stem cause the valve to seat unevenly. This is not noticeable when grinding in the valve, and the seat may be perfect. Not only should the ends of the springs be square but the springs should be tested for strength and resiliency.

There are factors other than the spaces between the valve stems and the tappets that contribute to incorrect timing of a motor. Starting with the application of the energy of explosion to the crankshaft, thence through the crankshaft gear to the gear actuating the camshaft, it is possible that the teeth of these gears are worn, a condition resulting in lost motion. Play may exist in the camshaft bushing as indicated at Fig. 2 C, or the cam proper may be loose on the shaft as illustrated at A. A common cause of lost motion is indicated in the same sketch illustrating a conventional method of opening a valve. As a rule the roller does not wear but the pin retaining it in the plunger not only decreases in size but it increases the opening in the roller. The dotted lines emphasize the lost motion as do those showing how it is possible for a cam to wear. Motors with the overhead type of valve operating on the principle shown at B develop lost motion in the valve mechanism at the points indicated by the dotted lines in the drawing.

It is essential that any existing faults be corrected before attempting to retime the motor. While it may appear that these faults be minor individually, yet in the aggregate they mean considerable lost motion. For example: Assuming that there be ten places having lost motion and that each is a 25-1000 of an inch. The aggregate wear will be 250-1000 or one-quarter of an inch.

The work of retiming the motor is not difficult when the flywheel is marked. As a rule the opening and closing point of each valve, exhaust and intake, as well as the upper and lower dead centers, are marked at the factory. If the flywheel is not marked a timing diagram will be necessary and it can generally be obtained from the factory. If the timing cannot be secured, the motor will have to be timed in a general manner and changes made until the desired results are obtained. Methods for timing unmarked motors as well as how camshafts may be reset to overcome certain troubles due to incorrect timing and wear, will be discussed in logical sequence.

Different marks are utilized on flywheels. The centers may be indicated by the litters U D C and L D C, meaning upper and lower dead center, or may be denoted by C, both upper and lower, or a line scribed on the periphery of the flywheel. The opening and closing points of the valves are also marked on the flywheel and these are indicated by letters,

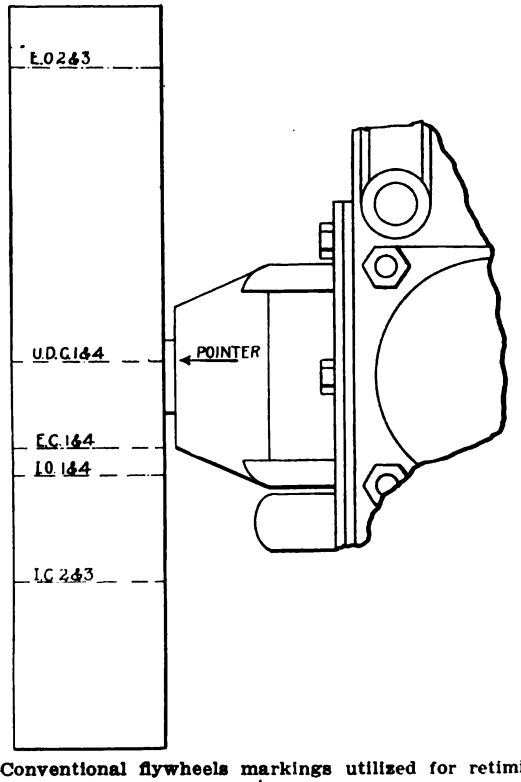


Fig. 4—Conventional flywheels markings utilized for retiming the motor.

generally as follows: I O, I C, meaning the opening and closing point of the intake valve, and E O and E C, the opening and closing of the exhaust valves. The letters are usually followed by numerals indicating the cylinders. This is illustrated at Fig. 4 which shows the markings of a flywheel of a four-cylinder motor.

The utilization of two figures such as E C1 and 4

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is puzzling to the motorist not familiar with the work of checking the timing of a multi-cylinder motor, but it is very simple when one takes into consideration the cycle of the motor. The reading of a timing diagram is not difficult if one will apply the cycle of the motor and take into consideration the fact that 360 degrees represent a circle and that two complete revolutions or 720 degrees represent the cycle of the engine. This is shown at Fig. 3 which illustrates a timing chart for two and four-cylinder engines.

Upper and lower dead centers divide the circle into 180 degrees. As may be noted, the intake valve opens 15 degrees after the upper dead center line has passed an imaginary mark or pointer denoting the dead center. The valve remains open until 25 degrees after lower dead center when it closes, consequently the period of opening is 190 degrees. The exhaust valve opens 35 degrees before lower dead center and closes 10 degrees after upper dead center, it having a period of 220 degrees.

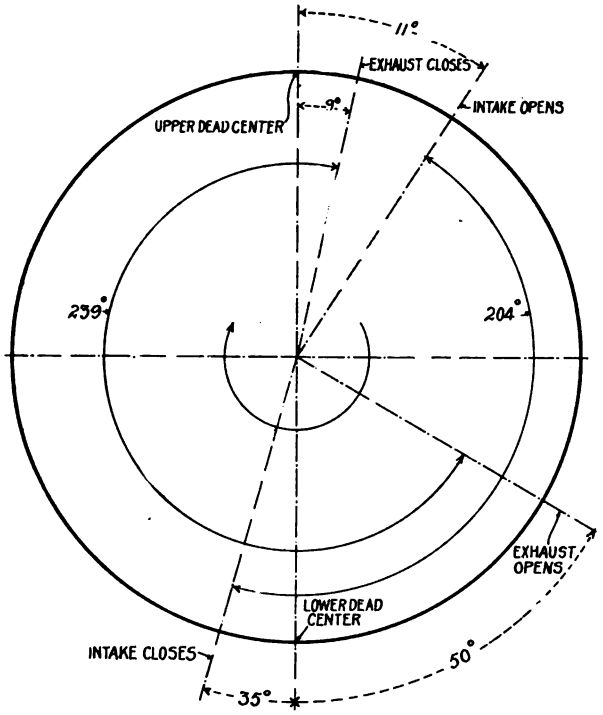


Fig. 5—Timing diagram showing the average timing of the intake and exhaust valves.

The periods of compression and expansion are also given. That for compression is 155 degrees and is easily figured as follows: The intake closes 25 degrees after lower dead center and as the piston attains its top dead center position after 180 degrees or half a circle travel, we deduct 25 from 180 which gives 155. The expansion period is 135 degrees as we deduct 10 degrees, the point the exhaust valve closes and 35 degrees, the point it opens, from 180 degrees. Intervals of 10 degrees are allowed in this diagram. The markings of 5 degrees are made to utilize the chart for timing low and high speed motors. As may be noted the periods of intake, compression, expansion, exhaust and intervals equal a total of 720 degrees or 2x360 degrees, the cycle or two complete revolutions of the flywheel. These points are explained at length to enable the motorist to time two valves at the same time; that is, to check up the timing of the valve that follows the No. 1 without rotating the flywheel until the No. 2 valve starts to lift, etc. This will save time as well as labor.

Before beginning the work of checking the timing, remove the spark plugs to relieve the compression and to make easy the work of rotating the flywheel by hand. The first step is to locate the dead centers. Rotate the flywheel until the piston is at the top of its stroke and the crankthrows of the shaft exactly vertical. When in this position the line marked U D C should coincide with a pointer similar to that shown at Fig. 4. If a pointer is not provided, prick punch the cylinder directly opposite the line indicating center on the periphery of the flywheel. Knowing the firing order of the motor is of assistance in the work.

(To be continued.)

THE GASOLINE PROBLEM.

Looking Vainly for a New Fuel as Price Continues to Soar.

From Alfred Reeves, Automobile Chamber of Commerce.—Of all the problems that we find nothing is of greater importance than the question of a fuel supply at a moderate price. There has been ample fuel for our needs up to this time, with a wonderful distribution so it is obtainable almost anywhere, yet of late the price has been increasing at a rate which is a menace to the growing use of motor cars and of internal combustion engines generally, such as those used on farms and in boats.

Our engineers have worked, and are working, with the result that we have the efficient cars of to-day supplying almost double the mileage on a gallon of gasoline of the cars of six or eight years ago, yet this greater efficiency in mileage per gallon is offset by the greater uses we have for motor cars and the increased cost of the fuel itself.

One reason after another has been offered for this advance in price, the oil companies finally getting down to the statement that it is now a matter of supplying the demand and pointing to the fact that five years ago we used approximately 2,500,000 gallons of gasoline per year in motor cars, while during the past year the consumption was not far short of 1,000,000,000 gallons.

If there continues to be a shortage in gasoline and the price increases, we must look for some new fuel. Its arrival is certain, because there never has been a crying demand for anything without an answer from engineers and inventors. Such new fuel may come from crude oil, but more than likely it will be a chemical. Hail to the man who will deliver us from the need of gasoline in motor cars! Just think of the time when chemists will furnish us with tablets one of which in a gallon of water will provide fuel for your motor! Notwithstanding the increased quantity of gasoline we have had from the same quantity of crude oil, the price continues to advance. In the early days, with inefficient carburetors and heavy cars, six miles to a gallon was considered excellent.

One of the manufacturers' committees, on which I had the pleasure of serving, interviewed the Standard Oil officials a few years ago, who informed us that if we could use lower grades of gasoline they would be able to furnish ample for our needs. In other words, as they expressed it, more gasoline could be obtained if they could cut deeper into the crude and get an increased amount of gasoline from

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each gallon of crude oil. At first cars would only run with gasoline of 72 degrees; then we got down to 68 degrees; then to 64 degrees, and now a large part of it is 58 to 60 degrees. Kerosene is about 45 degrees.

While kerosene could be used and would be cheap, it has up to this time exhibited a tendency to give off an odor when burned and also leaves an excess of carbon in the cylinders. The low grade of gasoline is a little more difficult to start on, but supplies more heat and is a better fuel for general work after the motor is under way.

The average car now will give fourteen to eighteen miles on a gallon, with some running as high as thirty-five miles, offering transportation at a pretty low cost. The new pumping systems of oiling enables cars to travel 500 to 800 miles on a gallon of oil.

It is certain that 1,000,000 and possibly 1,200,000 cars will be made during 1916, so that at least 3,000,000 automobiles will be running in this country at the end of this year. These cars will average 400 gallons of gasoline annually, a total of 1,200,000,000 gallons, while the oil consumption will be not far from 35,000,000 gallons of lubricating oil. You can see, therefore, the great problem that confronts the industry and the great opportunity offered for our great chemists to supply some form of new fuel.

MAGNETO OR BATTERY.

Comparison of the Two Systems by an Electrical Engineer.

Francis R. Hoyt, Simms Magneto Co., before the New York S. A. E.—In discussing the subject of ignition, where a comparison between systems becomes the objective, it is first necessary to divide these various systems into groups or classes, handling those in separate groups individually. For our analysis of battery systems, we will consider them in two divisions.

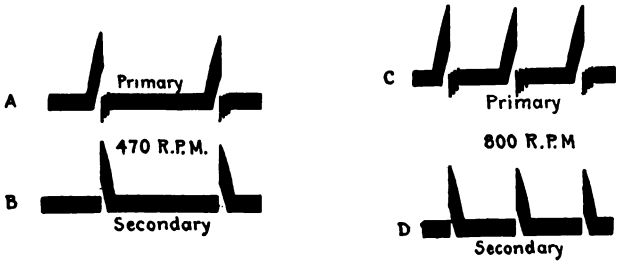


Fig. 1.—Current Waves of Open-Circuit Battery System.

In one division the contact-breaker is normally open and the necessary periodic closing is accomplished by some mechanical device for a definite interval of time regardless of the speed of rotation. This will be called the open-circuit battery system. In the majority of such systems the make-and-break is accomplished by a spring-controlled lever tripped or set in motion by a revolving cam. This action brings the interrupter points together for a very brief contact. Because of the comparatively short length of this time interval, the current in the primary winding of the induction coil can only grow to a very small part of its full ohm's law value.

The other division consists of those battery systems in which a normally closed contact-breaker is opened periodically by a revolving cam or its equivalent. In this type the current growth in the primary is in proportion to the speed of the ignition device, each increase in speed consequently being accompanied by a decrease in core saturation. These will be referred to as closed-circuit battery systems.

For our classification of magnetos we need consider only the high-tension type. This review treats of all high-tension magnetos whether the armature actually carries the inductive windings and rotates within the pole-pieces or the rotating member simply causes a periodic change of flux in the stationary induction coil.

Open-Circuit Battery Systems.

In the open-circuit battery system the current in the primary only rises to a small fractional part of its total value. The current waves that accompany the making and breaking of the circuit are shown in Fig. 1. Waves A and C show the growth of current in the primary winding at 470 and 800 r.p.m., respectively. The two current values are practically the same. The total current consumption from the battery, of course, increases with the speed, because of the greater number of interruptions per given interval of time. The secondary spark is of comparatively high voltage, and has practically negligible heat value and duration. The secondary waves B and D, corresponding to each speed, are shown below in their proper relation to the primary currents. These values remain practically constant regardless of speed. The inability to secure core saturation, and consequently heat value in the secondary spark, must be compensated for, and so the initial voltage is made great enough to produce a longer spark than other systems require. The higher voltage is secured by a big ratio of turns between the primary and secondary windings, and the thin spark thus obtained is relied on both for breaking down the resistance of the spark-plug gap and for ignition. As will be seen by the primary oscillograms, the current at the time of break is still increasing rapidly. The current value at the peak of the wave is 1.5 amperes, whereas if this current were allowed to attain its maximum, the full Ohm's law value would be 23.8 amperes. The time of contact is so short that the coil as operated is only 6 per cent. efficient, not considering electrical losses.

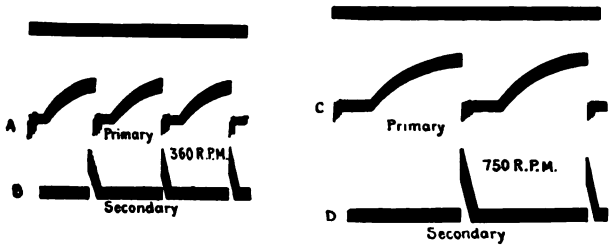


Fig. 2.—Current Waves of Closed-Circuit Battery System.

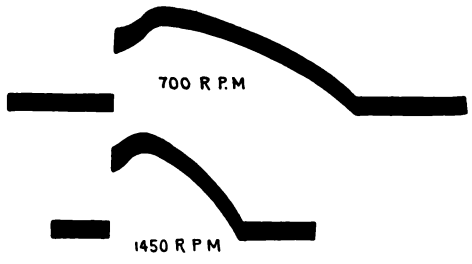


Fig. 3.—Secondary Current Waves of High-Tension Magneto.

In the normal closed-circuit battery systems, Fig. 2, the primary current growth, A and C, is regulated by the speed of the device and is the greatest at the lowest speeds, falling off rapidly as the speed in-

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creases. The straight line above each of these waves represents the maximum current that would flow if the contact points remained closed long enough. The speed of the upper wave was taken at 360 and that of the lower at 750 r.p.m. These correspond to engine speeds of 740 and 1500 r.p.m. In these systems the heat of the secondary spark is proportional to the speed of the engine; the greatest spark

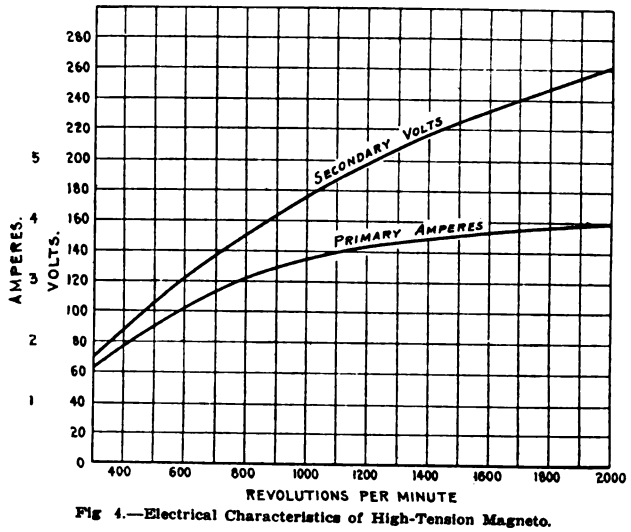


Fig 4.—Electrical Characteristics of High-Tension Magneto.

heat at the lowest engine speeds and vice versa. The secondary waves are shown at B and D in their proper relation to the primary.

The condenser proportions present some difficulties, as when the core saturation, to secure a higher secondary current and consequently a greater spark heat. The secondary spark is of short duration, being only slightly longer proportionally than that of the open-circuit group. The closed-circuit battery system having greater heat value, works with a shorter spark plug gap.

High-Tension Magneto Systems.

Fig. 3 shows oscillograms of the secondary current from a high-tension magneto, the upper at 700 and the lower at 1450 r.p.m. These are about the

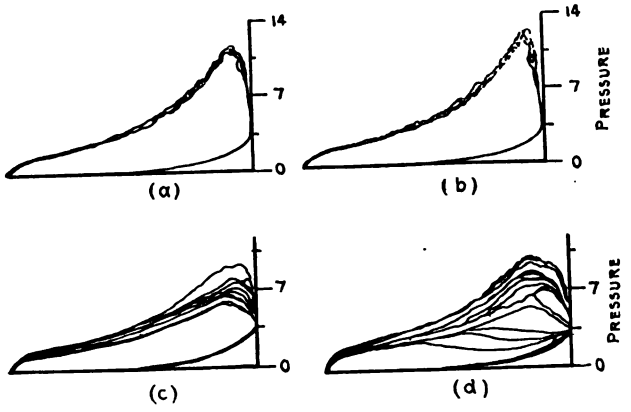


Fig. 5.—Indicator Diagrams Taken with Battery and Magneto Ignition.

same engine speeds as were used in making the battery oscillograms, and show clearly how the spark heat increases with the speed. The current waves of all three secondary circuits were made with the same damping and oscillograph connections so that the values are comparable. The shape of the magneto current-wave, Fig. 3, shows the well-known "follow-up" current, which is not shown in either of the battery-system waves. The secondary waves shown were taken from the type of machine in which the heat varies at different positions of the timing-lever, and are the waves of lowest order.

Ignition Requirements.

No matter what theory may be held as to the molecular structures of the gas particles in the combustion chamber, all will agree that flame propagation is not instantaneous, and that the rate of propagation, so far as the ignition spark is concerned, is influenced by the heat of the spark or flame area introduced into the cylinder. The greater this heat and the larger the volume of flame, the more quickly the compressed charge will burn. If the flame spreads more rapidly, the combustion will necessarily be better and the engine efficiency and performance increased.

This suggests a comparison between spark heat and spark advance. Take for illustration an engine in which we can switch suddenly from a spark of great to one of low intensity. It would then be necessary in order to have the piston begin its outstroke at the point of maximum pressure to give a greater angle of advance to the spark of lower heat value. It is only by this method that many ignition systems are operative to any degree of satisfaction.

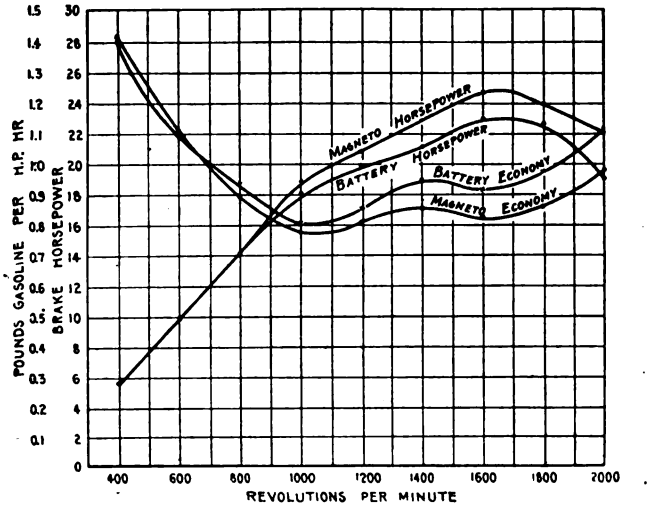


Fig. 6.—Economy and Horsepower of Magneto and Battery Systems.

This seeming method of substitution has, however, serious drawbacks, for the expansion pressure exerted before the piston has reached top-center tends to impede its upward progress, and the mixture is being ignited before becoming thoroughly homogeneous. Other losses also can be traced directly to the same cause.

Open-Circuit Battery System.

The secondary or ignition spark from an open-circuit battery ignition system is a spark of short duration, of practically no heat value and of constant intensity regardless of speed, depending for its flame area upon a slightly longer spark-plug gap. The igniting properties of a spark of this character will never be able "to lend a helping hand;" all speeds, all grades of mixture and all degrees of compression are treated alike. The same flame or spark will be introduced into the cylinder whether the engine is under high compression at low speed or low compression at high speed. In addition the spark must be timed accurately because it will not help compensate for any of its own irregularities, to say nothing of assisting the engine during varying internal conditions. In the type of interrupter me-

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chanism used there is also a large mechanical lag, caused by the fact that the interrupter cam or its equivalent is rotating rapidly away from the lever that actuates the breaker mechanism, thus entailing time losses. This mechanical lag is proportional to the interrupter speed, but it must be compensated for by a further advance of the spark itself, thus introducing further complications.

This system has one structural advantage over the closed-circuit battery system, because the arcing

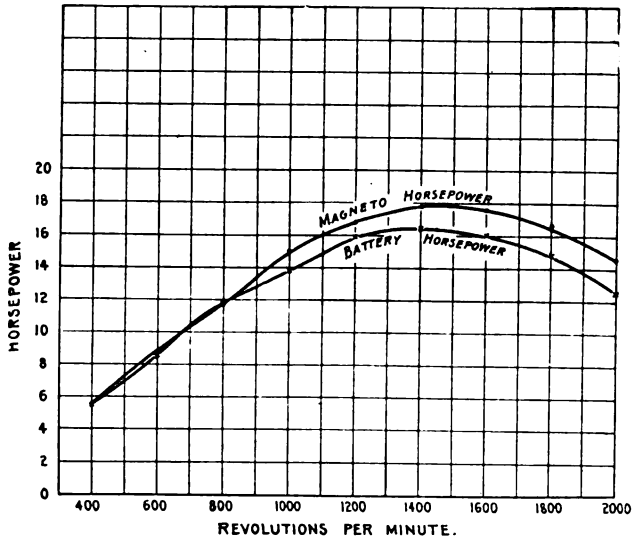


Fig. 7.—Power from Fixed-Spark Magneto and Variable-Spark Battery Systems.

at the contact points can be more nearly eliminated. The primary current growth is the same in all cases and the condenser that assists in eliminating the arcing can be graded properly.

Closed-Circuit Battery System.

In the closed-circuit battery system, the spark induced in the cylinder is more effective at low speeds without excessive spark lever manipulation. The current in this type however drops off very rapidly with increasing speeds. In battery systems in which the current draw on the primary is comparatively heavy (say three amperes or over) at starting speeds, there should be an extra source of battery supply; otherwise it will be found that the hot spark for winter starting is a myth. The drop in voltage across the terminals of the storage battery, due to starter load and an inefficient battery at winter temperatures, will prevent the primary of the coil from receiving the necessary current for good spark production. The secondary current wave is of about the same duration and of more heat value than those obtained in the open-circuit class, but as this heat falls off rapidly with an increase in speed, the question of spark advance is again involved. The flexibility, economy and power of the engine are under these conditions regulated solely by the skill of the driver. Every person who has ever driven a battery-equipped car must have realized the amount of practice and skill necessary to advance the spark with increasing engine speeds when under heavy load, without producing a spark knock. It may be well to add, however, that from a point of view of ignition results this construction is the preferred battery one, and comes much nearer meeting the demands of an engine. It is possible to produce a spark of greater heat value because of greater coil efficiency, than with the open-circuit type irrespective of whether the engine is at low or at high speed. The difficulty so often encountered, of draining the battery when the starting-switch is not thrown off has been the object of considerable engineering. Attempts to overcome this difficulty have been made, but where electrical means are used there is an inevitable loss by waste primary currents that must traverse the mechanism continually, and where mechanical means are employed, complications are introduced.

The inherent property of a high-tension magneto of delivering a spark of increasing intensity with each increase in speed is in direct response to the demands of an engine and to a large degree compensates entirely for spark advance. An excellent illustration of this is given in Figs. 6 and 7. Fig. 4 is a curve showing the actual primary current of a high-tension magneto and the generated and induced secondary voltages. These curves are plotted from readings taken with an alternating current voltmeter and ammeter. In obtaining the generated and induced secondary voltages the contact-breaker of the magneto was removed and the readings taken directly across the terminals, just as a voltage reading would be taken in the case of a low tension magneto. With any ignition device capable of increasing its spark heat with increasing speed, it will be found, particularly in the hands of the ordinary driver, that an engine is more flexible, that better combustion is secured, that slight carburetor errors are to a certain extent corrected, and that varying grades of gasoline, such as are now so common, will give good results without the annoyance of continual carburetor adjustment.

The magneto is the only type of ignition device that delivers a flow of current after the first or arc-

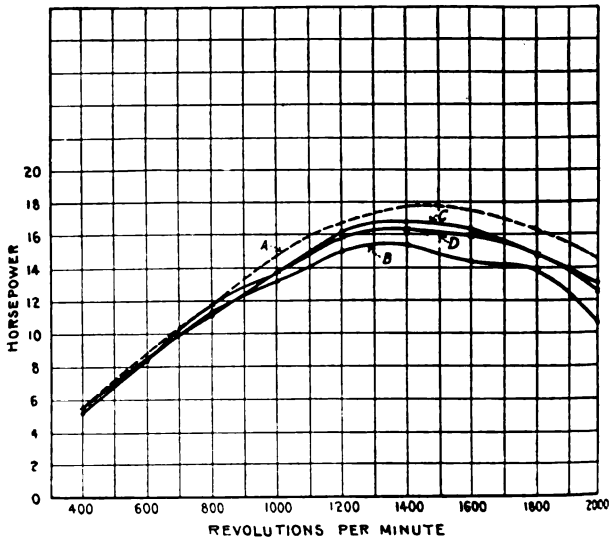


Fig 8.—Effect of Spark Variation on Battery System.

over voltage has passed. It has been said that the arc-flame or follow-up current of the magneto plays no part in ignition. This conclusion is based on the assumption that the gas in the combustion chamber immediately surrounding the plug is ignited by the first formation of the spark, and that consequently any additional flame at the spark plugs is of no value. It must be remembered that at the time of the occurrence of an advanced spark, the piston is traveling upward, and the mixture is being more and more compressed. Therefore the same par-

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ticles of vapor are not being held in fixed relation (or "suspension") to the gap of the plug. A constant change is going on at the plug-gap, as well as at any given point in the cylinder, both in the formation of the molecule and in the position of the whole mass. Table I illustrates the position of the

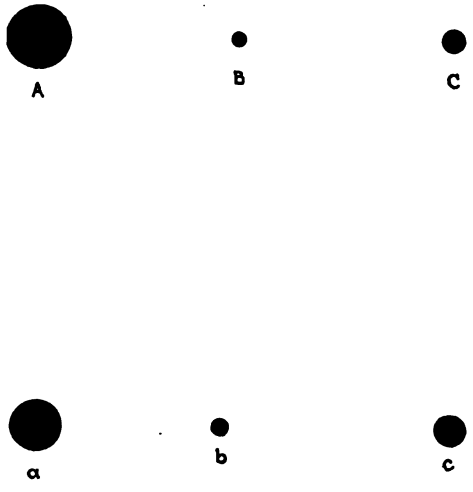


Fig. 9.—Spark Heat of Ignition Systems. Magneto, *A*, 1500 and *a*, 740 r.p.m.; Open-Circuit Battery, *B*, 750 and *b*, 370 r.p.m.; Closed-circuit Battery, *C*, 750 and *c*, 370 r.p.m.

piston in the cylinder with reference to different advanced spark occurrences.

Since the flame of the magneto follows the initial jump of the spark by a certain number of degrees (depending on the exact construction) its mission is one of extreme value, for in no other manner can the changing gas particles be placed in direct contact with the fundamental source of ignition. A substitute for this "follow-up" cannot be found in any other construction.

The ability of a magneto to produce sparks capable of igniting various mixtures is shown in the following: "If a car has both battery and magneto ignition, it is easy to compare the merits of the two methods by an indicator. Diagrams A and B (Fig. 5) taken by switching-in respectively the magneto and the coil, in both cases with a rich mixture, show no important differences in the results obtained from the two methods. But if a poor mixture is

Table I—Fractional Part of Total Piston Travel

Spark Advance in Degrees on Crankshaft	Connecting-Rod to Crank	
	Ratio = 4.5	Ratio = 5
10	.0059	.0061
14	.0116	.0119
16	0152	.0156
20	.0237	.0243
30	.0531	.0545

used, both maximum and mean pressures during the working strokes are much more regular with magneto than with coil ignition, the diagrams C and D, Fig. 5, showing the difference. In some of the cycles the ignition from the coil progresses so slowly, as in diagram D, that the pressure does not reach its highest value until the end of the working stroke.

Fig. 6 and Table II gives some tangible evidence that the magneto increase of spark heat with speed is equivalent in large degrees to an actual spark advance. In this test a standard variable spark magneto was set permanently in the advanced position, and operated as a fixed spark machine. The battery ignition system was of the closed circuit type, and the spark was regulated manually. Even under these conditions the magneto developed greater horsepower with a lower consumption of gasoline per horsepower-hour. It will be seen from the power curve that the spark of the magneto was advanced a trifle too far for the best results at extremely low speeds under full load.

Fig. 7 shows another example of fixed spark magneto and variable spark battery ignition. In this case the battery system was of the open circuit type, and the spark was automatically advanced by the governing mechanism contained in the interrupter and distributer housing. The curves were plotted from the figures in Table III. These show a great loss of horsepower in the battery test, and a noticeable irregularity up to 1200 r.p.m. in the power curve, which probably was caused by the mixture taken in at these speeds not being suited for combustion by the thin spark of this system.

In both of the tests shown in Figs. 6 and 7, the spark plug gaps were set at the distance specified as correct by the different manufacturers. The carburetor adjustment was not touched in either case during the tests.

After the test described in Fig. 7 was made, the

Table II—Results of Tests (Fig. 6) on Magneto and Closed-Circuit Battery Systems

R.p.m.	Horsepower		Pounds Pull		50 C. C.* Sec.		Gasoline per Hp.-Hr., Pounds		Water-Outlet Temperature, Deg. Fahr.	
	Mag.	Bat.	Mag.	Bat.	Mag.	Bat.	Mag.	Bat.	Mag.	Bat.
400	5.5	5.5	55	55	37.6	37.2	1.41	1.40	137	136
600	9.6	9 7	64	65	27 0	27 4	1 10	1.08	140	136
800	14.0	14.0	70	70	23.0	22.0	.89	.93	142	138
1000	18.7	18.0	75	72	19.8	19.8	.77	.80	137	140
1200	20.7	19.8	69	66	17.4	17.0	.80	.85	148	144
1400	22.7	21 0	65	60	15.0	15.2	.85	.94	145	142
1600	24.6	22.8	59	57	14.2	13.8	.82	.91	142	142
1800	23.8	22 5	53	50	14.2	13.2	.85	.97	142	144
2000	22.0	18.9	44	38	13.4	13.6	97	1.11	145	140

*These two columns of figures show the time in seconds required to use 50 cu. cm. of gasoline.

automatic-advance mechanism of the battery system was prevented from operating and the spark controlled by hand. The spark was varied three degrees each way from the exact position taken by it at the various speeds when automatically controlled. This was done to determine what power variation, if any, was brought about by an early or late spark. The data secured from this test are given in Table IV and Fig. 8. The dotted line A in Fig. 8 is the magneto power curve from the preceding test.

No effort was made to determine the maximum power obtainable with a correct setting, but from the figures in Table III the power could not be exceeded to any great extent with this form of spark.

A direct comparison of the relative heat value of the different sparks is given in Fig. 9. This portion of a magnetograph chart represents the spark heat of a magneto (A-a), an open-circuit battery (B-b), and a closed-circuit battery system (C-c) at speeds corresponding to 740 and 1500 r.p.m. of the engine.

Fig. 9 leaves little further to be said regarding relative flame areas introduced into an engine cylin-

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der by battery and magneto ignition devices. In this test the spark heat is recorded on a piece of blue paper chemically coated with a substance resembling white paraffin in appearance but with a lower melting point. The spark is caused to pass from a needle point through this chart to a grounded drum and in so doing melts away the white coating, leaving the blue paper exposed. The amount of

TABLE III—RESULTS OF TESTS (FIG. 7) ON MAGNETO AND OPEN-CIRCUIT BATTERY SYSTEMS

R.P.M	HORSEPOWER		AVERAGE POUNDS PULL		Spark Adv. in Deg.	
	Mag.	Bat.	Mag.	Bat.	Mag.	Bat.
400	5.5	5.5	55	55	Fixed	3
600	8.7	8.5	58	57	Fixed	11
800	11 6	11.8	58	59	Fixed	16
1000	15.0	13.7	60	55	Fixed	18
1200	16.8	15.9	56	53	Fixed	21
1400	17 8	16.4	51	47	Fixed	24
1600	17.6	16.0	44	40	Fixed	30
1800	16.6	14.8	37	33	Fixed	35
2000	14.5	12.5	28	25	Fixed	41

this coating melted away is in proportion to the heat of the spark, the value of which is represented by the blue area in view.

The electrical principle upon which an ignition device is constructed determines its possible performance.

The rate of flame propagation of a combustible mixture depends upon its quality, the compression and the speed of the engine.

For the best results the spark in an engine cylin-

TABLE IV—EFFECT OF SPARK ADVANCE (FIG. 8) IN OPEN-CIRCUIT BATTERY SYSTEM

R.P.M.	Horsepower	Average Pounds Pull	Spark Variation in Degrees
400	5.2	52	0
	5.5	55	3
	5 5	55	6
600	8.4	56	8
	8.5	57	11
	8.5	57	14
800	11.4	57	13
	11.8	59	16
	11.2	56	19
1000	13.2	53	15
	13.7	55	18
	13.7	55	21
1200	15.0	50	18
	15.9	53	21
	16.2	54	24
1400	15.4	44	21
	16.4	47	24
	16.8	48	27
1600	14.4	36	21
	16.0	40	30
	16 4	41	33
1800	13.9	31	32
	14.8	33	35
	14.8	33	38
2000	10.5	21	38
	12.5	25	41
	13.0	26	44

der must occur at a time depending on the rate of flame propagation.

Spark advance while necessary is often (though inefficiently) used as a substitute for spark heat.

The unavoidable errors nearly always present in spark timing can be compensated for to a great extent by increasing the spark heat.

A spark of constant heat value and short duration (open-circuit battery system) must rely entirely on spark advance for meeting varying engine conditions.

A spark can occur too early even though from outward appearances the engine is operating correctly.

A spark that grows weaker (closed-circuit battery system) as the engine speed increases is wrong in theory and practice.

The larger the spark the faster the flame-spread and the greater the efficiency.

A prolonged or "follow-up" spark in any advanced position is necessary because of the constant change in the position of the gas vapor with respect to the spark-plug gap.

A spark that increases in intensity as the speed increases and burns in the form of an arc for a measurable period after its first passage (high-tension magneto) conforms directly to the requirements of an engine.

ALUMINUM ALLOY PISTONS.

Results of Experiments and How the Design Must Vary from the Iron Piston.

James E. DeAmond, before the Indiana Section of the S. A. E.—I will comment on some points of superiority of the aluminum alloy piston, although this will involve a repetition of statements more or less familiar, inasmuch as this type of piston has been the subject of much discussion in recent months. Certain phases of piston design also will be considered.

The weight of the aluminum alloy piston is, roughly speaking, one-third of that of an iron piston of the same design. It follows that the inertia forces due to the purely reciprocating mass, that is the piston itself, is reduced approximately 67 per cent. by use of the aluminum alloy piston. Moreover, the vibration-producing forces attributable to inertia conditions are decreased to the same extent, whether the vibratory force be due to lack of balance between opposed vertical forces present in vertical motors, or to unbalanced horizontal forces in V motors. Crosswise vibration is much more disagreeable than vertical, and the smaller the vibratory forces can be made, the more likely it is that the motor will absorb them within itself.

In reducing the inertia forces responsible for vibration, another desirable object is attained, the diminution of the bearing pressures engendered by these forces; this, of course, increases bearing life—a consideration of no mean importance. It is easy to underestimate the magnitude of these forces, but with the present tendency toward small-bore long-stroke high-speed motors, more attention must be given to this phase of motor design. It is quite safe to say that in some of the recent European racing products the inertia forces are of greater magnitude than the working forces in the motor.

The coefficient of friction of an aluminum alloy suitable for pistons is about 50 per cent. of that of cast iron. A slight gain in mechanical efficiency should result, and possibly the reduced friction explains a decided decrease in consumption of lubricating oil noted in cases in which iron pistons have been replaced by aluminum alloy pistons; doubtless the much greater heat conductivity of aluminum plays a part in this.

The greater heat conductivity of the aluminum

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alloy piston explains why the carbon deposit on its head is less than on that of an iron piston; under favorable lubricating conditions very little if any carbon is deposited, and as a rule the little that collects is easily removable.

In case an aluminum piston seizes, it is damaged in rare cases only; and the cylinder is practically never injured. Seizure of an iron piston usually necessitates reboring and regrinding of the cylinder and frequently a new cylinder block.

Comparing the Cothias process and sand casting, I have found the permanent mold piston superior in every respect, most markedly and valuably in hardness; being 25 per cent. harder, its wear-resisting quality is proportionately greater. One of the troubles with aluminum pistons has been that they were too soft. They are now being made by the process mentioned of a hardness not much less than that of cast iron.

While the strength of the sand cast piston is sufficient usually, the increase of strength attainable by the process named should be welcome, the tensile strength ranging between 25,000 and 30,000 lb. per square inch, considerably higher than that of ordinary iron. In one case some sand cast pistons of scanty proportions failed in a few hours, and permanent mold pistons of the same design have run in service over 10,000 miles.

Permanent mold pistons can be produced more cheaply. They usually come from the molds with no more excess material than can be ground off in one operation. While some aluminum alloy pistons cannot be ground satisfactorily, the permanent mold pistons to which I am referring are being ground successfully in production. Kerosene is a suitable grinding medium. Turpentine also, I believe, will serve. The wrist-pin holes are cored and brought closely enough to size in some cases to require only a reaming operation.

The percentage of defective pistons after machining operations is much less than in the case of sand cast pistons; in one instance in the proportion of one to ten.

It is doubtful whether sand casting foundry practice will ever be refined to a point where allowances for finish need not be as liberal as at present. The excess metal represents not only dead loss usually, but also additional expense in machining it off.

The design of aluminum alloy pistons can follow closely that for iron pistons. It is advisable, however, in my opinion, to rib the head to carry heat away from it better, eliminating the possibility of a gradual deterioration of the metal after being subjected to high temperature for a long time. Whether one rib or two be employed, if the rib in the plane of the bosses is dropped down to them, stiffness is had where required and the ring-carrying portion of the piston is bound more rigidly to the rest of the piston.

There are as many advocates of the practice of oscillating the pin in the piston as of locking the pin in the piston. Each construction has advantages, but it is clear that the former is cheaper and has given highly satisfactory results. In pistons of this type, which I have examined after many thousands of miles of service, the wear in the wrist-pin holes was not measurable.

Whenever possible, it is wise to increase the length of the piston, possibly as much as 25 per cent. This gives, of course, more bearing surface. It is also good practice to increase the width of the first land, as well as to fit the rings somewhat more tightly than customary in fitting rings in iron pistons.

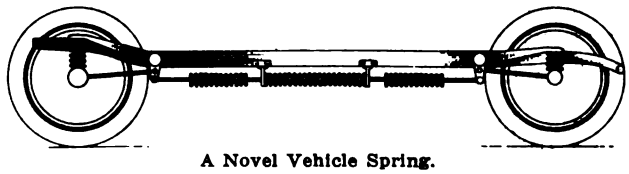
No general rule can be laid down as to the clearances required, in view of the greater coefficient of expansion of aluminum. The proper clearances for each type of motor must be determined by experiment. In many cases if the piston barrel is tapered, it is possible to eliminate piston slap entirely, even when starting the motor cold.

The manufacture by the Cothias process of pistons with a so-called wiping ring at the bottom of the skirt is not commercial at present, if strict adherence to conventional design is insisted upon. As the process becomes adapted to the manufacture of pistons of the "hour-glass" type, however, the same end can be attained. Prejudice against this type of piston is very much less than it was. One of the large motor manufacturers is now using permanent mold pistons of the general "hour-glass" type. I am informed that the De Lage cars are equipped with this type of piston, and that it is standard with the Minerva, Clement and one or two others.

While developed for the iron instead of the aluminum piston the design in general works out well with the latter.

New Spring Principle.

A Melbourne, Australia, genius has invented a novel automobile spring suspension, which is illustrated herewith. Not only is the arrangement of springs and levers somewhat revolutionary, but the results of the tests made have been such as to call forth favorable comment from experts. As shown in the illustration there is an entire absence of leaf springs in the system, all the springs being of the spiral type and all working under compression. By virtue of the lever action, which for all its simple appearance is decidedly complex, the weight of the car is divided among the various springs. Not only is the downward tendency of the body, as when the car wheels drop into a hole, checked by the spring arrangement, but the rebound is caught, cushioned and absorbed. The system was recently tested out on a specially built car equipped with solid-rubber tires, and the value of the equipment demonstrated under unfavorable conditions.



A Novel Vehicle Spring.

For Distilling Water.

The instructions for caring for the storage battery are very specific and particular emphasis is made in the paragraph relating to the use of distilled water. Water drawn from the city supply through metal pipes and faucets or from wells or springs must not be used as it may contain salts or minerals. Distilled water must be kept in clean glass or earthen receptacles.

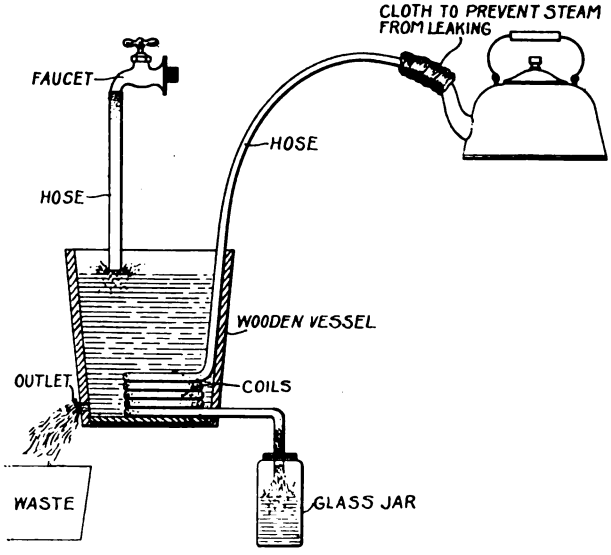
While it is a simple matter for the resident of the city to purchase distilled water, it is not so easy when one resides a considerable distance from the source of supply. For the benefit of those so located

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the following suggestion for making a simple still will be of value.

The material required consists of a wooden vessel, suitable length of clean rubber hose and an ordinary tea kettle. The hose should be long enough to reach from the stove to the sink and large enough to fit inside or outside of the spout of the kettle. To obtain a steam proof fit, wrap the tube with cloth. Run the hose to the wooden vessel and make several coils in it. Bore a hole in the container at the side and near the bottom and run the free end of the tube through. As the tube is of rubber, a leak-proof opening can be made by drilling the hole slightly smaller than the diameter of the tube. Run another rubber tube from the water faucet to the vessel, also drill a small hole in the side of the tube near the bottom. Place an earthen or glass jar near the vessel and insert the free end of the coiled tube in it.

When the water boils in the tea kettle the steam



Home Made Still For Obtaining Distilled Water For Storage Batteries.

will pass through the tube to the coils, which being immersed in cold water, will condense the steam into water. The water will then flow into the glass jar. The flow of water from the faucet should be regulated so that the coils will be kept cold. A small plate gas stove or an oil stove may be utilized to boil the water in the tea kettle if the distance from the stove be too great. Care must be taken that none of the cooling fluid reaches the vessel retaining the distilled water.

Now Smaller Profits in the Business.

From Hugh Chalmers, Michigan.—Considering the great investment and risk involved the returns to automobile manufacturers are not nearly so great as in business where less capital is required and where there is comparatively less risk.

Take the case of the Chalmers Motor Company as a single example. The manufacturing profit on a Chalmers car is about five per cent. of its selling price. How many manufacturers of so-called staple articles would be satisfied with so small a margin of profit?

Politicians and perhaps some portion of the public obtain their ideas of enormous profits from reading reports on big sales figures. Without a doubt motor car sales have increased tremendously, but if they had not, car prices would still occupy the same plane as they did six years back. It would be impossible to incorporate improved features in motor cars each season, reducing car prices simultaneously without a corresponding increase in sales and production.

In practically every instance manufacturers have given the buying public the advantage that has come to them through increased production—in other words, the business has been placed on a profit-sharing basis. I venture the assertion that most standard automobile manufacturers to-day are making less money per car than at any time in their history, but the business continues big because the demand is big.

ADDS 10 YEARS.

To the Man's Life Who Possesses and Drives an Automobile.

From E. R. Erskine, President of the Studebaker Corporation.—It may be difficult to say exactly how many years an automobile adds to a man's life, but I should say that ten years is a fair estimate. There is no gainsaying that the possession of a motor car increases the number of years a man lives, especially if in addition to owning the car the owner drives it himself. For in that way he gets the fullest possible benefits in the way of health.

Of course, there is a certain amount of worry and nervous strain which the novice must undergo in learning to drive his car and to handle it in any traffic situation. However, after a week or two at the wheel this nervousness wears off and then the pleasures and benefits of driving begin to pile up.

After the novice gets his bearings, so to speak, the act of driving becomes automatic in increasing measure. He does not try to climb up on his steering wheel, but sits back in relaxed fashion. I know that from practice I am able to drive my Studebaker car at a good clip without concentrating upon the act of driving. On the contrary, I enjoy the surroundings as I travel along and at the same time get all the benefits of the health and strength-producing exercise attendant upon driving.

The motor car has accomplished almost invaluable results in doing away with a certain species of person known as the tired business man. The individual who once was classed as a "tired business man" is tired no longer; he is alert every minute; his eye has a brighter sparkle; he is alive and keen and responsive.

Figures prepared by the Government Census Bureau certainly show in striking fashion the decrease in our death rate since the automobile came into being; and though we cannot give all the credit to the use of motor cars, still we must not ignore the fact that motor cars have played their part in helping us to live longer.

Let us look at these figures carefully. In 1880 the death rate a thousand was 19.8. In 1900 the rate had gone down to 17.6, and in 1906, with the further increase in the use of automobiles, the death rate had reduced to 15.7. Since 1906 it has wandered still further down the scale, reaching a low water mark of 13.9 a thousand in 1912.

The answer you can find in the above figures—the coming of the automobile has indeed been an

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able assistant to the progress of civilization in making a man live longer. Of course it can be realized that as the length of the average man's life increases the death rate decreases. One fact finds its reflection in the other.

The more automobiles in use, the more man gets out into the country and enjoys the benefits of a change of scenery, fresh air and respite from business care. Likewise, the more automobiles the more persons give up time to recreation and relaxation, particularly when no mental strain is involved in operating the car. Automobile drivers give this time to recreation and relaxation largely because they find they can perform their regular daily tasks quicker and better.

The motor car has eliminated distances and has enabled men to live farther away from their work than previously without causing them any inconvenience. It encourages long drives out in the country and broadens and enriches one's experience by opening up new regions—new beauties in nature. It jams good, fresh air into a man's lungs and makes him feel younger each day than he did the day before.

When we list the reasons why the automobile has come to stay we, in justice to its importance, have to name this one and underscore it: The automobile makes a man live longer, and although I am not a physician I should say the possession of an automobile makes a man live at least ten years longer.

Lathe From a Breast Drill.

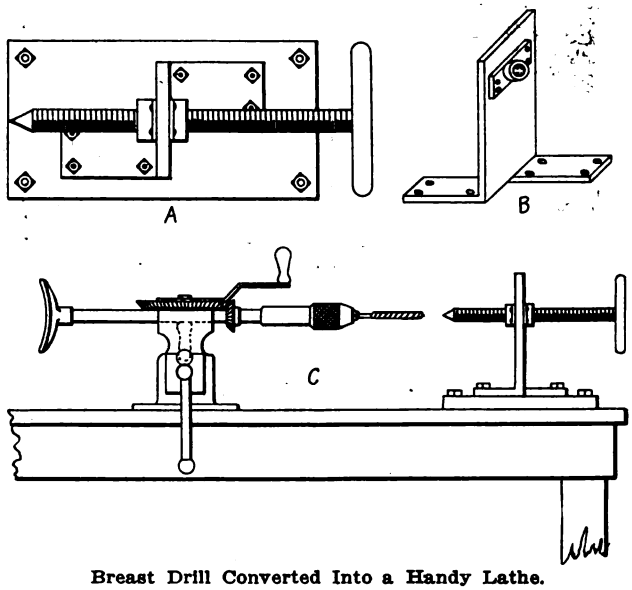
It is not easy for the owner-repairman to drill a hole in metal without making the opening larger than the diameter of the drill, and in drilling holes 1-64 and 1-32 inch in diameter the small actual cross section of the twist drill makes it an easy matter to snap it. This is due to exerting too much pressure on the drill holder and to inexperience. Drills are also broken when the point just breaks through the metal or when the drill begins to chatter.

If the drill holder be held true as in a lathe, not only is the work drilled accurately but there is less opportunity for breakage. An accompanying illustration shows how a home made breast drill lathe can be constructed, and the equipment is capable of doing such light work as drilling, turning keys to size, refacing valves, polishing and numerous other light jobs. The material required is inexpensive and the average owner can make the tool.

The sketch at C shows the completed drill lathe, also the drill clamped in the bench vise. As the average breast drill is fitted with a spirit level, it is an easy matter to obtain a horizontal position, which is essential for accurate drilling. The tailstock is constructed of a piece of hard wood and a section of 3-16-inch sheet metal. The block should be about one inch thick, six long and about four wide. Assuming that from the centre of the chuck of the breast drill to the top of the work bench is 5½ inches it will be essential to utilize a piece of sheet metal at least eight inches long and four wide.

Take a piece of iron or soft steel, two inches long, one wide and 3-16 thick, and drill four holes at the corners as shown at B. It is advisable to clamp this strip of steel to the large plate before drilling so that the holes of both sections will register. Use rivets and peen over the heads securely. As it is important that the hole bored in the small and large strip for carrying the tailshaft be exactly the same height as the center of the chuck, measure carefully, also allow for the thickness of the wooden block. It is best to cut the metal plate to the shape shown at B, drill the holes and fasten it before taking the measurements previously referred to. The plate can be cut with a hacksaw. If after the work is assembled it be found that there is a slight variation, or in other words, the tailshaft and point of drill do not coincide, the difference can be offset by changing the position of the breast drill in the lathe.

Accuracy can be obtained by placing the drill in the vise, and running the plate against the point of the drill. Prick punch the spot, then drill and tap for a half-inch thread. An exact vertical position of the plate carrying the tailshaft can be obtained by using a spirit level. Upon completing the plate



Breast Drill Converted Into a Handy Lathe.

member, drill four 7-16 inch holes as shown at A, and bolt the wooden block to the bench.

The tailshaft is made of half-inch round stock about six inches long. One end should be pointed while at the other is secured a small hand wheel which should be pinned to the shaft. The tailshaft is threaded and can be locked in position by a nut on either side when using the lathe for turning purposes. It is advisable to use long bolts for securing the tailshaft member to the bench, and if lock washers with wing nuts be employed, the tailshaft can be removed from the bench when not in use. The location of the tailshaft member is optional. It can be located at the right or left of the vise, according to convenience.

The Emergency Brake.

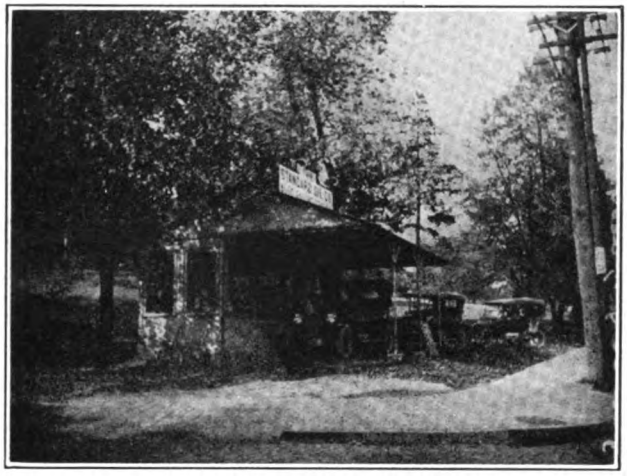
If, in a tight corner, try to collect your faculties sufficiently to remember one thing. Your safety lies in the emergency brake. It will stop you dead—and alive, which is much more important. You may mess your tires up a bit, but that is better than an accident, and no harm will be done to your engine or transmission—which is more than could be said of many cars in case of a sudden enforced stop. When familiar with the car you will never use that so-called "emergency brake" for emergencies; but till you are, remember that it is your "friend in need."

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CHEAPER THAN BY RAIL.

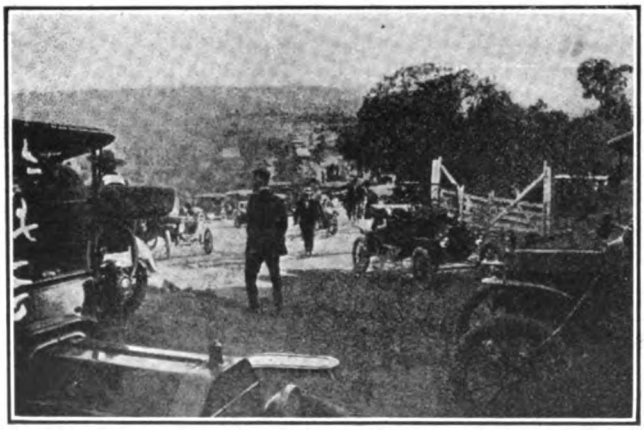
So Every Tourist Goes to Tia Juana by Big or Small Automobile.

From Felix J. Koch, Ohio.—There is probably no other single place in the world where one may see anything anywhere like it, in peace times at any rate. Tens, scores, hundreds—one is tempted almost to say thousands—of automobiles; automobiles



An Automobile Station.

of every kind, class and description; big and small automobiles, cheap and costly; some of them actually made of the second-hand parts from elsewhere and put together by the owners themselves! There are automobiles in that procession which hail from every State in the land. There are automobiles which come to this stage of the journey, which may draw a line squarely across the map of the Western continent and say: "From thence have we come and by most direct route." Nor is the occasion a rare one. All through the winter months, when California is advertised as the one great tourist



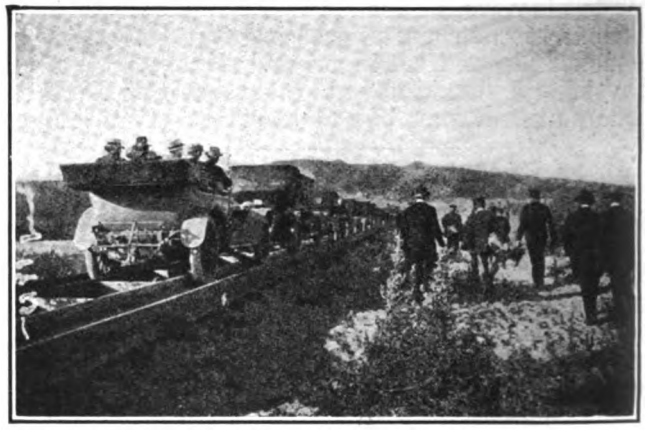
Automobile Activity.

land of the West, and has to compete with only Florida and Virginia in the country at large, you will find a repetition of this array of motorists.

All through the summer, now that the great expositions of California have served to show a doubting country, as well as folks of the Dominion of the north, that even in mid-summer southern California is not over warm, one may look for these motorists just so long as revolution does not wage its battles so close to the American frontier as Tia Juana, and the weekly bull fights held here are properly advertised in San Diego and beyond.

It is a triteism of American travel that no self-respecting American goes to see a second bull fight. It is, however, also a most certain gamble that every American goes to see a bull fight at least once, if at all within range of such affair. Even to those with whom the sport is most revolting it sounds big, and it gives the proper touch of appearing "travelled" to be able to say on one's return—most unconcerned, of course: "Yes, we motored down into Mexico, and attended one of the big bull fights," and adding hastily, as if apologizing for going, "of course, I'd never go there again." The result is that every time there is to be a big bull fight in Tia Juana, and that means just about every week at least, the fact is duly advertised in newspapers, by bill boards and in the hotels and other places, over all that section of California lying southward of San Francisco—in other words the territory from which tourists might reasonably expect to come.

Not that all of these come all the way down from the north simply to see the bull fight, but they want to see Los Angeles and San Diego and go over to



Single File Only.

Coronado. They want to visit Oldtown, the home of Ramona, and they might cross the line as well.

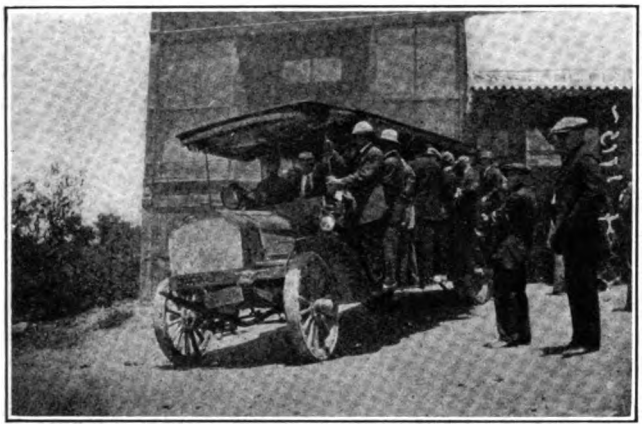
And so they come in perfect caravans, these motorists. The roads leading to Tia Juana are fairly choked with them. Each automobile as a rule bears its full quota of people, strangers often aboard as well, who beg a lift on their way, as the trains are so full they cannot accommodate them. These are most convenient guests as they pay the toll for the automobile as it passes over the toll bridge and beyond the line. It is at the toll bridge that one sees the string of automobiles at its best, crossing to Mexico. The bridge is but a single roadway, and so the motors must travel in single file. As each is halted for toll there is a bunching up of the machines behind, and as it consumes the same amount of time for each to pay their toll, and as they must still keep to that one road, they take definite spaces in an endless line that travels slowly toward the hills. The toll bridge is a private affair and it pays well. An automobile of any description with a driver pays 20 cents. Every additional passenger pays 5 cents. Of course, it often takes some little time to count the folks aboard, especially when it is a big touring car, but the company gets every nickel, rest assured, and until it does, the automobile doesn't go on. The construction of the bridge is such that there is no diverting or getting by

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while the gatekeeper is not looking. You enter upon two substantial runways, as to a garage entry. You find these flanked with little edgings too high for the automobile wheel to raise itself across, even if it cared. Between the runs there is only open space, with its criss-cross trestling, and you stick to the path, or tumble into the deep.

Arrived at last at Tia Juana, the automobiles park on the plaza and it is only as you see them in endless rows that their actual number is brought home.

Motoring across the border may hardly be accounted among the listed sports of the American.



Costs Less Than By Rail.

Taking the country generally and recalling how revolutions have caused Americans to fight rather shy of Mexico of late years, whatsoever may happen along the line between the two republics, it is certain that no place can take greater rank as a center for all types and makes of automobiles than the little bridge of solid timbers.

SIX, EIGHT OR TWELVE.

Cylinders May All Be Good, but They Can't All Be Best.

From R. H. Collins, Buick Motor Company.—If the advantage of the six-cylinder motor had to be defined in one word that word would be "balance." Makers of six-cylinder motors contend that this type of power plant yields the maximum of smooth power that can be obtained without the necessity for more or less costly mechanical sacrifices.

Theoretically, of course, the smoothness of the power developed by a motor increases as the cylinders are increased in number. Makers of sixes contend, however, that beyond a certain point this extra smoothness of power has no significance to the average motorist. They argue that for all practical purposes the six-cylinder motor supplies power that is smooth enough to be defined as practically liquid in its flow.

The Buick Company contends that in the present stage of engineering development to go beyond six cylinders would involve a mechanical complicity and expense which would not be warranted by the advantages gained.

The Buick Company also takes the position that the six is the logical motor, from the standpoint of public favor as well as the standpoint of mechanical efficiency. Since the announcement that all Buicks would be six cylinder models the company has been swamped with a demand for its product.

The Buick Motor Company received thousands of inquiries after its "sixes exclusively" announcement asking why its output would be confined to that one type. The reply in each instance was to the effect that the six-cylinder motor offered the greatest possible motor smoothness and balance that could be built into a motor of simple construction.

"Eight Will Be Permanent Type."

From Edgar Apperson, of Apperson Brothers.—There are many mechanical reasons why the eight-cylinder design will find an always widening market. I do not mean that this type of motor will supplant the four and six, but that there will be a demand for all three types—fours, sixes and eights. They are all dependable, and give satisfactory service. The choice depends upon the degree of speed, comfort, flexibility and ease of control the motorist wishes to enjoy.

Each type of motor has its advantages. The six will do things that cannot be expected of the four, and the eight has characteristics which you must not call upon the six to perform.

The building of an eight-cylinder motor is not entirely a new thing, for in Europe engineers have been experimenting with it for years. They had not, until lately, become practicable, for the reason that it was necessary to overcome many difficulties, the chief one being inadequate oiling systems.

The two most important features of eight-cylinder performance are: First, flow of power, and second, flexibility.

The eight gives you four power impulses for every revolution of the flywheel, an impulse every quarter turn. The overlapping is so complete that the turning effort is practically constant. The eight is the ideal power plant, for there is no hesitation between impulses.

In eight-cylinder construction there are honest reasons for using the word flexibility. For there is a degree of flexibility enjoyed, never before thought of with the use of any other type of gasoline motor.

Now for the Twelve.

From F. N. Nutt, Chief Engineer of the Haynes Automobile Company.—In considering the advantage of any car or motor from an engineering standpoint there are two sides to consider. The designer and his helpers are to be thought of on one hand, while the manufacturer makes up the other side. In other words, the engineering staff of an automobile first must work in harmony with the manufacturing side if good results are to be obtained.

Twelve-cylinder construction is an advantage to the manufacturer as well as to the buyer, because larger quantities can be produced more cheaply. Nearly all parts on this type of engine are considerably smaller than when used on the motor of a less number of cylinders. This means that the expense is less for each part. Also in machinery, parts can be handled cheaper because of the smallness in size. In assembling the decreased size of parts brings about more despatch because they can be handled easier and faster. Because of the smallness in size larger quantities of parts can be handled, giving a more efficient production.

In the design of twelve cylinder motors various valve arrangements have been made. In most cases

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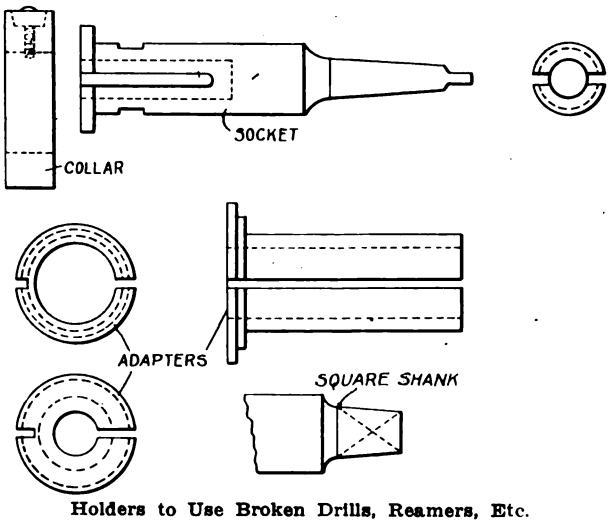
the T-head motor has not met with consideration. The L-head has been used in two ways. Some have arranged the valves on the outside, which necessarily requires two camshafts, besides adding width to the hood. Other users of the L-head twelve-cylinder motor put the valves along each side of the "V" alleyway. This arrangement requires only one camshaft, but it adds complications and inaccessibility.

In the valve-in-head motor the valves are accessible for inspection at all times and require only the removing of a cover plate to watch their action and for adjustment of springs. Only one camshaft is required with the valve-in-head arrangement.

Another distinct advantage has been gained in twelve-cylinder motor construction because of the increased number of power impulses. Naturally piston displacement has been increased, but not to such an extent that power is wasted. A decrease in bore and stroke brings the added displacement down so that only a little more than the added friction is taken care of. Therefore, the motor while sufficiently satisfying the demand for more power has an added effect of always producing a harmonious flow of power. This, coupled with lightweight construction, should surely satisfy the popular demand.

A Useful Drill Socket.

As a rule broken drills, reamers and similar tools are discarded. If considerable work be done the cost of replacing the tools amounts to quite an item in the course of a year and reduces the profits, for



Holders to Use Broken Drills, Reamers, Etc.

the wear and tear of repair shop equipment can only be charged to overhead expense, not to the customer.

The accompanying sketch illustrates an easily constructed drill socket that will be found to be useful for holding straight shank and broken drills, reamers, etc. As may be noted, it is so constructed as to be used with adapters, thus permitting of the use of drills of various diameters. The adapters are turned from cast steel, and can be made up with a tapered shank on a square section member, making the latter adaptable for use with a ratchet brace.

The holder has a recess bored in it, as shown by the dotted lines, and this construction adapts it either for the fitting of the shank of a drill or to take the various adapters. A loose collar fitting the outside of the holder is drilled, countersunk and tapped to take a square headed set screw. When this collar is slipped over the head of the holder, and the screw set up snug, the last named presses against the holder, causing it to grip either the drill or one of the adapters.

The adapters are best when constructed of mild steel and as many can be made up as required. They are completely divided at one side, and partially slotted at the other, this being necessary to allow them to contract or grip easily when pressure is applied on the outside holder. The slots of the adapters should always coincide with those of the adapters.

TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1751 **Many Inquiries.**

From Chas. W. Finney, Indiana.—1—How may the exhaust pipe and exhaust manifold be cleaned of carbon deposits? 2—How may a Holley carburetor be disassembled? 3—What is "Prussian blue" and "Persian red?" Are they paints? 4—In disassembling the transmission of a Ford, is there much danger of not getting it back together right? 5—What do you think of installing electric lights on older model Fords, to run from the magneto? 6—Is there any way to remedy scratches on the cylinder walls, other than regrinding? 7—How are the main bearing cap bolts in a Ford kept from working loose? 8—Is it safe to use ground cork in differentials to prevent noise made by worn gears? 9—How may the water passages in a motor be cleared from rust and lime? 10—There is a buzz in the gearing in my Ford when running from 20 to 25 miles an hour. I think it is in the differentials. Can you tell me why it is at that speed only and what is the cause?

Reply.—1—Boiling in water in which soda ash or washing soda is dissolved should soften carbon deposits. It is possible that soaking in kerosene might answer. 2—By removing the holding screws and float lever fulcrum pin. 3—They are pigments used for coloring paints largely. 4—Practically none. 5—Seems to work out satisfactorily providing the magneto itself is in proper shape. 6—We know that regrinding will remedy this condition, but if there is any other satisfactory remedy we do not know of it from experience. 7—Nut locks and cotter pins are both used for the purpose of preventing loosening of nuts where there is much vibration. 8

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—Yes, if there is no danger of filling up oil grooves and holes, but safest to put in new gears. 9—By using water to which muriatic acid has been added, rinsing out carefully and exercising great care that the water and acid mixture does not come in contact with any bright parts, and after having cleaned out the lime deposits use thereafter nothing but rain water in your radiator. 10—No. It may be caused by the gears being off the true pitch line, due to wear of the driving shaft bushing, resonance or some other cause. Whatever it is, it should be remedied.

1752 **His Regal Ignition System.**

From Harley Graston, Indiana.—My car is a Regal 39 horsepower, 1915. Is there a magneto made that can be put on the car for ignition? I want to use the storage battery for just starting and lighting.

Reply.—This model, as we understand, was designed to use a well and favorably known complete system of combined ignition, starting and lighting, similar to that in use to-day by a good many thousand cars. Where there has seemed a demand for magneto ignition on such cars magneto manufacturers have in certain cases devised magneto ignition systems which could be installed. The manufacturers of the Regal car could best advise you, if they would and we see no reason why they should refuse except they cannot see why you are seemingly dissatisfied with what is generally accounted as about ignition perfection.

1753 **Batteries and Tire Chains.**

From I. O. Ernest, Ohio.—1—My car is a 1915 model T Ford roadster. I wish to install some dry batteries to assist in starting from seat with a "hand starter." My car starts rather hard and have been told that batteries would give a hotter spark. The carburetor floods after the second priming which causes considerable annoyance. Is there any advantage in starting on battery rather than on magneto? 2—Please state number of cells required and about how many miles the required number of cells to form a battery would last, running continuously on battery in place of magneto. In other words, I wish to obtain an idea as to how much it would cost to install and maintain a battery for either starting or emergency use. 3—Does a battery deteriorate when not in use? 4—How should the battery be connected up, and where should ground be made, if at all? 5—In putting on Weed tire chains should the opening of cross chains be toward the tire or ground? If toward the ground this brings the sheet metal clamp on coupling next to ground also, thus: Have had trouble with chains throwing off recently caused by opening of coupler. Kindly advise proper manner of installing a chain from which information I may be able to remedy the difficulty I have experienced.

Reply.—1—At low speed as in starting, a hotter spark may be obtained from battery than from magneto. 2—Six cells, but no one on earth, not even the best informed electrician or manufacturer of dry cells, could tell for how many miles a battery of dry cells would furnish ignition, especially when used in connection with vibrating coils, for the reason that there are many conditions of adjustment as well as cell construction, size and quality of chemical ingredients to be considered. You will find it an ultra expensive system, one abandoned by every motor car manufacturer. On the other hand there were many thousands of cars turned out last year with battery ignition systems, but every one of them used the so-called "single spark" systems and practically every such installation proved eminently satisfactory. 3—Yes. 4—In series, that is the carbon of one cell connected to the zinc of the next, etc., and one pole grounded to the frame of the chassis and the other connected to the battery side of the switch. 5—Usually towards the ground. Chains will not throw off unless they are too long and are too slack upon the shoe.

1754 **His 1909 Buick.**

From G. S. Day, New York.—1—I have a model 10, 1909 Buick, and would like to know if I can change my water system into syphon system and how to do it. Mine is gear type. 2—Also please tell me what steel is the best to use for making new valves and stems. I want to use the best from every point.

Reply.—1—We fear you will not be able to transform your water circulation system as you would like, for the reason that your radiator would not be of sufficient capacity and in general the jackets, connections, etc., are designed for mechanical rather than thermo-syphon or natural water circulation. 2—Nickel steel is largely used for this purpose, while tungsten steel is also used to a considerable extent. When the latter steel is used the valves themselves cannot be reground in place, the valve seats having to be ground to the valve faces. Both steels have advantages. You will note that we have been careful to refrain from expressing our views as to the superiority of either steel. Some prefer one and some prefer the other. Nickel steel mushrooms welded to machine steel stems give good satisfaction. Nickel steel is much more easily machined. Vanadium steel has some good features. You can buy new valves ever so much more cheaply than you can machine them, providing they are for any standard model of motor.

1755 **His Two-Cylinder Maxwell.**

From C. E. Caswell, New Hampshire.—I have a Maxwell runabout, two-cylinder, model AA, which is probably three or four seasons old, but has been kept in fine condition and up to about a month ago has run slick as oil. The motor starts all right and apparently runs O. K. when the car is idle, and on low; but when thrown into high it will run for thirty or forty rods and commence to fire back through the muffler, and the power die down until have to shift into low, until the motor speeds up again, then change to high and it is O. K. for a few rods more, possibly quarter or half a mile sometimes. I have readjusted the carburetor probably a thousand times, and finally set it where it has been for a year or more and here it appears to do the best. Have drawn out the gasoline from bottom of carburetor, taken feed pipe out and drawn out gas from bottom of tank, and in fact done everything I can think of, but do not hit on the proper adjustment. It appears as though there might be dirt in the carburetor, but there is not. The motor starts on batteries and acts the same when running on magneto. Have ground the valves and changed the plugs several times. Platinum points are badly

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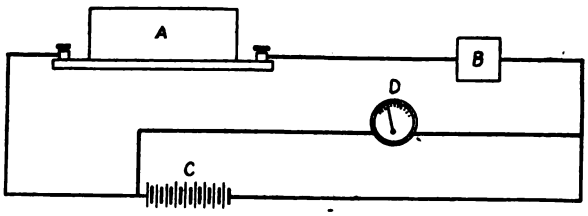
worn, but have smoothed them up. The car will run low but not on high is the long and short of it.

Reply.—Your Maxwell runabout is considerably older than three or four seasons, for it is several years since the Maxwell-Briscoe Motor Co. abandoned double-opposed motor design. Without any doubt your inlet valve stems and bushings are so badly worn that air leaks cause such a lean mixture at low engine speed that ignition cannot take place regularly. Your remedy is probably new inlet valves with larger and better fitting stems, or possibly you can use inlet valve stem bushings which fit more closely.

1756 **Electric Starter Trouble.**

From K. Dorion, Massachusetts.—1—I have twice broken the chain on my General Electric starter, on my Ford car. Can you let me know how I can prevent this? 2—Will you let me know how to wire an electric meter, in order that I can see the charge and discharge of the battery.

Reply.—1—It is possible that you have tried to start the car with the ignition set too early. This chain is certainly sufficiently strong for the purpose if given a reasonably fair chance. It is also possible that your reverse band may drag or that your motor starts much harder than it should normally. 2—You should connect an ammeter in



the circuit, one pole connected to the wire leading from the storage battery to the circuit breaker, and if the system is the grounded or single wire the other pole could be grounded. If the other pole of the battery is connected by wire with the generator, the other pole of the ammeter could be connected to it. In either case you might connect the other binding post on the ammeter to the storage battery terminal marked—or "Neg." In the illustration A represents the generator, B the circuit breaker or relay, C the storage battery and D the ammeter, in a system using a wire return.

1757 **Clutch Trouble.**

From J. P. Roche, Connecticut.—I have a question to ask in regard to my Ford car, which has been driven about 12,000 miles. For the past six weeks when I push in the clutch to start, there is a sort of catch and grinding sound, which seems to come from the transmission case, but I know sounds will travel from the rear. I asked a garage man about it and he said I had a poor pinion, or my clutch band was too tight. I had a new pinion put in about three months ago, and have tried the clutch at all adjustments it would work at. I am a rural carrier and average 100 stops daily, but have not used the car for two weeks, the roads are so bad.

Reply.—It may be that new bushings in the transmission gears will remedy the trouble, although it may be that the bushings in the differential may be badly worn, allowing the gearing to run off the pitch line. If you will block the rear axle up so the wheels clear the floor you should be able to tell whether the trouble is in the differential or transmission by turning the wheels by hand. Where one makes 100 stops a day almost anything is likely to happen to clutch or gears.

1758 **Valve Timing.**

From A. C. Kidwell, Washington, D. C.—I desire information as to timing the valves on a four-cylinder motor, firing 1—3—4—2. I have ground in the valves and thoroughly removed all carbon. Previous to grinding, one cylinder occasionally missed and I was of the impression that a dirty valve was responsible for this. Since grinding, however, the same trouble exists. While I had the head off my motor, I checked the timing of the valves by the marks on the flywheel and also noted that the valves worked in proper sequence, but am not certain that the valves closed just at the proper time. For instance, on the suction stroke, the intake valve opened when the piston had descended about an inch from the top and the exhaust valve started to open when the piston on the working stroke was about an inch from its lowest position. The valves operate the same way in all cylinders. I tested the spark in each cylinder and found that it reached the cylinders when the piston was in its highest position on the compression stroke. After replacing the head on the motor, I started the engine and it worked fine for about five minutes, not a cylinder missing; then it began to miss and no adjustment of the needle valve on the carburetor will make any improvement. I have so much compression now that it is difficult to turn the motor over, notwithstanding the fact that it is only 15 H. P. I have a 1914 Saxon roadster fitted with a Continental motor and Mayer carburetor.

Reply.—You can be reasonably sure that the manufacturer of your motor knows when the valves should open and close, and that the markings on the flywheels are correct. Late inlet valve opening is to give the gas a high velocity during the induction stroke of the piston and also to minimize possibility of "back fires" through the carburetor. Early opening of the exhaust valve is necessary in order to have the valve fully open at the end of the power stroke, else the motor would lose power at high speed. You will probably find a leak between the inlet valve stem and bushing which admits air to the bothering cylinder, or an exhaust valve spring weaker than it should be. A bent exhaust valve stem will cause symptoms such as you describe. Of course you have noted whether or not the plug in the troublesome cylinder "fouls" more quickly than in the others, an indication of poorly fitting piston or rings.

1759 **Batteries for Lighting.**

From W. L. Woodfield, Indiana.—I have the Presto lighting system but would like to change to electric, if practical to do so, using dry cells. Will 6 C. P. lamps light the road as well as the 3-4 foot gas burners with 5-inch mirror lense reflectors? Or can I use 12 C. P. lamps on dry batteries? I intend to use this set of batteries for the head lights only. How many cells will be required for the 6 C. P. lamps? 12 C. P. lamps? How will these be connected, series or multiple? Which size will be most economical, No. 6 or larger? Using

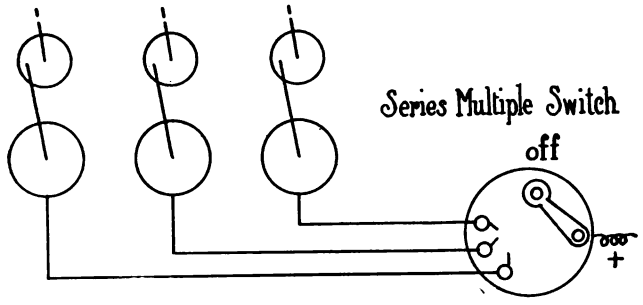
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lights 4 to 6 hours per week, how many light hours will a set of dry cells furnish? What will be voltage of lamps? Will the lamps be connected in series or parallel? Will a set of dry cells furnish any more light hours when the lights are turned down by means of a dimmer than when they are on full?

Reply.—Your inquiries concerning the life of dry cells are rather hard to answer, for manufacturers of dry cells would hardly care to attempt to answer them. You can take it from us, and seriously too, that the present high cost of dry cells, due to the prevailing high cost of black oxide of manganese which has to be used in their construction, utterly puts the use of dry cells "out of the running" for the purpose of headlight illumination, on account of the terrific cost of such illumination even when using 6 C. P. lamps. It would be a modern Croesus who could afford to use 12 C. P. headlights with dry cell battery current supply. Of course the slower the discharge the longer dry cells would last. Probably six parallel series of four each, a total of 24 cells, would be the most economical in the end, although if not used a great deal, not over 4-6 hours, there would be likely to be a considerable loss of current when the lights are not burning. Four dry cells in series would necessitate the use of 6-volt lamps in parallel. If the dimmer is so constructed that the voltage at the battery is lowered the current consumption would be less, but if resistance is interposed the consumption of current might be the same both with and without the dimmer.

Triple Contact Switch.

From Charles E. Duryea, Pennsylvania.—Mr. Walker very correctly points out a source of loss



Wiring Diagram.

that often destroys dry batteries when connected in multiple series. See last paragraph of his well written article in the November issue. Mr. Shattuck also refers to the multiple series method as being best and cheapest. That both of them should favor this arrangement and one of them point out the fault and neither of them suggest a remedy seems to call for a word to the effect that the loss can be avoided by the use of a switch having a triple contact post. Instead of connecting the three series to one wire, let a wire from each series run to the switch and there terminate in a binding post from which a slightly elastic finger extends to the spot where the switch lever is supposed to contact. When the switch lever is on it contacts with all three of these spring fingers, and their combined current is carried where wanted. But when off there is no chance for a circuit back through the next battery series, for all three are separated at the one end. The sketch makes this plain.

Useful Electrical Information.

From A. W. Clinton, New York.—In charging storage batteries for lighting and starting automobiles, it is necessary to use a direct current, and connect the positive pole of the charging current to the positive pole of the battery, or the battery would be ruined. Therefore, it is necessary to find out which is the positive pole of the charging current. If a wire through which a current is flowing is held in a north and south direction, and a compass is placed over the wire, if the north end of the needle is deflected to the east, the positive pole is the south end, but if the north end of the needle is deflected to the west, the positive pole is the north end of the wire. If the compass is placed under the wire the reverse is the case. An alternating current cannot be used in charging a battery and has no effect on a compass. An automobile that is electrically started by a single unit, or a motor generator, cannot have an ordinary ampere meter placed in circuit to indicate whether the battery is being charged or discharged, as the current used in the starting is so strong it would burn out the meter, but a little compass will indicate whether the battery is being charged or discharged. If a compass is placed over the positive wire running from the battery to the motor generator when discharging, the north end of the needle will swing to the right, and when charging to the left. The strength of the current is indicated by the amount of the deflection of the needle. A weak current deflects the needle only slightly. A strong current causes it to stand at right angles to the wire.

I have recently placed one on my car. I have a Dyneto-Entz motor generator. I could not conveniently place the compass over the large cable running from the battery to the motor generator, so I took an insulated copper wire about one-sixteenth of an inch in diameter and attached one end to the positive pole of the motor generator and brought it back to the instrument board, where I had placed a block with a hole bored in it the right size to set the pocket compass into. I looped the wire once around the compass to intensify the action of the current and attached the other end to the positive pole of the battery. I did not know how it would work—dividing the current between the cable and the wire—but found it worked perfectly, and indicated the current as well as could be desired. The compass should be set level, and I painted the north end of the needle red and the south end white, to be seen more easily.

As I had the pocket compass and the wire the indicator has cost me only the pleasure of putting it on and having it work satisfactorily.

Suggestion for Signals.

From William A. Robbins, New Jersey.—As I have driven about and noticed the various and often careless ways in which drivers hold out the arm to indicate turning the corner, it has occurred to me that we might adopt a uniform custom. I suggest that the arm should be held down to indicate a turn to the right and held up to indicate a turn to the left. I select these motions for this reason: the turn to right is not so dangerous to others, therefore I would indicate it with the less emphatic motion down—the turn to the left frequently interferes with traffic and should be announced by the raised arm, a conspicuous signal. To complete the series,

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the arm could be held extended horizontally to indicate a slowdown or stop. These signals would serve as well for a left hand as for a right hand driver.

Interesting Experience.

From William Thomas, New York.—I have been running my E. M. F., 30, car for a few years and do a heavy passenger business in the Catskill mountains. Here there are nothing but steep hills and I am on the road day and night. I have a run which I make every afternoon in the summer months of 72 miles, round trip, and run heavy trips in the morning and take out joy riders at night. I have carried at times 7-passenger loads in my machine. I have never had any engine trouble since I bought the machine and have never had to stop for any kind of trouble, except with tires, and that is the least thing that bothers me. I get big mileage out of the tires I use. I might buy three in two seasons. I am using two tires now that I got a year ago last Spring, and you can see the prints of the "Non-Skid" yet. They are a Miller and an Ajax 32 by 3½, and I have one on my front wheel, which is a Morgan & Wright. They came out of the factory on the car in 1912. The other night I took five prisoners and an officer and myself over a rough frozen road of 65 miles. It was snowing hard and we did not stop for anything. This Morgan & Wright tire that is running now I discarded once after getting 2,000 miles out of it, and last year I thought I would use it again, so I put in a blow-out patch, a different inner tube, and although my wife said I might as well throw the tire out of the garage, I made good use of it. I split the tube in the center all around, washed it with gasoline, and did the same with the tire, using an old razor to cut all the high places off the shoe so it would be smooth. I gave each two coats and with a little help stretched the tubing from bead to bead and pressed it in. To look at it now you would think it had just come from the factory with a new white tread. I have had 829 miles use from it. I try experiments of this sort and always come out ahead. Some time I hope to write you about my experience with my magneto. Garage men could not solve the difficulty with it, but I put it in condition myself and saved $20. My car has only been in the garage once and then only two hours, and I stayed and watched it so that no funny work could be done.

Valve Cap Fit.

To obtain a perfect joint under a valve cap care should be taken in the first place in unscrewing the cap. A suitable spanner should be used and not a hammer and punch, as is often the case. When the cap has been removed the threads of the cap should be carefully cleaned, and also those in the cylinder head, to remove all carbon, burnt oil, etc. Then examine the lower face where the joint is made with the cylinder casting, and it will possibly be found that the cap has been distorted or burred by hammering up at some time; if so, true the face carefully with a file, or, better, in the lathe, so that the cap, minus the copper washer, will screw quite home, true all round. This is important, and the cap should be tested with a feeler gauge or a smear of red lead and oil, or even paint. Now take the copper washer and make it red hot in any convenient manner—just dull red—then cool it out in water, and wipe it clean. This softens the washer, and both new and old ones are better for this treatment, the asbestos suffering no harm. The threads of the cap should now be greased; if possible, use a graphite grease, as this ensures the plug being readily removed subsequently. A smear of graphite grease should be placed on the faces of the washer also, and the cap screwed firmly home. Do not use too much grease on the threads, and on no account allow gold size, or similar compounds, if used on the joint, to get on to the screwed portion of the cap.

Touring in Canada.

From Canadian Motoring.—Removal of the restrictions placed on automobile touring by federal and provincial regulations has long been one of the chief objections of the Ontario Motor League. The refusal of the Ontario government to recognize United States automobile registration has been the principal factor in deterring automobile tourist travel. The other deterrent has been the customs regulations requiring all tourists bringing foreign-built cars into Canada to provide a guarantee bond if the cars are to be used beyond the limits of the port of importation and vicinity. These have been the two chief obstacles to motor touring in Canada on the part of United States citizens. But the motor tourist may now spend ten days in Canada and return to the United States by any port at the end of that time, without being compelled to furnish a bond. In the Province of Quebec, where license exchange has been in effect for some time, United States motorists have now practical freedom in touring, but in Ontario the automobile license obstacle still remains. The United States motorist who wishes to spend even a day or an hour in Canada must pay a full year's license fee. It is apparent that such a regulation must deflect automobile tourist travel from Ontario to a large extent.

It is to be hoped that the removal of the customs barrier due to the recognition by the Federal government that automobile touring should not be discouraged, will furnish an example to the Provincial government to remove the other barrier which license exchange places in the path of automobile touring.

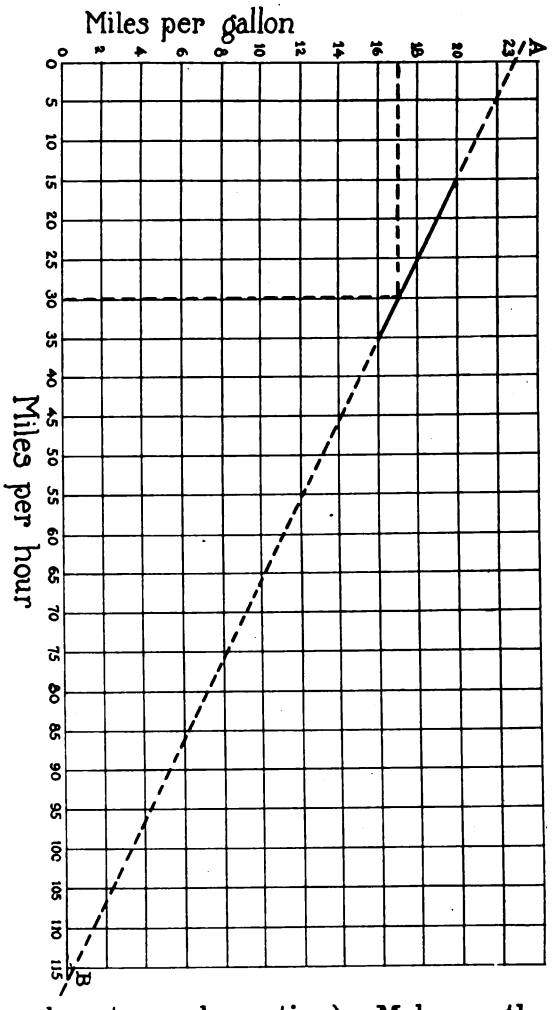
Due to the Carburetor.

From A. R. Campbell, Kentucky.—What is the matter with my car? Do I know, well I should say so. It got so it did not run good. The carburetor got worn, so I traded for a new one. My car was an Elmore, two cycle. I put on the new carburetor. It ran fine, but did not have the hill climbing capacity it formerly had. I used the new carburetor about one year, and the speed gradually decreased. I had new piston rings put on, and the car made still less progress. It would formerly make 50 to 60 miles, but it become so reduced I could not make over fifteen miles. After all improvements failed I figured it out that the carburetor did not produce enough gas, and for a final trial I concluded to buy another larger carburetor, so I ordered a new one, and to my utter surprise my old car would simply pass every car in our city, including Fords, Maxwells, Buicks, Empire, Dodge, Pullman and Franklin, just simply go right around them; don't know how fast I could go because of the speed limit. In conclusion, if your car will not run look up the faults of your carburetor.

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Gasoline Equation.

From M. G. Near, New York.—To find how much gasoline your car uses when traveling at any given rate of speed, first lay off a square map like the illustration, or you can use this same one which is already laid off. Horizontal distances represent miles per hour, and vertical distances miles per gallon. Let us suppose that when you travel at the uniform speed of 15 miles per hour you find that your car will go 20 miles on one gallon. Make a dot opposite the 20 and over the 15, just as I have done. And again, when you travel at the uniform speed of 35 miles per hour you find that your car will go 16 miles on one gallon. (These values are



pretty close to good practice.) Make another dot opposite the 16 and over the 35. Now draw a straight line through the two dots and extend the ends until the line cuts the vertical and horizontal lines at A and B. That's the end of the drawing job.

You will note that Point A is cut at 23, and point B at 115. To find the miles per gallon at any ordinary speed, now, multiply the figure at A by the speed in miles per hour and divide by the figure at B, and then subtract the result from the figure at A. For example, how many miles per gallon will the car go when traveling at the rate of 30 miles per hour? Solution: (30 times 23) divided by 115 equals 6. 23 minus 6 equals 17. Therefore, 17 miles per gallon. You will note that 17 lies exactly opposite the point on the AB that is cut by a vertical line from 30. The problem is therefore "double checked."

MR. DURYEA COMES BACK

With Vigorous Words in Favor of the Two-Cycle Motor.

From Charles E. Duryea, Pennsylvania.—Your disposal of the 2-cycle matter doubtless seems to you and to many as a fair one, but I trust you will pardon me for being certain that it is not. Having once been as much prejudiced against the 2-cycle as any one has a right to be, and having learned the error of my thought, I feel that I am better qualified to speak than most men. The array of authorities cited looks formidable, but knowing personally three out of the four, I know that they were not so well acquainted with the 2-cycle as they should be to-day or doubtless would be if writing to-day. So rapidly does the auto business grow that a book written five years ago can hardly be considered authority.

Nor do your short quotations present correctly the facts found in the books quoted. Please do not think me to insinuate that you had any thought of coloring the testimony by selecting only that which favored your views, but that it is not possible to give all the facts in a short quotation or two. For example, Hiscox only gives credit for superiority to the 4-cycle in the "larger power units" and says just two pages earlier "At the present time it (the 2-cycle motor) has an equal standard value as a motor-power as its ancient rival, the 4-cycle."

The error we moderns make is that we compare the cheap and nasty 2-cycle boat motor with the highly developed auto motor of the 4-cycle type and quite rightly pronounce in favor of the latter. Most of the writers on the subject having nothing else to compare do likewise. But any fair minded man will admit that this is not fair nor likely to lead us to that better form we all desire. Nor is it correct to say that the 2-cycle was tried and "found wanting." You ask of the Elmore and Knox Atlas. I once asked, "What did the Elmore people sell out for?" The answer came at once, "For $800,000 in two drafts. I saw the drafts." That was reason enough for me. A man prominent in the strong combination that bought out the Elmore connected himself with another high-grade 2-cycle car and it ceased using a 2-cycle motor. A company connected with that combination tried out the 2-cycle motor and was so pleased with it that it built a hundred or so cars. Then, for a reason not known to me, but easily guessed, they scrapped the entire lot. Another company in that same combination tested out a 2-cycle car and seemed pleased but changed its plans and dropped the matter. It seems a safe assumption that the 2-cycle looked dangerous to their interests and that it was but good business to suppress it so long as a growing market for the 4-cycle existed.

The Atlas had a bad odor following it. Its ports were badly arranged and its crank bearings were of the roller type and without packing. Doubtless air entered the crankcase and vitiated the mixture which, coupled with the bad port action, caused it to be wasteful and smelly. Chase built up a splendid business on a motor that was both 2-cycle and air-cooled.

Your reasoning is not final. Twenty years ago the gasoline motored car swept the field. There were no electrics or steamers to compare with it. Yet the people wanted electrics and failing to get them, took steam. It took seven or eight years to

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get them to see the advantages of the combustion motor. And some of the oldest and best informed makers of gas cars wondered if they ever would see. Side entrance surreys were one of the early forms, but the rear door tonneau wiped it off the map and people could well have said that the side entrance four-passenger body has been tried and found wanting. Left side drive was used on the Knox and Autocar vehicles and on some others. Central (either side) on the Duryea. But the right drive won the day. No sooner was it fully established than again the wind of popular favor changed and left side now predominates.

Steel wheels were fitted to the majority of the cars of the first years of the century and then later gave way to wood. In far better design they are again applying for recognition. Dare you to say they will not come back? Yet they were "as extinct as the proverbial Dodo."

The matter cannot be settled on any such grounds. Merit is immortal and no matter how often downed the good thing will eventually win. A well designed and well made 2-cycle need not hide its head before any other design. It is simpler and lighter. It is cheaper and has more impulses. It needs less repairs and is longer lived. It cools easier and may be more economical. Most people will grant the above claims until they come to the last two, but they are easily explained. It holds the hot gases only 125 degrees out of 360 degrees, whereas the 4-cycle holds them 360 degrees out of 720 degrees. It has no idle pistons and no camshaft friction. All its power can go into work. Many of the largest engines are 2-cycle. Don't let prejudice hide its merits.

(Note by the Editor.—Mr. Duryea's natural and acquired knowledge of automobile construction and engineering is as wide as that of any living man. But we fear he may also know some things that are not so. The strongest argument he gives in the foregoing communication as to the superiority of the 2-cycle motor is that simply because things have been discarded and afterwards improved and successfully taken up, 2-cycle motors will also be successfully employed. But this is a rather negative argument. One may as well claim that because many more things have been discarded and not again taken up, the 2-cycle motor will not again be successful. The writer of this has no opinion about this motor nor anything else that he will not gladly exchange for the truth and the facts, and we have merely tried to secure the truth and the facts rather than to prove that the motor is or is not superior for automobile propulsion to the 4-cycle motor. Meantime, nothing stands in the way of making the 2-cycle engine successful—unless it be itself. The field is open to anyone who cares to enter it, and may he be successful.)

Defends Mr. Duryea.

From C. L. von Berg, Nebraska.—In the November number, under the heading, "Two Cycle Engines," was printed a splendid article by Chas. E. Duryea on the possibilities of these engines and on another page appears an article, by the editor, I presume, in which he quotes various authorities to bear him out in down-crying this form of engine.

The editor, very carefully evades contradicting Mr. Duryea on what he has said about the merits of air-cooled engines, and I dare say could get about as poor a recommendation from these same "authorities" for an air-cooled engine. For, "they have been tried and found wanting."

The fact remains that there is, and has been for many years, an air-cooled engine, which in point of dependability, economy and about every thing else that is good, is so far ahead of any water-cooled engine that there is no comparison. Mr. Duryea says there is a successful two cycle engine, and I think he is the designer of this engine and that it is also air-cooled. If this is true, as he says, what has been done, can be done again. If certain makers have failed with a poorly designed air-cooled engine, or one of two cycle design, it does not prove the principles wrong.

Or, if they have been discarded by ignorance and prejudice it also proves nothing. Some "authorities" may have more theory than actual practice. The trouble department of any auto publication will prove that the carrying of a hot water "cooling" plant on any car, means the most grief to its owner and that complication of valves, springs, cams, etc., go to make up the balance of his trouble. This has been true when a four cylinder motor was considered a "multi" cylinder motor. What will it be with the sixes, eights and twelves! What garage has tools and men to do the work on these motors, which sooner or later must be done? How many early sixes were as good as the same make fours and why were they not? Why should not thousands of dollars, if need be, be spent in perfecting two cycle and air-cooled engines, when the actual proof of their great advantages are before us?

This should be work for the wise men from the east, the S. A. E. of Greater New York. Instead they spend valuable time deciding if the "drop" of the front spring hanger shall be so many inches, in "perfecting" the soap-box running gear now universally adopted. Early frames had a flexibility by which one wheel could run over an obstruction, or drop into a depression without twisting and wrenching the frame and the crude old "lumber wagon" can do this. So can a box car, running on rails and a good grade, but the soap-box "chassis" with its short, stiff, two-inch sweep, half elliptic springs that we imported from France, is forced on us from all but two or three makers. What driver does not know the front axle gets the worst abuse over new roads, or almost any roads? Yet we hear that "heayweight" is all that will make a car ride easy!

Why can one air-cooler maker dictate the price and all water-cooled makers be forced to sell at competition prices? Why can't we make a car for Americans and American roads that will be ahead of all others? The near "engineers" of early days are about dead, and buyers beginning to see what they ought to have, so let's banish ignorance and prejudice and let us have an ideal car, while we still may enjoy it.

Locating a Knock.

From C. E. Penrod, Ohio.—Having read in your Trouble Department the complaint made by Mr. S. H. Showalter, West Virginia, No. 1728, about his 1913 model Ford car having a knock which he cannot locate, I would suggest that it may be due to one or more loose fitting pistons, and this can be overcome by fitting in slightly oversize pistons.

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Antagonism 'Twixt Riders and Walkers.

From A. G. Batchelder, American Automobile Association.—Between a man who rides and a man who walks there has been an ever-apparent antagonism since vehicles first came into use. True it is that the viewpoint of the man who walks changes rather quickly when he becomes a vehicle passenger. But it is becoming an absolute need that the pedestrian when he invades the territory apportioned to the vehicle shall be required to observe rules which make for his own safety.

People are not yet thoroughly accustomed to the increased speed of the motor-driven vehicle contrasted with that of the slower moving horse-drawn wagons. Of course, this does not mean that a small percentage of motorists do not crowd their speed to a point where it is unfair and dangerous. Admittedly they should be called to account and properly punished. At the same time there is too much of the "Oh, they don't dare to hit me" in the attitude of people who leisurely cross the streets, a part of the time in the middle of the block, or cut corners diagonally.

Throughout New York State Mr. Hugo of Albany has a task which of itself could occupy all the official hours of the Secretary of State. His evident desire to bring about sane, yet efficient, enforcement of the automobile law has been manifest from the day he took office. His purpose of eliminating the few who endanger the many deserves sincere support from the motorists who realize the growth of danger in road travel.

Many of our highways are entirely too narrow to accommodate the traffic. It is a financial question to secure sufficient money to raise our arterial roads to a standard which will meet the new conditions. Not only are passenger vehicles multiplying exceedingly fast, but the use of the commercial vehicle is extending even into exceedingly remote sections, where railroads either do not exist or are of the single-track, few-train variety.

It is now possible to reach the man "way back" with a road and a self-propelled vehicle, and in seeking the maximum of general prosperity we have come to realize that the product of the scattered individuals must be added to the sum total.

Aluminum in Great Demand.

From E. E. Alleyne, Aluminum Castings Company.—The raw material from which aluminum is made is found in as great a quantity in this country as in any other country, and the only stumbling block toward the production of this metal is the great horsepower required to transform it from its crude state into the finished material.

By the end of 1916, which will probably go down in history as the beginning of the aluminum age, the manufacturers of aluminum will be in position to take care of the great demand which now is being felt in a small way because of the wonderful practical results obtained in 1915.

The last year has seen aluminum substituted for other metals in the manufacture of automobiles to such an extent that by the end of 1916 we are planning to take care of an increased business such as has been seldom known in the history of American manufacturing.

Automobile power plants will be made up mostly of aluminum castings; through the entire automobile will be found aluminum generally substituted for other metals. Fortunately America's wealth in this metal is equal to that in the other metals used in the manufacturing world, and while the war has put the supply far behind the demand, because of the cutting off of the European product, it will be only a few months until the production has been increased to a point where the automobile business world will have little to worry about.

Demountable and Clincher Rims.

From E. E. Larson, Iowa.—It may not be generally known that wheels with demountable rims are heavier than those having clincher rims and if placed on cars originally having clincher rims may materially shorten the life of the car if not produce serious breakage.

In operation the rear wheels are at times being pushed by the engine and at times are pushing the engine, likewise the front wheels are being pushed by the car and at times are pulling the car. Thus when the brakes are applied it is often the energy stored in the rims of the front wheels more than in the car that prevents it from stopping instantly. Suppose the car has been supplied with wheels heavier than those intended for it and the engine is overhauled and the bearings made so tight that the car has to be towed around a block several times in order to start it, which happens too frequently, then if this car has a brake on the transmission which many have, and if it is driven at a high speed and the brake applied, the throttle closed without disengaging the clutch, something is likely to snap between the engine and the wheels. Most cars will stand such treatment a long time if supplied with the original wheels. One need not be a sophist if he predicts that the demountable rims in the future will be replaced with clincher rims made lighter than formerly but corrugated to give strength. No doubt aluminum will be used both in the rims and the tires.

How to Climb a Hill When Gas Is Low.

From G. B. Freer, New York.—The writer had a 1913 Ford on a hill that was so steep that he could not get the gas in the carburetor, while he had over three gallons of gas in the tank. The road was too narrow to turn around in and nearly three miles to the bottom to back down. Stalled? I guess not! I simply took a match, sharpened it to a point, wet it in my mouth on the sharpened end, and fitted it tightly in the vent hole on top of the tank. I made a paper washer for the filling plug in the tank and screwed the plug in tightly. Then I took the tire pump and fastened it over the drain cock in the bottom of the gas tank and started to pump and at the same time opened the drain cock and forced a small air pressure on the tank. The way we went up the hill was fine and dandy. This was all possible because we had what is known as an "Acorn" connection on the pump, but a rubber washer might possibly be used to the same advantage with an ordinary connection on the pump.

The More Cars the Less Flies.

C. B. Georgen in the New York Globe.—In today's Globe is an editorial in which the swatting of the winter fly is advocated. Attention is also directed in the same editorial to the fact that "The

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house fly was not so much in evidence last summer as during the previous year because of an increasing public interest in his extermination."

While this attitude of the public has no doubt helped in exterminating the fly, it is just as well to bear in mind that the really potent factor has been the advent of the automobile. For the automobile in doing away with the horse has eliminated the breeding place of 95 per cent. of the flies, which is the percentage, according to the current number of the Scientific American, bred in horse manure.

Thus the automobile has been a most important factor in the elimination of typhoid fever and many other microbic diseases, in addition to the improvement in roads, farming conditions, etc.

All Want Lower Priced Cars.

"It is intensely interesting to compare the questions of motor enthusiasts who are attending the show this season with the questions asked by visitors of former years," says John N. Willys, president of the Willys-Overland Company of Toledo.

"Big, heavy cars costing up in the thousands of dollars were all that would formerly interest people, even of moderate means, and as for those who could afford a high-priced car, they would no more think of driving anything else than walking. But at present, economy in weight, fuel consumption and upkeep expense are the important questions people want answered in detail. They have learned that the initial cost of an automobile, while an important consideration, is not the determining factor in choosing a car. The expense of keeping the car in operation is the thing which every automobile buyer knows will determine the saneness of his investment from a business standpoint.

"In other words, the public realizes more than ever before that a light weight, medium priced car, produced on a large production scale and backed by a reputable concern, is the most sensible automobile investment that can be made."

A Choked Gasoline Pipe.

Recently an involuntary engine stop occurred on the road, and it was found that the pipe between the tank and the gasoline filter was choked up, and a lot of trouble was experienced in removing the obstruction. Chips of paint from the gasoline tins had found their way into the pipe, and had completely blocked it up. To dislodge this the tire pump had to be fitted on to the gasoline pipe, and this was found to be a somewhat difficult matter. Since then an attachment to the tire pump tube which will couple direct on to the gasoline pipe has been carried, so that in future there could be no difficulty in blowing through the gasoline pipe, or for that matter an oil pipe if necessary.

The moral is, of course, that a filter should always be used when filling the tank, irrespective of the efficiency of the filter in the gasoline pipe.

Perfection Grease Retainers.

A good many of our subscribers want to know who makes the Perfection Grease Retainers for Ford cars, alluded to by our correspondent in California, on Page 53 of the November number. Any reader who can furnish the information will please address the editor of the Automobile Dealer and Repairer, New York.

SOMETHING ABOUT OILS.

How to Get the Best Results in Running and Little Carbon.

When the internal-combustion engine, such as is now used in motor cars, motorcycles, boats, etc., first came into use in this country, it was thought that practically any kind of very heavy petroleum oil would be satisfactory for its lubrication; but it was soon found that the dark-colored and black oils contained too much "free" carbon, which was the cause of many of the earlier difficulties with this type of motor. In fact, carbonization was so prevalent a trouble in the early days of self-propelled vehicles that the announcement of an oil manufacturer that he would guarantee his oils not to carbonize an engine within 200 miles of running caused much astonishment, and was not generally believed by either the trade or the consumer.

A heavy-bodied oil was necessary for use in the old-fashioned engines, as their pistons and bearings were not accurately fitted, and the greater "body," or viscosity, had a tendency to fill up the uneven surfaces and fittings and to increase and hold the compression. Later on, when motor car engines were more highly refined in their adjustments, it was found that the lighter-bodied oils could be used with greater satisfaction, particularly because they contained less "free" carbon.

A great deal has been written and said about oils during the past few years, both from a technical and advertising standpoint, but of all the foolish and misleading statements the one that certain oils "contain absolutely no carbon" is certainly about as far wrong as it is possible for a statement to be, for all petroleum lubricating and burning oils are made up of varying percentages of hydrogen and carbon, and are, in fact, chemically known as "hydro-carbons." Therefore, the elimination of the carbon would mean the breaking up of the oil into some other chemical element.

Practically in every case where one experiences carbon trouble the blame is attributed to the oil used, little thought being given to the fact that carbon deposits are oftener than not caused by a number of other conditions which may prevail in an internal-combustion engine. About ten years ago, when gasoline was plentiful—in fact, at that time it was really hard to dispose of the quantity necessarily made with the other petroleum products—refiners ran their crudes as far as it was possible to other products than gasoline. Consequently, the gasoline manufactured at that time was of a very light gravity, meaning very light in weight compared with an equal bulk of water, and it was of a highly volatile nature. Quite naturally this gasoline would more readliy combine with the oxygen of the air than would a heavier product, on account of its gaseous nature, and when the mixture of this gasoline vapor and oxygen was burned or exploded in the explosion chamber of the cylinder, the combustion was very rapid and complete, and a minimum residue was left to cause carbon deposits.

But with the increase in the number of gas engines during the last few years, and the consequent large demand for gasoline, the petroleum refiners found their position exactly reversed; gasoline was and is really scarce, and something had to be done to meet the demand. The only thing the refiners

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could do was to increase the percentage of yield of gasoline from a given amount of crude oil. This meant the producing of a heavier-gravity product that was not nearly so volatile in its nature, and, in some instances, we now find gasoline, or what might more properly be called "motor fuel," which is of but slightly lighter gravity than ordinary gasoline.

Anyone can make a simple experiment and burn a small amount of gasoline and kerosene in partially-covered cups; the first will flash off rapidly and leave practically no soot, the other will burn more slowly and leave quite considerable soot or carbon. While the improved carburetors manufactured to-day will perform their functions satisfactorily with the heavier-gravity gasoline, it should be remembered that, when it is used, there is not always such efficient combustion as there should be, and, if the combustion is incomplete, there is a residue of carbon which, under the heat of the explosion, will bake on the interior of the cylinder, piston heads, valves and valve seats.

When the percentage of gasoline in the mixture is too high, that is, when the mixture is "too rich," carbon deposits will form rapidly. A mixture of this kind is indicated by a black smoke from the exhaust or by a strong odor of burnt gasoline from the same place; also, if the percentage of gasoline is too great the motor will run sluggishly at low speeds and the explosions will be muffled.

No matter how good an oil is used, too much of it will cause carbon deposits on account of the inability of the heat of the explosion to burn off the surplus; this condition is readily shown by a blue or grey smoke from the exhaust pipe.

Another thing of which very little has been written or said is that a careful chemical analysis of scrapings from the interior of cylinders of motor car engines very often reveals that they are largely composed of silicate. Now, as silicate is an element entirely foreign to either oil or gasoline and to the motor itself, we must look around and see how it gets into the motor and how it is formed. Silicate is but another name for dust or sand, and when the road dust is drawn through the carburetor with the mixture into the cylinders, it is there retained by the partially-burned oil, and the great heat of the explosions bakes it on to the cylinder walls, causing hard, brittle deposits. In view of this condition, it might be well to suggest to manufacturers of carburetors and to designers of motors that they modify or change their designs so as to prevent, as far as possible, this dust from being drawn into the interior of the engine. If they succeed in doing this they will have removed one of the causes of deposits in the cylinders and also another cause of trouble, for if the dust gets into the crankcase it certainly helps to wear out the bearings located there.

There is still another reason why deposits of carbon collect. After a gasoline engine has been run for a certain length of time, the exhaust pipe and silencer are apt to become more or less clogged with carbon, dust, dirt and partially-burned oil. This results in back pressure, and when the motor cannot exhaust freely the carbon trouble appears again, only this time it is caused by the incomplete scavenging or cleaning out of the cylinder. Another thing which makes it important to have the burnt or exploded gases carried off quickly is the necessity of having the explosion chamber clean when the suction stroke begins, for if the partially-burned gases are mixed with the fresh charge of gas from the carburetor, the entire mixture will be weakened, causing a heavy loss of power.

The motorist who desires the best results from his car and the least carbon, is advised to use as light a gravity gasoline as it is possible to secure; to be careful to see that the engine is not running on too rich a mixture, this implying incomplete combustion; that too much oil is not used; to see that the exhaust pipe and muffler are clean and that there is a free passage for the burnt gases; to keep as much of the road dust out of the carburetor and motor as possible, and, finally, to use only an oil of known merit and not some cheap, unbranded product which may be adulterated, and which may cause damage amounting to many times the value of what is saved by its purchase.

Misfiring of a Ford.

A case of intermittent misfiring on one of the latest Fords baffled even those motorists who had long experience on Ford cars. After the car had done about 500 miles, misfiring would occur occasionally, and, despite putting in a new set of plugs, carefully examining all wiring, thoroughly cleaning the commutator, and adjusting the tremblers, the trouble was not located. An accumulator was also used to test the buzz of each trembler. The trouble was finally traced to one of the coil units, which occasionally rose off its seating, and it was found that the heat had shrunken the wood of the units, causing a loose fit in the stamped iron coil box. In the older models this coil box used to be made of wood, so naturally when any shrinkage took place, the box shrunk with the units. The wedging of the units with a piece of wood partly overcame the trouble, which ceased on inserting thin pieces of glass paper between the units—of course, not on that part of the unit making contact—and also a strip of rubber on the grooved edge inside the top of the lid of the box.

Enormous Increase in Auto Exports.

Export of motor vehicles climbs to higher and higher figures. For the twelve months ended in December, 1915, the per cent. of increase over the preceding twelve months is placed at 250 per cent. The greater part of this business was in trucks, but the value of passenger automobiles is figured to be more than one-third of the total. During the continuance of the war the totals of export will probably show progressive gains, as armies are found to be more efficient the more wheels there are under them. More shipments go from New York than any other port. The average for weeks from New York has been not less than 850 cars per week. Following are chief items in export of motor vehicles:

Estimated total value motor vehicles exported during 12 months ended December, 1915	$100,000,000
Increase over previous 12 months	250%
Estimated value exports of commercial vehicles during 12 months ended December, 1915	$63,000,000
Increase over previous 12 months	623%
Estimated value exports passenger cars during 12 months ended December, 1915	$37,000,000
Increase over previous 12 months	90%

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Automobile Dealer and Repairer

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, JANUARY, 1916.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE FUTURE VEHICLE.

Unless nature has still another secret which she can be prevailed upon to give up, no one need look for any fuel for automobiles that is better than gasoline at the present price or at anywhere near the present price.

Although, of course, there are other considerations than heating value for such fuel, there is nothing known in quantity that gives as much heating value as gasoline. A pound of alcohol gives up abaut 11,800 British thermal units and a pound of gasoline about 18,000 such units.

Although the gasoline car is at present far ahead of the electrically propelled car, the last named will undoubtedly be the car of the future. And it will be so long before that period arrives which scientists term "the electrification of everything." Electricity is the one thing in the world that is practically inexhaustible. A writer in the World's Work recently stated that steam generated power—boiler and engine in each industrial plant—is giving way to power from electrical-generating central stations, which supply current for many power users. He says:

"Take the map of the United States and see how the network of great distribution systems is already growing over it. In the South, five States—North Carolina, South Carolina, Georgia, Alabama and Tennessee—have a thick overgrowth of high-power transmission lines, the cables of eight systems with physical inter-connection, so that energy from a score of hydro-electric plants, helped out by some steam-turbine stations, flows through the combined system to the section that needs the energy most. The Southern Power Company, with 1,300 miles of transmission lines, is already furnishing the drive for 150 cotton mills. At the western end of this southern interconnected zone two new developments now approaching completion will soon be joined, it is said, and then the copper of a great arterial system will be continuous from the Atlantic to the Mississippi."

According to the Department of the Interior, the available water power of the United States amounts to about two hundred million horsepower, or probably about three times as much as all the animal and steam power combined. But this does not take into consideration the tides of the ocean which are simply exhaustless.

The tides of the sea will be employed before long to generate electric current. They would have been employed for this purpose long before if the same study and talent had been brought to bear upon the subject that has been bestowed upon a search for some substitute for gasoline.

But cheap electric power is of course not all that is required to bring the electric vehicle into universal use. The vehicle itself must be reconstructed to meet its peculiar requirements of being obliged to bear the tremendous weight of the battery. There is no reason why the frame of the battery should not also be the frame of the car, the shape of the cells being changed as required. In other words, the battery should be made to bear rather than be borne.

As at present designed and constructed, the electric car has decided disadvantages, but the chances for improvement are far greater than in the case of the gasoline car.

MAKE IT THE YEAR ROUND.

The automobile business is rapidly approaching an all-the-year-round state. Accessory and car dealers should do all in their power to help the movement along. It has been demonstrated again and again that an automobile can be used in snow and in cold weather more economically and with greater success and comfort than a horse-drawn wheeled vehicle. Quite likely people do not use their cars so much for pleasure in winter as in summer; neither do they use their horses as much. Wherever and whenever there is economy in using automobiles over horses for business or trucking in summer, there is the same economy in their use in winter.

Accessory dealers and automobile agents who stand idle in winter, making no effort to get business, make a big mistake. If there is more leisure on the part of purchasers in winter, then they have all the more time to consider their real needs. And if their cars are more liable to be idle, then there is a better chance to install needed replacements and for overhauling.

A spasmodic business is not a good business. Anything that is out of equilibrium—out of balance—is out of health. There is no reason whatever why the automobile business should not be continuous the year round. It needs nothing but a little effort on the part of accessory and car dealers to create a healthy balance so that it will not be "a feast or a famine," a rest or a rush. A little more effort to get business in winter would benefit both repairmen and dealers as well as car owners themselves.

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TRAVEL COMPETITION.

Some of our older readers may recall that it was stated in this magazine some four or five years ago that the railroads would soon find the automobile their most formidable competitor. This is now not only demonstrated, but the automobile may soon so overcome transportation monopoly on the part of the railroads that the problem of rates so long considered by the Interstate Commission, may be settled in the natural way, namely, by competition.

A score of instances might be cited where the automobile is now successfully competing with the railroad, and indeed, carrying passengers at a rate not yet being met by the railroads. For instance the distance from Santa Barbara to Los Angeles, Cal., is 105 miles, and the fare by automobile is $2.50. By rail the fare is 3 cents a mile, or $3.15. From Los Angeles to San Diego, Cal., the distance is 125 miles, and the automobile fare is $2.50, while the railroad fare is $3.75.

What is the lesson to be drawn? Why, either modern railway travel is not the most economical and efficient method, or the claim made that the United States government has enforced too low rates is not well founded.

Surely, if a system of travel that has had 75 years for development is unable to compete with one of but 8 or 10 years' development, it is easy to imagine the final outcome. It is true that in the instances cited, and quite likely in most others where the automobile is now carrying passengers at a less rate than the railroads, there are probably special favorable automobile conditions, but with additional highway expense somewhere near the cost of private railroad beds, grading and tracks, the final outcome is to say the least, somewhat uncertain.

LIQUOR AND CAR DRIVING.

It has been a rule of law that no cognizance can be taken as to whether a man accused of crime was drunk or sober, although juries sometimes seem to feel that drunkenness should be used as a palliative to punishment. But the law says he must be punished for the crime alone and the condition he was in when he committed it has nothing to do with the case.

But a well-intentioned member of the Massachusetts legislature thinks differently. He has filed a bill which provides that drunken drivers shall have their licenses suspended for a first offense and permanently revoked for a second. Drivers, drunk or sober, who hit a person and run away are even more severely penalized. They are to be liable to a fine of $100 to $1,000 or imprisonment for three months to three years or both.

Purely as a matter of fact or logic, it is no crime to drive a car whether a man be drunk or sober; the crime is in driving so carelessly that some one or thing is injured. Under ordinary circumstances, the rule may be well held to that the condition, either mental or physical or both, a man is in when he commits a crime should not affect the punishment. But if any exception be made, it may well apply to driving a car, and for two reasons: First, the exhilaration of the natural sort in driving is sufficient to create a tendency to recklessness, as the volume of accidents prove, and any addition to such recklessness inspired by the use of a few drinks is a menace to safety that should not be tolerated. No one knows how many accidents are due purely to whiskey stimulation when the mental or nervous activity is not apparent. And second, anything rational that may be done to increase temperance, or total abstinence, for that matter, is a valid subject for legislation.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Is Killed Fleeing Accident Scene.—After running down and seriously injuring a woman, and then endeavoring to make his escape, a man was killed and his companions injured when their automobile overturned against a tree in rounding a corner. The accident occurred at Los Angeles, Calif.

Steering Device Broke.—A young man was injured so that his life is despaired of, in an accident at Gardner, Mont. The young man was driving and while at a high point where there was almost a sheer drop on one side and high walls on the other, the steering apparatus broke and the car hurled forward and went over the precipice, down a distance of over fifty feet.

Loses Control of Car.—A young man lost control of his car while coming down a hill at Madison, Wis., and ran it onto the sidewalk, striking a man wheeling his child in a baby carriage. The child was thrown out, the wheels of the car passing over its body, crushing it to death. The man was severely hurt.

Driving Without Lights.—Four men were riding in a car near Monroe, Wis., without the lights turned on. The driver failed to see the road and the car swerved as they approached a bridge. It struck the bridge and went over an embankment. One man received a concussion of the brain and the others were more or less injured.

Touched the Self-Starter.—A young woman was killed near Beachy Head, Ky., when it is supposed she touched the self-starter, which was the only thing, her husband states, she knew how to use about the car, and the machine started and went over a cliff. The woman's husband had just left the car and turned to look back but the automobile had disappeared as stated.

Irresponsible Because of Drink.—A young woman was knocked down and killed at Mt. Carmel, Ill., by a driver who stated that he had been drinking and did not know what he was doing. The woman's skull was fractured.

Carries Candle Into a Garage.—A man was leaning over his car with a lighted candle preparatory to starting the engine, at Topeka, Kans., when the flame of the candle ignited gas escaping through a leak. Flames covered the tank in an instant and threatened to burn up the car. Firemen were called and extinguished the fire before the car was badly damaged, but the man's hands were severely burned and he was obliged to receive medical treatment.

Struck by Passenger Train.—A young man met instant death in his new car near Hastings, Neb., and a young woman will probably die as a result of injuries received and exposure, due to a collision with a passenger train. When the young woman was found, after a night of helpless agony, both her legs were broken, and the body of her companion was found nearby face downward beneath eight inches of mud and water.

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Smothered Under the Car.—Near Gary, Ind., a woman and two men were found imprisoned beneath an automobile which capsized in an isolated marsh. A man who was walking along the road saw a red light gleaming in the darkness and wading over to it saw a woman's foot protruding through the mud and water underneath the wreck. After an investigation it was learned that the car must have been driven at an excessively high rate of speed.

In a Blinding Snow Storm.—Two women and a man were killed when the driver, blinded by a snow storm, got off the road near Sterling, Ill., and plunged off a culvert into a creek which was swollen with four feet of water. A young woman and man were drowned and the other woman was caught in the wreckage and so badly crushed that she died inside of an hour.

Red Lantern Went Out.—An automobile went into a sewer excavation at Battle Creek, Mich., and the driver was painfully injured, because a red lantern stationed where a sewer was being excavated went out.

String of Idle Cars Obscures Track.—Two women were killed at a railroad crossing at Barry, Ill., when a collision occurred between the automobile in which they were riding and a freight train. There was no flagman at the crossing and the driver was going slow. As he passed the idle string of cars he noticed a box car coming toward him. He kept going and the car kept approaching with the above result.

Used Lantern to See If the Tank Was Full.—At Morris, Minn., a man placed a lantern on the seat of his car so that he could see when the tank was full of gasoline as he poured. The moment the gasoline left the can a ring of fire appeared on the rim of the tank. Quick action was taken. the fire department called and the man escaped without injury. The car was damaged.

Automobile Stops on Railroad Track.—Four people were instantly killed in a railroad crossing accident at Chicago, Ill., when the driver in attempting to avoid the collision became bothered with the brakes and the machine stopped dead on the track.

Broken Beer Bottles Cause Accident.—A pile of broken beer bottles in the road near Shenandoah, Ia., which it is stated were placed at intervals along the road by persons prejudiced against motorists, caused two tires on an automobile to explode. The car was thrown to the side of the road and upset, severely injuring both of the occupants.

Car Skidded.—A man was drowned and his companion severely injured when the car in which they were riding skidded off the boulevard extension and fell into a lake near East Hammond, Ill.

Intoxicated Man Insists on Driving.—One man was killed and two were hurt near Amboy, Ill., when the owner of the car insisted upon taking the wheel when he was in an intoxicated condition. He drove the car up an embankment and in trying to bring it back it turned turtle. One man's temple was gashed, his skull cracked, windpipe broken and he also received internal injuries. He died on the way to the hospital. The driver's head was badly gashed, and the other occupant suffered internal injuries.

Head Bent in Snow Flurry.—A woman, with arms filled with bundles from Christmas shopping, and head bent down in the face of the snow flurry, was struck and killed by an automobile at Chicago, Ill.

THE HUDSON SUPER-SIX.

Claims That it is a Revolution in the Motor Car World.

There is presented what is called a marvel motor in the new Hudson Super-Six. The name Super-Six is to be the designation of the new car and this name is registered and is the sole property of the Hudson Motor Car Company. This is not a mere new model with minor refinements, but it is an absolute upheaval of all present impressions regarding motors, and particularly regarding six cylinder motors. The inventors and builders claim that the Super-Six begins a revolution and their belief may be realized.

The heart of the new Hudson Super-Six lies in the motor. Its power has been increased by 80 per cent. It has reached 76 horsepower without added size or cylinders. It is a complete and radical revision of the six cylinder motor familiar to engineers and to car owners. The principle is new. In every atom of efficiency it establishes higher standards. The big fact back of the new motor is that with cylinders only 3½ inch bore by 5 inch stroke, exactly the same size as last year's light six, the new motor develops 76 horsepower maximum whereas last year's motor developed but 42 horsepower. Even this motor quadrupled Hudson production and to a large extent revolutionized the building of motor cars of the light six class.



H. E. Coffin, Vice-President and Consulting Engineer of Hudson Motor Car Company, in his first car.

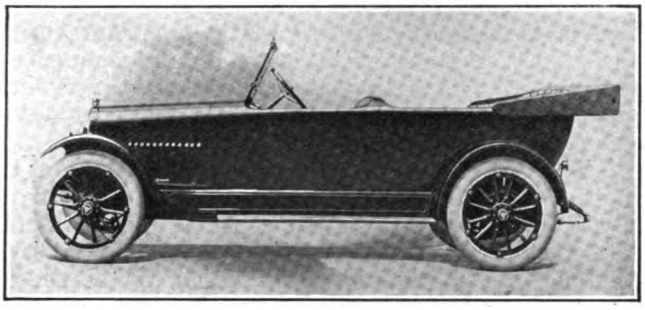
Constantly, however, the Hudson engineers were looking for something still better. In pursuit of their ideas, they built several V type motors, both in eights and twelves. They also bought every V-type motor of prominence on the market. But the advances apparently gained by some of these motors did not seem to the Hudson engineers to be sufficient. They invariably meant more weight, more cylinders, more complications, and this without sufficient compensating gain.

The Hudson engineers thought they saw the way to a far better solution and that is the reason the Hudson never adopted either the eight or the twelve. At last the problem was solved, and on June 28, 1915, the Hudson Motor Car Company applied for a basic patent on their engineering discovery. This patent was granted on December 28, 1915. This new motor is strictly conventional in every feature. It

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is simply an advance on the present type of standard motor. The patent is granted on a principle rather than on any one mechanical part, although there are certain details of construction that are in themselves revolutionary.

The best six type reached its practical limit at moderate motor speed. There was a point at which vibration became severe and the absorption of power heavy. The average six of about 288 cubic inch

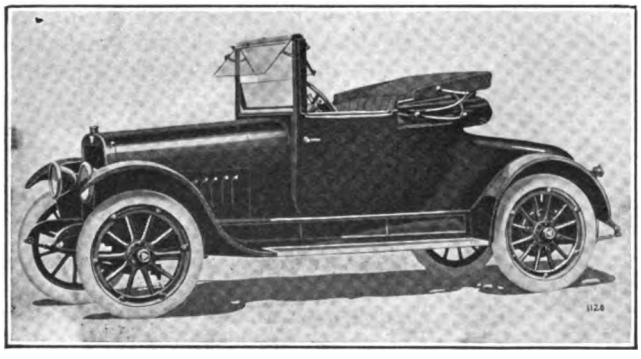


Super-Six Phaeton, Seven Passenger

cylinder capacity developed at maximum speed about 42 horsepower. The rest was lost through what the engineer calls friction. This meant fuel waste and waste of power and it placed a limit on speed and flexibility. The new Hudson Super-Six so nearly eliminates vibration and loss of power due to internal friction and lack of balance that the motor is capable of enormously high speed. Its ability exceeds by half the best performance the old type sixes.

The new Hudson motor persistently maintains efficient working conditions at speeds very far in advance of anything before known. It has been driven for hours on the test block at these high speeds developing constantly and smoothly over 70 horsepower. At the end of a severe test of this description neither motor nor bearings showed the slightest discoverable wear.

The Super-Six in official tests on the Sheepshead Bay track under the rules and supervision of the American Automobile Association has broken all stock car records up to one hundred miles. This

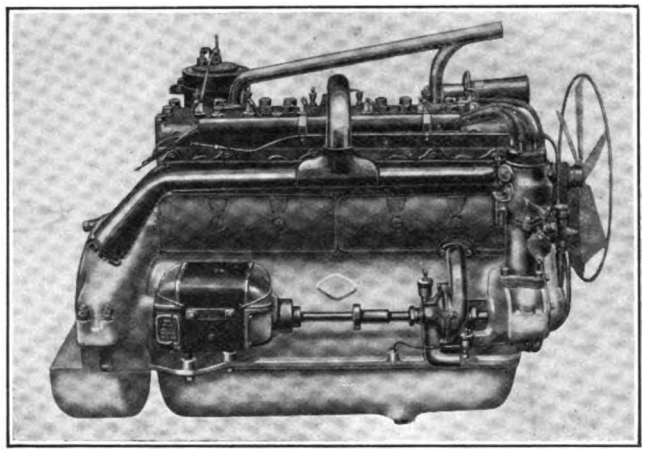


Super-Six Cabriolet, Three Passenger.
(Top Down)

with a car exactly the same as will be delivered to buyers of the 1916 Super-Six.

No change was made in compression, in pistons, in valves, camshaft timing or any other respect. The car was a stock car in all details. The chairman of the Committee on Tests of the American Automobile Association visited the Hudson factory and spent an entire day in personally measuring the car that was driven on the track and also other cars. This for the purpose of satisfying himself that there was nothing whatever special, or unusual about the motor that was to be used in the test under his supervision. After this inspection and measurement he certified that the car that was used on the Shepshead Bay track was a stock Hudson in every detail. Very many tests of various kinds were made at Sheepshead Bay. With two passengers in the car and with windshield and top in place the Super-Six made a record of 100 miles in 80 minutes 21.4 seconds, or an average speed of 74.668 miles per hour. One a two-mile lap, one complete circuit at the track, its record was 76 miles per hour. This was done not once but several times. Many times in succession it made records of a lap in one minute 33.4 seconds to one minute 33.8 seconds, varying only by the fraction of the second. Its clock-like regularity was amazing to observers. With five passengers in the car, and with the windshield and top up, it has exceeded 73 miles per hour, and averaged slightly over 70 miles in sixty minutes running.

The fuel consumption at 60 miles per hour is about the same as like sized motors at 40 miles per



Super-Six Motor (Right Side)

hour. And the motor runs as smoothly at low speeds as it does at high speeds, which means that the life of the motor is increased, due to its smoothness or lack of vibration. All these things come, so say the Hudson engineering department, from reducing vibration to a point never before attained in any type of motor. The Hudson has built all types including eights and twelves for comparison, and the tests for results all overwhelmingly favor the Super-Six.

The object of high speed in a motor is not merely high speed in the car. It can be utilized for speed if the driver wishes. But the fact that the motor is capable of this speed insures power, flexibility, ease of control, quick acceleration and reserve capacity for difficult roads or hills.

It gives the ability to creep at low speed on high gear. The Hudson Super-Six can be driven at a walking pace on high gear. It gives the ability to accelerate quickly to climb hills on high gear and to avoid changing gears on rough roads, or in crowded traffic. The Super-Six is permanently an exclusive Hudson feature. It is protected by basic patents granted on December 28, 1915.

In beauty, luxury and finish the Hudson Company announces that it has done its best to reach the apex

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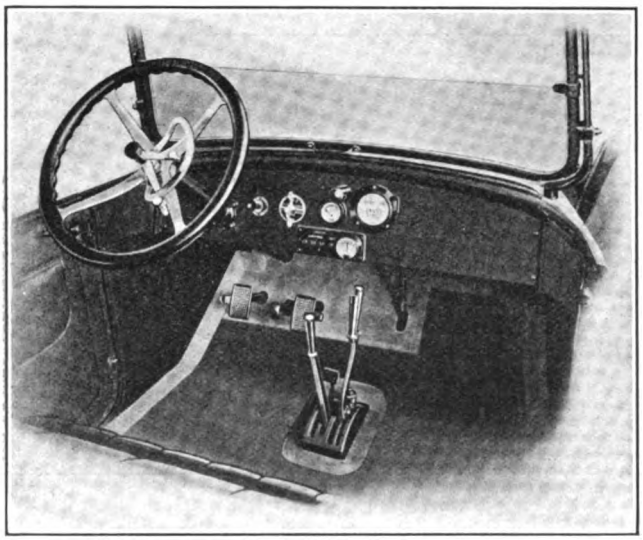
in the Hudson Super-Six. No question of cost was considered. A car was wanted which looked the supremacy the new motor gave it.

Hudson bodies have for years been famous. In the 1916 car was brought out the yacht-line body which has been the model for many other cars, both in the style of the body and in the name of the car. In the Hudson closed cars last fall many new standards were set in design and appointment. They were conceded by well-posted buyers to be the most artistic models shown.

The Hudson Super-Six, both in open and closed models, is a masterpiece of beauty, not in big things alone but in little—in the hundreds of details which appeal to the critical. Buyers will find every item on the car is in keeping with the motor.

The new car has new body lines, the radiator is higher, the body is lower. The windshield is set at an angle. The vertical windshield centers the draft and the dust on the back of the driver's head. The Hudson slanted windshield carries it over the car and offers less resistance.

The seven-passenger phaeton has a still more roomy body. The two extra tonneau seats disappear when not wanted. The body is built with a double cowl.



Super-Six Driver's Section and Controls.

The upholstery is all of fine grain, genuine leather. Not only the seats but all the leather parts consist of this extra grade of leather. No fabric leather is anywhere employed. The upholstery has been deepened, the seat curves have been remodeled to perfection. The tonneau of the car is finished with a handsome carpet which is carried up over a portion of the back of the front seat and above that the finish is a paneled leather design of extreme richness and beauty.

Mechanically the new car offers some further distinct improvements. The Hudson engineering department has designed its own carburetor, an entirely new design of the pneumatic type, showing great efficiency. It automatically insures the exactly right mixture of gasoline and air at any speed. One may step upon the accelerator pedal, depressing it to the full extent and there will not be the slightest indication of choking or strangling in the engine. It picks up the load instantly and smoothly. This feature alone to those who have ridden in the car has been a never-ending cause of exclamations of wonder. At high speed the motor cannot be starved, at low speeds it cannot flood. At all times there is perfect combustion, resulting in the minimum use of fuel.

The supply of oil is regulated automatically by the speed. As the speed of the motor increases, the flow of oil also increases to meet it. When the motor speed decreases, the supply of oil automatically is restricted in proportion. The cylinders are fitted with a removable head. A new ignition system is employed. An automatic governor controls the spark advance. The water pump connects directly with the cylinders without any intervening pipe, thus the water line can never leak, nor develop defective joints.

The gasoline is carried in a twenty gallon tank in the rear, and is supplied to the motor through a vacuum system designed especially for the Hudson Super-Six. This is further supplemented by an auxiliary hand vacuum pump which makes the system positive in any emergency. Hudson models on the new Super-Six chassis will be as follows, the prices being attached:

Touring car or phaeton, 7-passenger	$1,375
Roadster, 3-passenger	1,375
Cabriolet, 3-passenger	1,675
Touring Sedan, 7-passenger	1,900
Limousine, 7-passenger	2,500
Town car, 7-passenger	2,500

All these prices f. o. b. Detroit.

KEEPING CHARGE ACCOUNTS.

With Time Slip and Repair and Supply Cards for Simple Accounting.

Many competent automobile mechanics, who are proficient in the work, have made a failure in the repair business because no record was kept of the profits and losses, leakages, supplies and time charges. The majority of the failures assumed that because they charged 60 cents an hour for their labor that it meant $6 a day or $36 a week in the cash drawer, but such a basis of reckoning is false. The overhead expense and unprofitable time were not considered.

The repair man who expects to find the balance on the right side of the ledger at the end of any given time, such as six months or a year, must not set too low a price on his labor. If he has been repairing springs, etc., he should not take the labor charges as a basis upon which to figure general repairing, particularly if the charge per hour has been less than 60 cents. There are some repair men who will not agree with the writer, maintaining that there is good profit at 50 cents an hour, but a careful analysis of the costs of operating and maintaining a repair shop for motor vehicle repairing shows that none too much profit can be made when charging 60 cents an hour. It is admitted that the overhead expense will be more or less, according to locality, but this factor is generally overlooked, especially if a part of the shop be set off for the automobile department.

Let us assume that Mr. B. Smith conducts a garage or machine shop and finds that there is a call for automobile repairing; in fact, some of his customers have had minor auto repairs done and offer to send their motor car work if Smith will

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open a shop. Smith thinks it over and decides he will go into the business as a side line. As Smith is not proficient in automobile repair, he decides to hire a repairman at, say, $18 a week. Smith figures that by charging 50 cents an hour and work-

JOB No. 34 ◎ TIME SLIP

OWNER. W. C. Brown

DATE. 1915	START	FINISH	HOURS	MIN
JAN. 3	10.30	12.00	1	30
" 4	9.00	10.30	1	30
" "	11.00	12.00	1	
" "	1.00	6.00	5	
" 10	8.00	9.00	1	
" "	11.00	11.30		30
" "	1.30	6.00	4	30
		TOTAL	15	—

Fig. 1—Time slip insuring accurate record of work performed and preventing dispute by customer.

ing his man 60 hours a week that he will make $12 a week on his investment, or about $600 a year, a profit that looks good to Smith. But if Smith is a business man he will take his pencil and do some figuring before he decides upon his labor charges. After careful figuring he will find that 50 cents an hour is not enough, for the following reasons:

Smith has not made any charge for depreciation. Some large garages figure 25 per cent. as legitimate for the wear and tear on tools, machinery, etc., and for replacements. This figure would be too high for a small shop like Smith's, but it is reasonable to assume that some of the tools will be broken, therefore, a small per cent. should be charged to depreciation.

In fact, Smith must keep his workman busy 40 hours each week in order to break even. Now, it is not always possible to charge up $36 a week in labor, for a number of reasons, the principal one of which is termed unprofitable or unproductible labor. For example: A customer comes in with his car and wants to know about fitting a new carburetor he is thinking of installing. The repairman must look over the motor to ascertain if the carburetor can be installed and what will be necessary in the way of connections, etc. Invariably the owner will ask endless questions about the carburetor or another make, and when he leaves the workman has lost about 30 minutes.

Another customer drives up and asks for the workman, stating his mixture is not right, although the workman overhauled and set the carburetor a few days previous. The workman has to take a few minutes to explain why the motor does not pick up as fast with the throttle set at a certain point as it did before the change was made. An hour later another customer may take 30 minutes by asking the repairman to figure out how a motor starter and lighting equipment can be fitted to the car. And thus it goes—time that cannot be charged except to unproductive labor. If the customer decides upon the work and the repair shop purchases the equipment, the 25 or more per cent. profit made in the sale more than balances the lost time. This brings up another factor to be considered, and that is having on hand complete information of any equipment which an owner may be interested in. And the repairman should be a good salesman if he is to be valuable to the house. A practice indulged in by one shop is to allow the workman a small commission on equipment sold which makes him hustle for the business.

Under the head of unprofitable labor can be included time lost answering telephone calls, checking up the tools and equipment of the car entering and leaving the repair shop, and running to the supply house for material, etc., apparently unimportant items, but taking considerable time in the course of a month. Another factor, one generally overlooked in small repair shops, is proper charging of small material, such as cotter pins, lock washers, etc. True, these are not expensive when purchased in quantity, but there is no reason why a reasonable charge should not be made of the material. It is legitimate to charge for such material.

To overcome these leaks, as well as others that are inherent with automobile repairing, Mr. Smith should have his workman make a list of material used, both the chargeable and non-chargeable, and establish a scale of prices. With the costs of the material at hand, it should not be a difficult matter to arrive at a charge which will prevent loss as

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PARTS, MATERIAL, SUPPLIES, ETC.

JAN. 3	2 BRONZE BUSHINGS		80
" "	MACHINING "		40
" "	10 COTTER PINS		02
JAN. 5	10 FT. 2 X 1/8" BRAKE LINING	6	—
" "	5 FT. 1/8" COPPER TUBING		25
" "	1 1/8" UNION		35
" 7	10 FT. PACKARD CABLE	1	50
" "	1 VALVE AND GUIDE	2	75
" 10	5 GALS GASOLINE	1	10
" "	1 QT HEAVY CYL OIL		20
	CR.	13	37
	1 - 1/8" UNION		35
	TOTAL	13	02

Fig. 2—Reverse side of tag shown at Fig. 1 and used for charging up parts, material, supplies, etc., used on the job.

well as not work a hardship on the owner. The practice of making up the losses by padding the time slips is not to be recommended. Give the customer a square deal at all times if you would retain his business. He will not object to paying for

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material used, but will object to time not utilized on his car.

The system employed for charging up the labor on a car is most important, as it affects both the shop and the owner. The time charged for performing a certain piece of work is often questioned by a certain class of owners, particularly the automobilist, who does not take into consideration that it may take two hours to get at a part that requires but fifteen minutes to adjust. Because of this and other reasons, the shop should employ some accurate method of keeping track of the time, a system that will not leave the customer a leg to stand on should he dispute his bill. A time check system may seem unnecessary, but the writer can quote several instances where such a system ended a dispute and doubtless saved the cost of court fees.

Mr. H. C. Brown

248 West Broad St. Phone 4344 West	LICENSE No. 27748 MODEL. 32 Overland
JOB No 34	DATE REC'D. Dec. 30
MOTOR No. 847	PROMISED. Jan. 15

WORK TO BE DONE

ADJUST BEARINGS MOTOR	NOTE
RELINE BRAKES	INSPECT FOR LOOSE
GRIND VALVES	NUTS, BOLTS, ETC.
RETIME MOTOR	
FIT NEW CARBURETOR } SUPPLIED BY CUSTOMER }	
REWIRE MAGNETO	

CHECK EVERYTHING ON CAR — IN AND OUT

TOP	EXTRA TUBES	TOOLS	FOOT RAILS
CURTAINS	D RIMS	PUMP	ROBE RAILS
ENVELOPE	TIRE COVERS	JACK	MATS
TOP STRAP	CLOCK	CUSHIONS	BATTERY BOX
HEADLIGHTS	SPEEDOMETER	STR. BATTERY	TANK COVER
SIDELIGHTS	SWITCH KEY	DRY CELLS	MAG. COVER
TAIL LAMP	GAS TANK	OIL CAN	
HORN BULB	GENERATOR	LAMP COVERS	
HORN ELEC	WINDSHIELD	SLIP COVERS	
EXTRA SHOES	AMT SEATS	ROBES	

TESTED OUT BY Williams

REPORT O.K.

DELIVERED TO
SIGN OWNER H. C. Brown

Fig. 3—Form of card to be attached to work describing repairs to be made, date job is promised, etc. Card provides for checking equipment, etc. A similar form can be purchased ready made.

One particular instance will demonstrate the point involved:

The owner, in passing the repair shop on his way to his office, noticed a workman leaving the machine to go to work on a car that had been driven up. Out of curiosity the owner watched for several minutes, then went on his way. Later in the afternoon he again passed the shop and noted that the workman was still busy on the other car. Making a note of it, the owner determined to ascertain how much time was charged up to him on that day. On receiving the bill, he kicked long and hard, said that no such time could be put in, and finally, to cap his argument, told what he saw on the day in dispute.

Now, if the repair shop had not been equipped with a time checking system, the chances are that an adjustment would have been necessary to appease the customer. But after hearing the owner's side, the proprietor of the shop asked the bookkeeper for the time slips for the workman of that day. These included the slip for the owner's car and that of the other machine. Each slip bore the time the workman started and finished in hours and minutes on each job, and the figures stamped by the time clock also showed that it was only possible to charge up the maximum time of the workman on the both jobs; that is, there was only 10 hours labor in all. It should be explained that the workman was obliged to stamp the time he started on a job, and should he be called off to work on another job, he stamped the finish time on the card of the first job, then stamped the starting time of the second job on a separate card. It is obvious that the complaining owner could not dispute the time. He was convinced.

A time clock is not essential in a small shop, but it is necessary to utilize some accurate method of keeping track of the work, for the benefit of both the owner and the proprietor of the shop. The slip shown at Fig. 1 can be utilized to advantage and is practical. It consists of a manilla card with string, about four to six inches, or any similar standard size. The cost of printing is slight. One side is employed for setting down the starting and finishing of any work, also the date. The reverse side is employed for charging up the parts, material, supplies, machine work, etc., as shown at Fig. 2, and when the work is completed a record is afforded. The slip is filed away and is readily obtainable should an owner dispute any labor. The slip also affords the owner of the shop an opportunity to estimate profits and losses in that he can figure how much unprofitable time is consumed by his workman.

Any shop, small or large, should have a job tag similar to that shown at Fig. 3. When a car comes into the shop the name and address of the owner is entered, as is the license number, motor number and that of the job. Space is given to the date of arrival and when the work is promised. There is also room for entering the description of the work ordered, also a list of equipment. The equipment of the machine should be checked up on its arrival and its departure, so that the owner cannot claim that he had two extra shoes instead of one. This checking system is especially valuable when the job includes a complete overhaul, which necessitates stripping of the chassis, etc. If the car is to go to the paint shop, it will be necessary to check up tops, curtains, lamps, horns, etc., all of which are listed in the slip referred to. This checking should be very carefully performed, and when completed the tag is tied to the steering wheel.

As may be noted, the tag provides for the remarks of the workman testing out the chassis, also space for the signature of the owner or person authorized to receipt for the car when finished. This may appear to involve unnecessary work, but it protects the owner of the shop and is a record that will hold in court. Some repair shops incorporate a clause to the effect that the owner signing the slip is satisfied with the work. This is done after the owner has tried out the car in company with the workman. This prevents that class of owners who delay paying bills from using the old time excuse of "the work was not done properly."

Referring to Mr. Smith once more. He has decided, after taking into consideration the opportunities for losses and leaks as above described, that a charge of 50 cents the hour for labor will compen-

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sate him for the investment. On the other hand, another shop may find that the overhead charges warrant a higher rate. As previously explained, the locality and existing conditions are factors in determining the charge, and these, with the overhead expense, will enable the repairman to arrive at a decision. Automobile repairing, if conducted on a business basis, is profitable. On the other hand, slip-shod methods spell failure.

SOME LEGAL CASES.

Things Car Owners and Drivers Should Carefully Read and Remember.

Termination of Mechanic's Lien for Repairs by Voluntary Surrender.—A mechanic employed to make repairs on an automobile voluntarily surrendered possession, without payment, in July, 1912, and the machine remained in the possession of the owner until December following. It was then voluntarily carried to the mechanic's shop for other repairs. When the later repairs were finished, the mechanic refused to surrender the machine until the debt for the July repairs was paid. In an action by the owners it was held the mechanic's lien for the earlier repairs under the Texas statute was lost, though the rights of no third person had intervened. —Ford Motor Co. vs. Freeman, Texas Civil Appeals, 168 S. W. 80.

Waiver of Condition Against Assignment of Agency Contract.—A contract between the distributors of an automobile for a territory and a sub-agent for the purchase and sale of automobiles provided that no right under the contract should be assigned without the distributors' written consent. The sub-agent, however, after organizing a corporation to operate his business, assigned the contract to it without the distributors' consent. The corporation subsequently took one or more automobiles under the contract, and an account was stated between the parties. In an action on the account stated, it was held that these facts constituted a sufficient consideration for the defendant's waiver of the right to object to the substitution of the corporation for the subject under contract. The defendants pleaded in recoupment that the plaintiff had breached the contract, and one of the defendants testified that they had always been ready and able to deliver cars to the plaintiff as called for under the contract. It was held that the burden was on the defendants to prove the fact, and judgment for the plaintiff was affirmed —Barker Auto Co. vs. Bennett, Massachusetts Supreme Court, 106 N. E. 990.

Breach of Warranty—Buyer's Remedies.—The automobile was consigned to the seller and a bill of lading with draft on the buyer for the purchase price was assigned to a bank. The buyer was thus compelled to pay the purchase price before getting possession of the car. The fact that he did so did not preclude him from thereafter bringing suit to recover for breach of warranty. If the sale had not required the payment of the purchase price before delivery, the buyer could have (1) rejected the car and entered suit for damages for breach of contract, or (2) paid the price, taken the car, and recovered the difference between its value in the condition received and the value of the car required by the contract. Having of necessity paid the price it followed the latter course. The fact that the buyer sold the automobile after notifying the original seller of the breach of warranty, and took in part payment another car, did not preclude his right to recover for the breach of warranty, since the value of the car taken in payment could be determined, and the amount received by the original buyer for the defective automobile thereby ascertained.—Mobile Auto Co. vs. R. W. Sturges & Co., Mississippi Supreme Court, 66 So. 205.

Scope of Chauffeur's Employment.—A chauffeur, while driving his employer's automobile, was permitted by the latter to use the machine in going to his dinner at the home of a third person, and from there to a shop of the third person on his way to a school to carry home his employer's children. The chauffeur, instead of going to the third person's shop directly to the school, by the usual route, took a longer route to carry another towards the place to which the latter wished to go, but in the general direction of the school. While on his way, he ran into a pedestrian, who sued his employer. It was held that the issue whether the chauffeur acted within the scope of his employment while so driving from the third person's shop was for the jury, and, if they found that he acted within the scope of his employment, the defendant was liable for the result of the chauffeur's negligence. The chauffeur testified that after the accident he told his employer the whole story, and the latter said that the chauffeur had a right to be where he was when the accident happened, and that there was nothing for him to worry about. It was held that, if this was true, the fact that the chauffeur had also the purpose of gratifying a private desire of his own in taking the route that he did was immaterial.—McKeever vs. Ratcliffe, Massachusetts Supreme Court, 105 N. E. 552.

Sales and Condition When Shipped.—Suit was brought for breach of contract for the sale of certain second-hand automobiles by the defendant to the plaintiffs. The machines were to be put in good running condition f. o. b. cars at Kansas City, Mo., for shipment to North Dakota, to be there retailed. The evidence showed that the condition of the machines when received in North Dakota was such that they must have been in that condition when shipped by the seller. It was held that evidence of the running condition of the machines at destination was admissible to show their condition when loaded. An instruction that if two of the machines when loaded by the seller were not in good running order, and were unfit to be used for the purpose for which they were bought, and if the buyer was unable to sell them on account of their condition when shipped, the seller was liable, was held not to be objectionable as leading the jury to believe that an implied warranty of fitness for a particular intended use existed. The clause as to unfitness was not inserted as a ground of recovery. It bore solely on the question as to the value of the machines if they were not in good running condition when loaded for shipment. Moreover, the court charged that, if the jury believed that the seller loaded the automobiles in good running condition, the verdict must be for him, regardless of their condition when received at destination.—Kelly vs. Times Square Automobile Co. (Mo.) 156 S. W. 62.

Sale or Consignment.—In an action by a tire company on a contract to furnish tires the principal question was whether the contract was one of con-

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signment or one of sale. It recited that the company, an Ohio corporation, being desirous of extending its business in Texas, agreed to furnish the defendant, a Texas corporation, solid and cushion rubber tires on consignment to the amount of $6,000, and obligated the defendant to store and hold the goods in its name and under its control under the conditions named in the contract, and promote the sale of the goods. It provided that the defendant should keep the goods furnished it insured in the plaintiff's name, the policies to be sent to the plaintiff. It stipulated that the defendant was to sell the goods and report to the plaintiff on the first day of each month all sales made, together with a scale or weight inventory of the stock in hand, from said "consigned stock," settlements to be made on the 10th for all goods sold the previous month, allowing 2 per cent. as a cash discount. The price was agreed upon, with provision for rise and decline therein; and the defendant was bound to furnish a bond for $5,000. The contract concluded with a stipulation that, if there was no renewal thereof at its expiration, the defendant would purchase the stock of tires then on hand and unsold. It was held that the contract was one of consignment to sell on commission, and not of sale; the general property in the goods remaining in the consignor. The fact that the tires were billed to the consignee as if sold to it did not affect the question. The transaction, therefore, involved interstate commerce, and the statutes of the State of Texas requiring foreign corporations to procure a permit to do business there, and depriving it of the privilege of maintaining a suit in any of the courts of the State, if it failed to do so, was not applicable. And since the manufacture and delivery of the tires constituted an interstate commerce transaction under the contract, it was not a violation of the Texas anti-trust laws because of a provision in the contract that the consignee would sell no other solid or cushion tires.—Stein Double Cushion Tire Co., vs. Wm. T. Fulton Co., Texas Civil Appeals, 159 S. W. 1013.

Guaranty and Acceptance of Offer of Settlement.—Action was brought by the purchaser of an automobile for breach of guaranty. As a part of the trade the purchaser had received the seller's guaranty of freedom from defect in materials and workmanship for one year from date of delivery. He claimed that he discovered certain defects in the car, which were covered by the guaranty, and so notified the seller. The parts claimed to be defective were various bearings, in one of which, the crankshaft bearing, a ball was broken. The parts alleged to be defective were shipped to the defendant, in accordance with the terms of the guaranty. The defendant denied any liability whatever, except possibly for the crankshaft bearing. Several letters passed between the parties, and finally the defendant wrote the plaintiff a letter in which, while denying liability, it proposed to replace certain parts without charge and to furnish other parts at cost. The plaintiff telegraphed in reply as follows: "Ship, first express, complete set bearings through Sub-agent C. A. Welch, for my car." The bearings were shipped accordingly, and billed to the plaintiff in accordance with the terms of the offer, namely, at cost. The defendant contended that the plaintiff's telegram was an acceptance of its offer, and that the offer and the telegram constituted an accord, and the shipping and receipt of the new bearings a satisfaction, of the claim of the plaintiff under the guaranty; that it was, in effect, the substitution of a new contract under such conditions as to be a waiver of the claim under the guaranty. It was held, as a matter of law, that the defendant's offer was so clearly intended as a proposition of settlement that the plaintiff was bound, under the circumstances, so to understand it, and a verdict was directed for the defendant.—Horigan vs. Chalmers Motor Co., Maine Supreme Court, 88 Atl. 357.

Breach of Agency Contract.—A distributor which handled the whole output of an automobile manufacturing company entered into a contract with an agent, by which the distributor, in consideration of an order for 420 cars, gave the agent the exclusive right to sell all styles of the manufacturer's cars in certain counties in the State of New York for a certain period and the agent agreed to sell only such cars. In an action by the agent against the distributor for breach of this contract the defendant counterclaimed for and was awarded damages on account of the sale by the plaintiff of a large number of automobiles manufactured by other concerns. The contract provided that shipping specifications for each month's allotment should be given by the agent thirty days in advance, and if not received by that time the distributor should have the right not to furnish the allotment for that month. It was held that, as by the terms of the contract no shipment could be made without the agent's order, that was a condition precedent without which a physical tender of the cars was not a necessary condition of recovery of damages by the distributor. The contract provided that the agent should, on the signing of the contract, "deposit $1,500 on each bill of lading, f. o. b.," the amount of deposit on each machine being deducted from draft as shipments were made, and that if the agent rejected or refused to accept or pay for any cars, all deposits theretofore made by him should be long to the distributor as liquidated damages for breach of the contract, and thereunder only one deposit of $1,500 was made. It was held that, since the parties had not insisted upon strict compliance with the contract, the distributor's recovery was not limited to the $987 remaining as the balance of the first deposit. Under New York Personal Property Law, Section 145, as the price of the automobiles was established by the distributor, so that there was no available market or market price, the distributor was entitled to recover the profits lost by reason of the breach, i. e., the difference between the price agreed to be paid for the cars not taken and the cost to him of furnishing such cars.—Poppenberg vs. R. M. Owen & Co., 146 N. Y. Supp. 478.

Breach of Warranty and Buyer's Remedies.—The sellers of an automobile guaranteed the car fully for one year. The buyer, in an action for part of the price, set up as a defense breach of the warranty and asked for damages and rescission of the sale. It was held that the guaranty was not a mere agreement to make repairs, but was also an agreement that the automobile was so well constructed that it would stand proper use for one year, and that they would become answerable for any defect that might occur during that time not due to improper use. The measure of damages in such a case would be the difference between the actual value of the car and the value which it would have had at the time of the sale if it had been as represented. Two courses were open to the defendant when he discovered the

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defects in the car and decided to rely on an express warranty. He could return the car and plead the rescission of the contract as a defense to the action for its price and counterclaim for the amount already paid, or he could keep the car and counterclaim for damages. He could not maintain both defenses, and as he relied primarily on rescission the case was decided on the principles applicable to that defense. The evidence was undisputed that the break in the frame, claimed as the breach of warranty, occurred during ordinary use. The defendant did not immediately attempt to rescind the sale when he discovered the defects, but demanded that the car be made right and allowed the plaintiffs to make repairs on it. In such cases the injured party must act promptly, as soon as he discovers the supposed breach of warranty. If, knowing that the car was not what he had a right to expect, he still retained it, he was precluded from asserting a right to withdraw from the transaction altogether. Judgment for the plaintiffs was affirmed.—Miller v. Zander, 147 N. Y. Supp. 479.

Contract of Employment.—In an action by an employe against his employer, which was engaged in the business of selling motor cars, for damages for a wrongful discharge, it appeared that on July 1, 1912, the defendant employed the plaintiff to act as general sales manager at a fixed salary and a commission on each car sold and delivered within a certain territory. The agreement contained the following clause: "It is also understood that in the event of your failure to contract for and sell 25 cars on or before October 1, 1912, while in our employ, this agreement can be cancelled at the option of the J. M. Co." The defendant discharged the plaintiff on October 2, 1912, on the ground that he had not sold the stipulated number of cars. The plaintiff put in evidence ten documents, called "dealer's contracts," which provided for the sale of about 190 cars, the dealer making a deposit of $200, from which was to be deducted $20 upon each car when shipped. It was also provided that if the dealer failed to sell the specified number of automobiles, the balance of the deposit money would be applied to charges due the distributor, refunded to dealer, or applied to next season's line. The distributor (the defendant) reserved the right to cancel this agreement at any time, returning the deposit money. There was therefore no obligation on either party to carry out the agreement, and no liability for damages for failure to do so. It was held that these agreements did not comply with the contract of employment, and the defendant could exercise its option to discharge the manager.—Laciar v. Jackson Motor Co., 147 N. Y. Supp. 584.

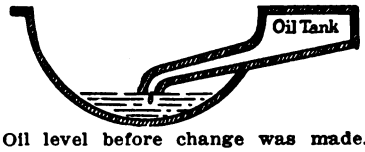
Side Line Work for Garages.

From the Woodside Garage, New Jersey.—Some time ago we read in one of the trade journals that many small town garages make a practice of manufacturing parts for outside concerns when their lathes and drill presses are not in use in their regular garage work. Can you give us any information along this line? Our reason for requiring this information is that we have a first class lathe and drill press in our shop that is idle a considerable part of the time and we wish to keep it going as much of the time as possible. Inasmuch as we are in a small town, and we do not have very much machine work, we would like to try and see if we can make arrangements to manufacture parts for anyone requiring such service. Our lathe is nearly new, has a 11-inch swing, 5-foot bed, compound rest and automatic feeds. The drill press is new and has a table that easily takes work 15 inches in diameter. In addition we have a good line of drills, reamers, etc., such as naturally would be found in any well-equipped garage and machine shop.

We have the experience to turn out strictly high grade work, and can furnish A1 references if necessary. We would appreciate very much any information you can give us along this line.

For the Maxwell Lubrication.

From A. K. Wheeler, Holyoke, Massachusetts.—Referring to inquiry No. 1697 by Mr. Coy P. Smith, in the October number. Mr. Smith complained about using too much oil in his 35-4 Maxwell car, 1913 model. I have a 1914 Maxwell car, and I have run it 22,000 miles to date. I average one quart to a hundred miles, which I consider a good, reasonable amount of oil to use. Mr. Smith must understand his oiling system, and remember that it is what is called a vacuum system, and that the tank that holds the oil must be perfectly tight. I think this is



Oil level before change was made.



Oil level after change was made.

his whole trouble, namely—air leaks around the filling plug, so that the oil leaks out of the tank into the crank case, and is burnt up and carbonizes in his cylinders. He should see that there is a good soft leather gasket under the filling plug, and that this plug is down tight so as to prevent any air from getting in. When this is made tight, I do not think he will have any more trouble, unless there is a leak somewhere else, so that the air gets into the oil tank and permits oil to run into the crankcase.

Drill down through the end of the nozzle and drive in a piece of copper tube, taking great care not to stop up the oil way from the tank. Make sure this is free and the oil will run through freely. Screw a ⅛-in. pipe plug in the top of the oil nozzle to stop up the hole in the top that you had to drill to get in the piece of tube. Let the tube stick down below the oil nozzle the required length, as the oil level in the crankcase will be determined by the end of the tube. This is all shown in the accompanying sketch.

To get the desired level, put a straight edge across the bottom of the cylinder and with the connecting rods at the lower end of the stroke, measure how far below the bottom of the cylinders they come, then put the straight edge on the crankcase and measure down to the end of the tube you put into the oil nozzle. This will tell you how far the ends of the connecting rods will dip into the oil. After all has been connected up and the engine has been run long enough so the oil level is correct in the crankcase, remove the breather pipe on the left hand side of engine, and run the engine. You can then

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see in through the opening for the breather pipe to the crankcase, to see if the rods are throwing sufficient oil to lubricate the engine properly. I hope I have made everything clear and that Mr. Smith will be able to correct his trouble.

CARBON MONOXIDE.

Further Information as to the Dangers of a Deadly Poison.

From Lester Curtis, Illinois.—The excellent article by Dr. Van Patten in your September number, on the pathology of carbon monoxide poisoning, pleased me, but it does not cover all the ground. Perhaps a few more facts may make the matter clearer and may not be uninteresting to your readers.

As Dr. Van Patten says, the gas makes the blood corpuscles incapable of performing their function; i. e., that of carrying oxygen to the tissues. This function is the most important and necessary function in the body, for if the cells are deprived of oxygen they cease to act, and death promptly follows. Dr. W. H. Rand (Bulletin of the Bureau of Labor, 1912), says, "All the blood charged with this poison is virtually destroyed as surely as if it had escaped from a severed artery. So if a considerable proportion of the blood becomes saturated with this gas, death is inevitable, not by suffocation as commonly imagined, but by carbon monoxide poisoning."

But the destruction of the blood corpuscles is by no means the whole of the injury done. Dr. Thompson (The Occupational Diseases,) says, the gas "also possesses a second and more important toxic effect upon the central nervous system, of the nature of a narcotic and depressant, for the effects are manifest even when there is still a large percentage of red cells carrying oxygen, and they often persist long after the CO (carbon monoxide) has left the blood." One of his patients had red corpuscles in the blood equal in number to that of high health, with 95 per cent. oxygen carrying capacity, and in all other respects it appeared quite normal, "yet he died two days after in coma."

Dr. Thompson examined the brain in twelve of his fatal cases. In all of these the brain was damaged, and in the cases "who had survived long enough for it to occur," actual destruction of brain tissue had taken place. In cases that got well, "recovery was slow and for some days the patient may suffer from mental weakness."

Krasek and Apfelbach reported before the Illinois Commission on Occupational Diseases, a study of 240 men who were suffering from chronic carbon monoxide poisoning from emanations in a foundry. They say of these men, "Many of them were in poor physical condition with reduced muscular strength."

Dr. George Gulland of Surgeons Hall, Edinburgh, states that "chronic gas poisoning is known to have been causally associated with pernicious anæmia."

Dr. Mary O'Mally (Transactions of International Congress on Hygiene and Demography, 1913,) reports a case of prolonged mental disturbance following carbon monoxide poisoning in a healthy young woman. The girl was treated ten days for the poisoning, in the Geo. Washington Hospital, Washington, D. C., and discharged as fully recovered. After about three weeks she began to show signs of disturbed mentality. Thirty-eight days after the occurrence of the poisoning she was admitted to the Government Hospital for the Insane and remained there four months, when she was discharged, apparently well.

A number of cases have been reported, of loss of memory and other mental disturbances after carbon monoxide poisoning; in some cases the disability remained permanently.

Inhalation of even small quantities of the gas, if frequently repeated, may result in serious impairment of health without the cause being suspected.

It is not the closed garage alone that is dangerous; the open garage, where an engine is running, is also a menace. Even the open air, when gas is present, is not free from danger, as in Mr. Ireland's case of a man poisoned to death while being towed behind a gas automobile. The other day a Chicago paper reported the sudden death of some one while driving an auto truck. The suspicion, at least, of gas poisoning, would seem justified in this case of a healthy man so suddenly overcome. A suburban friend who drives into business during the rush hours, suffers from headache and other unpleasant symptoms whenever, as often happens, he is caught behind a smoking automobile.

A MUFFLER STUDY.

Does the Silencer Reduce Power, and If So, Why and How Much?

Manufacturers or inventors of mufflers have been known to claim that by the use of their specialty not only is all back pressure eliminated, but a gain in horsepower on a given engine actually effected. The skeptical doubt the truth of such statements, and argue that in every muffler there must necessarily be back pressure, and that this back pressure must mean loss of power, and, consequently, the best possible muffler is that which combines the effective silencing of the exhaust gases, with the minimum waste of power. To have no loss of power is, they argue, to leave the exhaust gases unmolested and therefore not to reduce the noise they cause, and consequently to claim silence without loss of power is illogical, but to claim it with a gain of power is ridiculous.

But muffler experts still insist in their claims, and in one instance the claim is backed up by an officially observed trial. Who then is right? Paradoxical as it may seem, both claimant and skeptic are right, for it is possible to show an increase of power on fitting a muffler to an engine, although the muffler so fitted (assuming it is a silencer) must necessarily involve back pressure, which is in this case a synonym for loss of power. There is a "nigger in the woodpile" in the form of a loop-hole in the conditions that the experts demand for their tests, and the elucidation of this point will prove of interest to those motorists who have not carefully considered the interesting problem of silencing the exhaust gases.

The loop-hole referred to above is that it is necessary to include in the term muffler the exhaust pipes which lead from the cylinders to the muffler proper, the reason being that an engine which exhausts direct into the atmosphere can have its power increased by the fitting of a suitable plain exhaust pipe, because the atmosphere itself sets up some back pressure tending to hinder the egress of the gas.

It will therefore be seen that there is a margin between the horsepower obtained with and without

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an exhaust pipe—being greater with one—and that if an efficient muffler can be produced, the back pressure of which does not cause a greater loss of power than that gained by the exhaust pipes, then, when an engine is tested with the muffler and compared as to power with a test where the engine exhausts directly into the atmosphere, it would show a gain in horsepower. But if a third test were made in which the engine was fitted with a suitable and long exhaust pipe of uniform section and easy bends this last would show the maximum power.

Of course, if a muffler can be designed that adequately muffles the exhaust noises and yet has its power losses coming within the limits referred to above, every credit is due to the inventor, and this article is not intended to detract in any way from the merit of such an achievement, but merely to prove the possibility of such a result, which is doubted by many.

The theory which underlies this phenomenon is as follows: The exhaust gases issue from the combustion chamber at a velocity of something like 100 miles per hour, and these striking directly into the atmosphere have to make room for themselves by forcing away the surrounding air which necessarily hinders their progress, thus causing an appreciable loss of power, because to obtain the maximum power it is very necessary to get rid of the exhaust gases as rapidly as possible. Additional power is obtained on racing engines by fitting cams which open and close the exhaust valves more suddenly than on a touring car engine, thus enabling the valves to be open their maximum amount for a minute fraction of time longer.

Let us now consider an engine fitted with a long exhaust pipe made without any sharp bends or other obstructions. An exhaust valve opens and the gases rush down the tube at the tremendous velocity before mentioned; this sets up an action analogous to a piston in a cylinder, the momentum of which pushes out the air in front of it and tends to leave a vaccum in its wake, the result being that the next emission of exhaust gases, instead of having to struggle against the atmosphere as in our first example, now has a path in which all resistance has been removed, and even a partial vacuum helping it on its journey. To obtain this last effect it would be necessary, very judiciously to select the correct length and diameter of pipe, for it would seem that if the pipe were too short one charge of gas might leave the pipe before the next exhaust valve opened thus causing a back rush of air, and again if the pipe were too long there might be a "loitering" effect causing the succeeding charge to "hurry up" the preceding one.

If the above be an exact statement of this phenomenon it should prove a most interesting and valuable subject for a laboratory test to discover the correct dimensions of such an exhaust pipe, and the data for determining them for a given engine.

An ordinary dynamometer, such as is used for the commercial testing of engines, is not sufficiently sensitive for such a purpose, nor would the results taken from one size of engine be of much value, but some tests which, although not of a pretentious or exhaustive nature, are of some interest.

These were made with an ordinary electrical dynamometer and a standard engine having a bore and stroke of 100 by 140 mm. Test one was made with the engine fitted with a standard muffler. In test two the exhaust opened directly into the air, with, it will be observed in the appended table, an appreciable increase in power. For test three there was fitted to the engine long plain exhaust pipes, which ran with easy sweeps into one main exhaust pipe, with the result, it will be seen, that a further increase in horsepower was obtained.

Varying the length of this pipe was tried, but it was not possible to detect any appreciable difference in power, the apparatus not being sufficiently sensitive. The figures given are in every case averages over several readings.

The type of muffler used was a simple one, highly efficient, but absorbing rather too much power. Its main characteristic is an expansion chamber divided by three baffle plates; by removing two of these baffles the intermediate readings, as shown under test four were secured, and although the muffler was not very efficient as a silencer, there was, nevertheless, a distinct muffling of the sound of the exhaust. Thus it was shown that a muffler could be produced which apparently increased the power of the engine.

An interesting feature, incidentally, is the fact that the powers developed in all the tests were approximately the same at speeds below 1,000 r. p. m.; but this is a result which should be expected unless the muffler were very inefficient.

Table Showing the Results.

Engine R.P.M.	Test No. 1, with standard muffler. h.p.	Test No. 2, without muffler or exhaust pipe. h.p.	Test No. 3, with exhaust pipe only. h.p.	Test No. 4, with standard muffler modified. hp.
500	14	14¼	14¼	14¼
750	22½	23½	23½	23½
1000	28½	30¼	30½	30¼
1250	33¼	36½	37¼	36¾
1500	36	40½	42	41
1750	36¾	41¾	44½	42

The following deductions might be usefully drawn: First, that a muffler should always be mounted as far away from the engine as convenient so as to give the longest possible length of straight exhaust pipe. This main pipe and also the auxiliary pipes which lead into it from the exhaust ports should be as unrestricted as possible by having easy sweeps, instead of the common practice of having the exhaust box running parallel with the engine and connected to the cylinders by very short lengths of pipe at right angles to the exhaust box and sometimes coupled to the muffler by another pipe at right angles to the exhaust box, compelling the gas to pass three abrupt or right angle corners. This, as a matter of fact, was how the muffler used in the above tests was connected to the engine and accounts for a great deal of the lost power.

The second point is that, if a cutout be fitted to the system recommended above, it should be placed as near the muffler as possible.

A manufacturer should test his exhaust system in the way mentioned, and should not be content until he is able to get either the same horsepower—or preferably slightly more—with the cutout open on his standard exhaust system as he is able to get with the entire exhaust system removed and the engine exhausting freely into the atmosphere.

Never open the throttle quickly; open slowly and gradually. Close it as quickly as you like. Quick opening strains the engine, upsets the mixture, and does not speed you up.

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ROMANTIC FIGURES

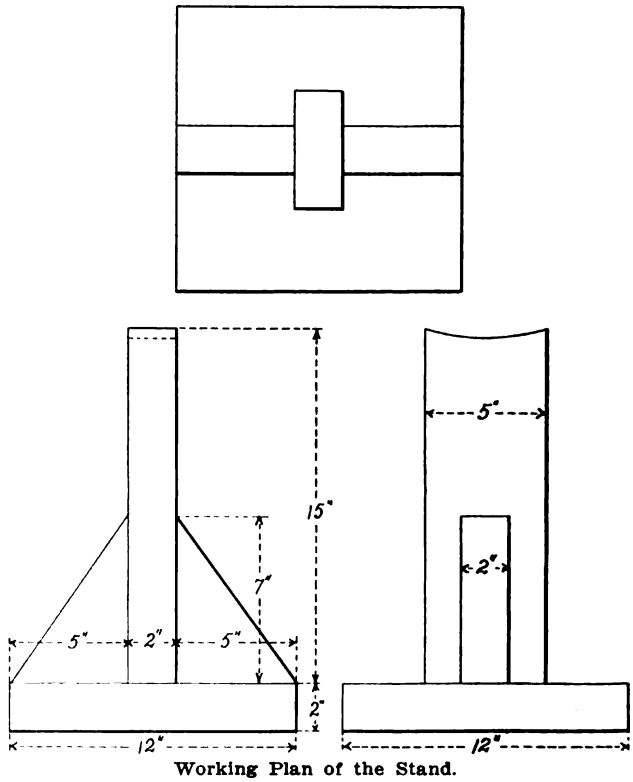
Well Worth Noting Concerning the Automobile and Its Magnitude.

(From Alfred Reeves, General Manager, National Chamber of Commerce.)

The motor car production for 1916 will exceed.	1,200,000
On the basis that any person with an income of $1,200 can own a car, there is market for automobiles to the number of.....	5,000,000
Motor vehicles sold during 1915.....	892,618
Retail value of cars and trucks sold in 1915..	$691,778,950
Passenger cars sold in 1915.....	842,249
Retail value of passenger cars sold in 1915...	$565,856,450
Motor trucks sold in 1915.....	50,369
Retail value of motor trucks sold in 1915.....	$125,922,500
Motor car sales almost doubled from 1907 to 1908, from 44,000 to.....	85,000
Number of carriages sold annually from 1908 to 1912	1,000,000
Miles of public road in the United States....	2,273,000
Money spent in this country on highway construction last year, which made for tremendous increase in real estate values, almost	$250,000,000
Automobile exports to 80 different countries in 1915 increased 250 per cent. and will exceed	$100,000,000
In 1914 it was.....	$28,507,464
England is our best buyer of automobiles, taking for the year ending June 30, trucks 5,306; pleasure cars 8,321, valued at.....	$21,000,000
Estimated value exports of Commercial vehicles only, 1915 (increase 600 per cent.)..	$63,000,000
Estimated value exports passenger cars dur- 1915 (increase 90 per cent.).....	$37,000,000
Freight carloads of automobiles shipped during 1915 exceeded	200,000
Miles traveled annually by motor vehicles (average of 5,000 miles per car).....	12,000,000,000
Gasoline consumed annually by automobiles (average of 400 gallons per car), gallons.	980,000,000
Lubricating oil consumed annually (average of 12 gallons per car), gallons.....	28,800,000
Tires used annually on motor cars..... ..	12,000,000
Number of brands of tires used on motor cars almost	125
Number of types and sizes of tires.....	140
Motor vehicles registered in the U. S. from State reports July 1, 1915.....	2,070,000
Total registrations for 1915.....	2,400,000
Registered in New York State Dec. 1, 1915...	231,713
Chauffeurs registered in New York State Dec. 1, 1915.....	79,899
Registered in California Oct. 1, 1915.....	160,000
Registered in leading 10 grain States.....	677,000
Total manufacturers of passenger and commercial cars	448
Commercial vehicle manufacturers.....	257
Dealers, garages, repair shops and supply stores	27,700
States in which automobile factories are located	34
Proportion of motor vehicles to population of United States	1 to 48
Proportion of motor vehicles to miles of road.	1 to 1
Proportion of automobiles to area of U. S...1 to	1⅓ sq. miles
Scientific engineering, standardization of main parts, skilled manufacturing, big production and efficient selling brought the passenger car to an average price in 1915 of.	$672
The average price of automobiles in 1899 for steam runabouts was.....	$1,284
The average price in 1907 went to.....	$2,123
The automobile and improved roads in some localities have increased land values, per cent.	400
Automobilists pay registration fees in all States and personal property tax, in addition, in all but four States. Many States also require and charge for a driver's license, while others have a wheel tax. There was paid more than $7 per car in motor vehicle fees for registration in 1915, exceeding	$14,000,000
Keen competition in the automobile industry brought failures in the past five years of.	400
Exports of cars and trucks per month are at the rate of.....	$8,500,000
The industry is rated to have begun in 1895, with the first automobile race over the World's Fair course in Chicago, won by J. Frank Duryea and Charles E. Duryea, in a car of their own make; the time for 55 miles was.....	10 hrs. 28 min.
Iowa leads per capita with one car for every 19 persons, with a total registration of cars of	117,407
In 1899 the production was.....	3,700
Value of cars in 1899.....	$4,750,000
In 1903 the production was.....	11,000
Value of production in 1903.....	$12,650,000
Big production came with the standardization of the most important parts of cars in 1910, when the number of cars made reached	187,000

For Jacking Up the Car.

Although the majority of motorists use their car the year around, some store them during the more severe winter months. As the wheels should be jacked up so that all weight and strain be removed from the tires, jacks or stands must be utilized. An easily made and inexpensive stand is shown in the accompanying drawing, and as the dimensions are given, no trouble should be experienced in its construction.



Working Plan of the Stand.

As may be noted, the base is made from a piece of two-inch plank, 12 inches square, and fitted to this is an upright, the top part of which is recessed. This groove is essential, as it will prevent the axle from sliding off the support. The upright is made of a piece of 2x5 joist, one end of which is nailed to the base piece. The upright is made substantial by using two triangular braces, five inches wide and seven high.

In connection with the work of jacking up a car,

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attention is called to the importance of setting the brakes before using the jack, so that the machine will not roll, and to the placing of the stands under the axle and not the truss rod or brake mechanism.

His 1911 Model Runs Well.

From Albert Lentz, Michigan.—I own and drive a Cutting car, 1911, model D, 40, and have driven the car four seasons, and it is always dependable under any and all conditions. It is equipped with a model L Schebler carburetor, which is one of the best made. It can be adjusted easily and always responds to the touch of the throttle and is quick to pick up. Now this car, being one of the older types, has to be cranked, but never coaxed. I have never had to use any hot water in order to start the motor in any kind of weather. It always starts with one or two pulls of the crank and I don't need to do even that if I don't want to. I can prime the cylinders about five minutes before I wish to start, and then when I am ready to go I push the button and the motor will start in any kind of weather, and after I start in this way, and the motor is hot, I can start on the button every time I stop for anything. Of course I had to put on a hot air hose and it has to be five feet long, as the exhaust is on the opposite side of the motor that the carburetor is on. I have 18 inches of contact besides a hot air pocket, 6 inches long on the end of the hose, all securely wound with asbestos to hold the heat, and this air is hot and vaporizes the gasoline quickly. Now about the motor. It is 4 by 5 and never misses fire, unless a spark plug gets cracked, as has happened a couple of times with me and I replaced them with new ones. I always have enough power and don't know what trouble is so far as ignition is concerned. I think, taking the age of the car to account, that it is a "hummer," as it runs fine and never balks on any road. I never race with anyone and if the other fellow wants to go faster I let him pass. There is one peculiar thing about my motor. It fires 2—1—3—4. An expert looked at it and said that he would not wire a motor that way, but as long as it runs good it would not make any difference. I do not know much about timing a motor, but understand the machinery parts and do about all of my own work. I drive about 14 miles on a gallon of gasoline, and my car weighs 2,800 lbs. I think, taking everything into account, that I have a good car and don't have to weary you with my questions this time, at least. I would like to hear from other car owners that can give as good a report as I have given. My car has a Remy magneto and coil and gives a hot spark. I use spark plugs with ½ inch extension, so the firing points are deep into the mixture. Last season I had to put in new platinum points as the old ones melted away. I am using my last year's dry cells and they only test 6 amperes. There are four of them and one of them doesn't test anything, but it will start the motor.

"Main Street" of the Nation.

The widespread interest that has attached to the amazing development of the Lincoln Highway in the two years since the idea of its construction was given to the public is responsible for an increasing demand on the part of the people for knowledge concerning road conditions in every part of the country. Were all the highways in the United States being developed as rapidly as the Lincoln Highway, some startling figures in the way of expenditures for such improvements might be quoted. Figures which really show the expenditures for road improvement during the past year and for the past decade are just as interesting as they show the necessity for immediate constructive endeavor. Ten years ago when the good roads movement was just beginning to enlist public support, approximately $79,000,000 was expended by states, counties, towns and districts in the United States in furthering the cause of improved highways. Through the awakened appreciation of the advantages of good roads since that time, due in no small part to the Lincoln Highway Propaganda, the amount has jumped to $235,000,000 for the last year. This includes the $4,623,800 which, in round numbers, were spent in improving the Lincoln Highway. The Lincoln Highway is 3,384 miles long, while the United States has, as a whole, 2,240,000 miles of public roads including the Lincoln Highway.

In comparing these figures, it is very apparent that the Lincoln Highway has received its share of attention as far as the percentage goes, but there is every reason in the world to continue the endeavor to complete the Lincoln Highway as soon as possible since it stands as the most certain example of what connected road improvements should be, for the rest of the country to follow.

However, through the interest which is centered on the construction of the Lincoln Highway many similar highway organizations have come into life since its inception, and public demand for good roads is becoming more and more insistent in seeing larger sums appropriated for highway improvement.

Economical Touring.

From the Skyland country of Colorado to the expositions of the Pacific Coast at a total cost of $40 for subsistence and automobile expenses, as compared with railroad fares, sleeping cars and meals costing $372 is the splendid record of a Hudson trip. That is the experience of J. W. Cary and family of four, who were accompanied on the trip by Dr. J. V. Solandt, all of Salt Lake City.

The Lincoln Highway was used from Salt Lake City to San Francisco, via Los Angeles. The homeward journey will be by way of the National Old Trails, visiting Grand Canyon, Petrified Forest and other scenic features of that road, crossing eight mountain ranges in Northern Arizona, and over the Transcontinental Divide at 8,214 feet in the westerly portion of New Mexico.

Between New Mexico and Colorado they will again drive their Hudson car over the high summit of Raton Pass and after a visit to the Royal Gorge and the Garden of the Gods will make the final homeward lap by way of Berthoud Pass, crossing the summit at an elevation of over two miles above sea level.

Night Road Accidents.

A Massachusetts paper advances the explanation for so many automobile accidents in that State at night that chauffeurs take naps at the wheel while the machine is spinning along. The paper says drivers wearied by long hours doze off and something happens. There is no doubt something would happen if there was any dozing or if chauffeurs even indulged in 40 winks to rest their tired minds and bodies. In the city drivers have no chance to sleep

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while on the go, but on a smooth country road at a late hour there may be momentary slumber. But three other contributing causes of night accidents cannot be ignored. They are a drop or two to drink, darkness and the blinding headlights of cars coming from an opposite direction.—Brooklyn Standard Union.

MAGNETO OR BATTERY.

Claims That the Generator Is the Best Source of of the Ignition System.

Frank Concord to the New York Society of Automobile Engineers.—The mechanism for igniting the charge in the cylinder of an explosive engine is one of the foremost problems of design with which the automobile engineer has to contend. Its general development is one of evolution, a condition which is true of all new problems in engineering.

The ignition mechanism on the early automobile engines was copied from the system as used on stationary engines of that day. This was the so-called make-and-break system in which an electric circuit was mechanically closed and opened through contact points placed inside the cylinder. The electric circuit usually consisted of a simple reactance coil in series with a few cells of primary battery. The inductive discharges from the coil produced a spark on separation of the contacts which ignited the charge in the cylinder. Under limited conditions this system leaves little to be desired. The electrical apparatus is simple and easily understood. The ignition spark is very hot and if the mechanical part is well made its operation is practically perfect.

Advantages of Jump-Spark System.

The next scheme to be proposed was the jump-spark or high-tension system in which the spark electrodes in the cylinder are fixed with a small separation between which the spark is produced at the proper instant by applying a voltage sufficiently high to jump the gap. This arrangement has the advantage that there are no working parts in the combustion space and therefore the parts are mechanically much more simple than the low-tension system. This system had the apparent disadvantage of giving a much weaker spark, and owing to the high voltage this spark might be further weakened by leakage between the parts forming the terminal supports and the connecting wires. These problems were more readily solved than the ones connected with the make-and-break mechanism. In fact, it can be stated that the modern high-speed gasoline engine would be impracticable with make-and-break ignition. For the slow-speed stationary engine, especially where, due to a low grade fuel being used, compression is carried to a high value, the low-tension system has, however, held its own.

In the high-tension system the mechanism connected with the sparking points has been simple and the problem of insulation of these points has been solved to a satisfactory degree. It is, therefore, upon the mechanism which furnishes the high-tension current at these points that our attention is now centered. The first and most obvious solution of this problem was to use an ordinary vibrating contact induction coil, the primary circuit of which was supplied from a primary battery, and in the secondary circuit of which was induced a voltage sufficient to jump the space between the electrodes in the cylinder, these electrodes and their mounting forming the now well-known spark plug. The primary circuit of the induction coil was controlled by a contact device which served to close this circuit at the proper instant. The shortcomings of this system were mainly in the battery which supplied the electric energy to the coil, and in order to obtain a reasonable life from the type of batteries available for this service, it was necessary to reduce the energy consumption to the minimum that would give satisfactory ignition. To overcome this defect, designers turned their attention to the matter of supplying this energy from a mechanical generator which would obtain its power from the gasoline engine. As the only object of this generator was to supply energy to the induction coil, it was evident that this coil and its contact mechanism would be combined in one piece of apparatus with the generator.

Ignition by Single Spark.

As a simple alternating current generator which gave a comparatively low frequency was used, it was found necessary to abandon the magnetically operated vibrator and substitute a mechanically operated one which would open and close the primary circuit of the induction coil at definite points on the voltage wave induced in the windings of the generator armature. This, of course, gave but one spark in the cylinder instead of the series of sparks induced by the vibrating coil, but as it is necessary to obtain proper timing of the explosion that the first spark ignite the mixture, the succeeding sparks are superfluous, although it is possible that should the first spark, owing to unfavorable conditions, fail to ignite the explosive mixture, a succeeding spark may do so. This condition can be practically overcome by supplying more energy to the single initial spark, which is permissible when this energy is generated by a mechanical device.

As a generator with permanent magnet fields gives the simplest arrangement and has the advantage of overcoming the time element necessary for any electromagnet field to be built up, the permanent type is universally used and the name magneto has by usage in automobile engineering circles been taken to cover generating and spark producing mechanism as a whole.

The advent of electric lighting, and later of electric starting of the gasoline engine, produced demands for electric energy on the automobile which could only be met by the use of a much more efficient type of generator than that which served for the supply of ignition energy. As it is necessary to have power when the engine is not running, a storage battery is required. This condition is being met by the variable-speed battery-charging generators now on the market. The presence on the automobile of a supply of electrical energy much greater than required for simple ignition seems, therefore, to render superfluous the use of a separate generator for the ignition system. Naturally, in view of this, the first impulse would be to go back to the original vibrating coil system with its primary battery energy being supplied from the lighting and starting system instead. This system, however, has certain disadvantages which have been in large measure corrected in the development of the magneto generator, the principal ones being the time which elapses between the closing of the primary circuit and the production of the spark at the plug

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and the limitation which the vibrating contact mechanism places on the amount of energy it is possible to deliver to the spark plug. As this time is constant and independent of engine speed, it is obvious that the spark would occur progressively later as the engine speed increased. To overcome these defects it has been necessary to design a mechanism in which the primary contact points are operated mechanically the same as in the case of the magneto. As the spark is produced at the opening of these contacts, and this opening occurs at a definite angular position of the engine crankshaft, the spark is not retarded as the speed increases, thereby necessitating only the amount of angular advance required for the complete combustion of the exploding charge, and the type of contact device also permits of increasing the amount of energy which may be delivered to the spark plugs. The remaining distinction between the operation of a magneto and a battery system lies in a difference in the action which takes place in the induction coil.

Energy Conditions in Battery System.

In the battery system the total energy to be supplied to the spark plug is delivered through the primary winding of the induction coil and stored as magnetic energy in the magnetic circuit of this coil. On opening the primary circuit this energy, minus the incidental losses, is delivered through the secondary winding to the spark plug. An oscillograph curve of the current in the spark plug circuit shows that this current rises instantaneously to a definite value from which value it gradually falls off to zero. The amount to which the current rises is determined by the value of the primary current and ratio of primary to secondary turns; while the time required for this current to fall to zero is determined by the energy stored in the magnetic circuit of the induction coil and by the resistance of the secondary or spark plug circuit.

In the case of the magneto the initial current value through the spark plug is, as in the case of the coil operated from a battery, determined by the primary current and ratio of turns. Its subsequent value, however, may be modified by the fact that energy can be delivered directly to this secondary through the mechanical motion of the generator armature itself. The time required for the current in the spark-plug circuit to reach zero may, therefore, be prolonged over that which would be possible in the case of the simple induction coil system. So far as performing its function of igniting the explosion charge is concerned, this prolonged spark can be of no value as, in order to properly develop the power in the cylinder, the combustion of the charge which is started at the spark plug points must take place through the whole volume of charge in an extremely limited time as compared to one complete engine cycle. No increase of power could, therefore, be obtained by maintaining the spark at the spark plug points after the explosive mixture in the vicinity of these points has been burned. This effect of prolonging the duration of spark may be very deceptive in comparing the relative intensities of the spark produced by different systems by observation. Thus, a greatly prolonged spark of comparatively low current value may appear much hotter than one of short duration but higher current value, although this latter would be the more efficient igniting spark.

Limitations in Magneto Voltage.

A further distinction between magneto and battery ignition lies in the limitations on possible secondary voltage it is practical to generate in the magneto equipment, especially at the lower engine speeds. In the battery system it is possible to wind the secondary coil for any required voltage. In the case of the magneto there are limitations of design, due particularly to the limited space in which it is possible to place a secondary winding and the difficulty of obtaining clearances necessary for effective insulation. This condition can be observed by noting the size of the magneto required to give efficient ignition when the jump-spark system is used on the comparatively slow-speed high-compression stationary engine.

I have not gone into any details of the construction or operation of either the magneto or the battery system, as it can be seen from the foregoing that there is no fundamental difference between the two systems, and the method used to work out the problem of any particular design would have no bearing on the question under discussion. That the ignition system in which the primary source of electrical energy is the generator, which can supply in common all electrical demands of the automobile, is the most rational solution, is evidenced by a study of changes in the types of equipment used within the last few years.

SKIDDING DANGERS.

How to Prevent Them and How to Handle the Car.

F. W. Muller in the N. Y. World.—Ask the average motorist what he fears most in the daily handling of his machine and the answer will be "skidding," for if there be one thing more than all others that the motorist fears, it is that sickly sinking of one's interior that comes with the sudden and entire loss of control inevitably accompanying a bad skid.

Skidding is the result of the failure of one force to counteract another—in other words, the momentum of the machine is in excess of its traction. The tendency of the heavy, moving body overcomes the adhesion of the rear tires, and they slide in the direction they were originally moving, instead of following the path of the front wheels, as skidding almost invariably has its origin in an attempt to alter the direction of travel when on a slippery surface. Except on a high-cambered country road, where the whole car naturally tends to gravitate sidewise into the ditch on the least provocation, it rarely occurs when driving straight ahead. Consequently, the first precaution to be observed is to drive slowly over the occasional stretch of wet asphalt. "Gingerly" describes it better—feeling your way carefully, so that the momentum of the car will not be sufficient to overcome its traction when necessary to go around an obstacle.

As an absolute preventive of skidding non-skid chains will naturally suggest themselves at once to the reader, and it may be added that two of the insurance companies that write automobile accident policies have taken cognizance of the frequency of accidents caused by skidding, and recommend the use of chains. In truth, if the chains are in their proper place on the tires, our "ever-present danger" has been exorcised, so that the remarks which fol-

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low may be taken merely as advice for that day when somebody forgot, and left his chains in the locker at home. And right here we can offer the best anti-skid rule of all: make it an invariable rule to keep the chains in the car, and not trust to remembering to put them there just before starting out.

A slow pace will also obviate the necessity of using the brakes in the majority of instances, for braking is one of the things that should be avoided by all means when attempting to regain control during a skid, as, if the rear wheels can be made to resume their usual function of rolling after the front ones, the slide will be over. The average motorist's first impulse is to jam on the brakes hard, with the result that the driving wheels immediately lock, and continue to travel sidewise on the small section of the tire that lost its traction and caused the skid in the first place.

If it be possible to avoid the use of the brakes and the front wheels be thrown immediately in the same direction as the rear of the car started to slide, the tendency to keep up this process until the car lands up against the curb or some other equally unpleasant obstruction will be counteracted, and its progress crabwise arrested. For example, if, in attempting to pass another vehicle to the left, the rear wheels refuse to take part in the manoeuvre, but start on a swing for the curb at the right, the steering wheel should be immediately swung in the same direction, thus presenting the four wheels of the machine as a broad "V" against the sliding action. The latter then has to overcome the friction of four wheels, instead of being aggravated by a snap-the-whip action, which results when the steering wheels are turned in the direction opposite to that of the skid. Once the rear wheels refuse to follow the front ones, they must take a path of their own, and they are naturally restricted to the arc of a circle having the middle of the front axle as its center and the wheelbase of the car as its radius. Hence that unpleasant and sudden swing which so often results in "sidewiping" the nearest obstruction, or causes the car to face back in the opposite direction when the road happens to be clear. Both of these can usually be counteracted effectively by letting the brakes alone and using the steering-wheel, in the right direction, which is always that of the skid itself.

Granted, of course, that the speed was sufficiently moderate to keep things in hand without the necessity of jamming on the brakes, this precaution applies only to the common or garden variety of skid, in which the back wheels alone are the culprits. Where the pace is overfast, considering the slipperiness of the surface, the energy of the moving body cannot be absorbed in a short distance either by the brakes or the turning of the steering wheels to counteract the slide. Then occurs that most to be dreaded of all skids—the "sashay on all four," against which only a swift mental appeal to Providence and a resolution to use the tire-chains next time are of any avail. The rolling momentum of the car is transformed into a force that sends the whole machine along sidewise, its progress aided by the locking of the rear wheels, and the driver finds himself utterly helpless.

As a producer of skids of the most virulent type, street car tracks are way above par. If there be a reasonable coincidence of their level with that of the roadway, little difficulty is experienced in getting off them when dry, but when wet the driving wheels will bind sufficiently to make it hard to release them except by turning the steering wheel much further than would be necessary under ordinary circumstances. The result is to bring them out with a jerk and the nastiest kind of a swing around follows; unless the street be clear, nothing but pure and unadulterated luck can save you from hitting something; and even if there are no wagons or pedestrians, street cars or other impedimenta there is still the curb to be reckoned with.

As the only sure and dependable means of preventing skidding, anti-skid chains stand supreme. Always have a set with you. They are easy to put on and easy to take off, and the element of safety they add makes them well worth while.

Overheating.

The two main causes of an overheated motor are defective carburetion and ignition. In the first case it may be that too rich a mixture is being supplied to the engine due to a defect in the carburetor such as worn toggles, punctured float, leaky needle valve, loose jet, etc. The carburetor may be of the type that is heated by the circulation of water from the cylinder jackets. During the summer months this hot water jacketing of the carburetor is frequently unnecessary, and may cause the carburetor to get too hot for efficient carburetion. There is usually a tap fitted in the pipe line that conveys the hot water to the carburetor, and this should be turned off and any improvement noted.

If the carburetor is supplied with hot air drawn from round the exhaust pipe by means of a "muff," a good sized hole should be made in the pipe between the carburetor and the muff and a sliding collar or clip fitted to cover the hole up when not in use. The hole should be made near to the carburetor, and should be opened in hot weather in order that cooler air may be drawn in. If the air for the carburetor be drawn through a filter the gauzes should be frequently removed and thoroughly cleaned, as any strangling of the air supply will cause more suction on the jet and more gasoline to be used.

Now as to the ignition, the brushes of the magneto high-tension circuit should be cleaned, and the platinum points examined to see that they are separating, when the rocker arm makes contact with either of the cams or rollers, a distance equal to the thickness of the gauge on the magneto spanner supplied with the magneto, also that the points are filed level so as to have a large surface of contact. The timing of the ignition should be checked, as it may have slipped. Driving with retarded ignition is one of the surest ways to make an engine overheat.

Effect of Vibration of Structures.

Recognizing that practically every one is certain that high speed, better work, and greater human efficiency are possible in a stable as compared with a vibrating building, but that exact data proving this fact are difficult to obtain, the Aberthaw Construction Co., of Boston, Mass., is undertaking an exhaustive investigation in the effort to bring together conclusive evidence. They will greatly appreciate any suggestions or reports of experience that our readers may be able to send to them. These may have

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to do with any aspect of the case that will assist in the collection of facts or the reaching of conclusions.

ASSOCIATED GARAGES.

A Big Convention to Be Held in Chicago the 26th and 27th of This Month.

The second annual convention of the Associated Garages of America is to be held at the Congress Hotel, Chicago, January 26 and 27, 1915, at the time of the Automobile Show there.

E. J. McGuirk, National Organizer, will have full details of the convention in charge. The past year has been devoted mostly to organization work. At the time of the first convention, when the organization was perfected, there were individual members from 18 States present. The only States that had State associations then were Illinois and New York. Since this convention the State of Michigan has been organized and has held two very successful conventions, one on May 22d, at Detroit, at which time they voted to apply for a charter and affiliate with the Associated Garages of America, and one October 7th at Grand Rapids, which showed a large increase in membership and progressing very nicely.

On March 10th, 70 automobile dealers assembled at Des Moines, Iowa, and formed the association known as the Iowa Retail Auto Dealers' Association and, at their convention on August 31, and September 1, 1915, they voted to affiliate with the Associated Garages of America.

The Garage Owners' Association of Illinois, affiliated with the Associated Garages of America in January, 1915. A large delegation in the State of New York assembled at the Continental Hotel in New York City and formed what is known as the United Garage Associations of New York State. At their convention held September 14th, they voted to affiliate with the Associated Garages of America. The Garage Owners' Association of Ohio, have voted to affiliate and apply for a charter from the Associated Garages of America. Early in May, the Garage Owners' Protective Association of San Francisco, one of the strongest local associations in the country, applied for a charter for local membership in the Associated Garages of America.

This association has a large general membership which is composed of individual garage owners throughout the country in cities where there is no local or state association. There exists throughout the country many local associations known as garage and repairmen's associations, dealers' associations, automobile trade associations and supply dealers associations, which come under the jurisdiction of the Associated Garages of America, owing to the fact that they have garage owners for members and, as rapidly as possible, the Associated Garages of America is placing before them the benefits that can be derived by joining.

This association represents the garage industry, the retailing of automobiles, and the retailing of automobile supplies and will be able to work in harmony with the National Association of Automobile Jobbers as well as the Motor and Accessory Manufacturers' Association, with the object of bettering the industry in general and placing it upon a legitimate basis, the same as other old line trades are enjoying.

There are other objects in view and at this Chicago convention committees with strong business men as chairmen, will be elected to discuss ways and means to bring about reform in the business, and it is hoped that the year 1916 will bring about a much stronger and larger association throughout the country and that the prosperity of the automobile business will have been greatly increased and placed upon a higher plane of business principles.

Wherever there is a local association or State association, organized along the lines of the Associated Garages of America, they would do well to correspond with the National Organizer, E. J. McGuirk, 333 S. Dearborn St., Chicago, and find out more about how the work is being carried on and the benefit that can be derived by affiliating with this strong national body which, in its first year, reaches from New York to San Francisco.

CAUSES OF BACKFIRE.

And Some of the Methods to Prevent or Cure the Trouble.

From W., in the Autocar.—Much misunderstanding exists amongst beginners as to what a backfire really is. Some people are afraid of getting a backfire every time they start up, and I want to explain that nowadays backfires are not frequent, and can do little damage. It is well first to explain that the term "backfire" is often applied to (1) firing in the inlet pipe, and (2) explosions in the muffler, as well as (3) to a "back-kick" of the starting handle.

The first is denoted by a popping or banging noise under the bonnet, a fault often described as "backfiring into the carburetor." This erratic performance is generally due to the mixture being too weak. To remedy this the amount of gasoline supplied to the engine must be increased either by cleaning out the carburetor and removing any obstruction in the passages, fitting a larger jet, or, if an extra air valve is used, by closing the air supply slightly. Other less frequent causes are a sticking inlet valve or incandescent spark plug points. Weak mixture, as a rule, is the cause, due more often than not to a partially choked jet or partially blocked feed pipe. This firing in the inlet pipe involves loss of power, and it may be dangerous, as by this means the gasoline in the spraying chamber of the carburetor may possibly catch fire. Therefore the defect should be remedied as soon as convenient. The carburetor is not likely to catch fire as long as the car is running, so that, although something very alarming is suggested, serious trouble is not likely to result in most cases.

Explosions in the muffler are due nearly always to misfiring caused by defective ignition. What happens is that one or more cylinders fail to fire, and the gas therein is discharged unburnt into the muffler and is exploded by the exhaust flame from another cylinder. Here, again, the only damage likely to be done is to the muffler, but the noise is objectionable, and, of course, much power is lost by the misfiring. Generally the trouble is due to a sparking plug being faulty.

A Backfire Proper.

A backfire proper, which is better termed a "back-kick," may occur when the engine is being started, and in the early days was responsible for many a sprained wrist. When motor cars were first produced hot-tube ignition was used, and with this an engine nearly always backfired at starting, and the agility of the operator alone saved him from injury.

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Then came accumulator ignition, with means for retarding the moment of firing, which was better; but with accumulator ignition it was very easy to obtain a backfire if one forgot to retard the firing point, and this frequently happened. On many modern cars accumulators are still used for starting, and consequently on cars so fitted it is very important to retard the ignition before attempting to start the engine. On the other hand, most carburetors now require the throttle nearly closed for starting, so that there is very little gas in the engine cylinders, and if a back-kick take place it is feeble compared with the hefty backfires which one used to experience with engines which required a wide throttle opening at starting.

With magneto ignition there is very little likelihood of getting a bad back-kick, as the magneto generally delivers very little current unless the starting handle is turned extremely fast, while it is only when it is moved slowly that danger from a back-kick can arise. If the engine be started on the magneto with the throttle nearly closed, it is almost impossible to obtain a serious back-kick, and if one occur it can nearly always be resisted by the operator of the starting handle, as the back-kick is so feeble.

As a precaution, however, to remove any possibility of damage to one's arm or wrist, the handle should always be pulled upwards, and the thumb should be placed beside the fingers under the grip of the starting handle. Consequently, if the engine backfire when the handle is about half-way up, the fingers are merely forced downwards and the handle flies from the hand. If one push the handle down to start and a backfire takes place, the whole blow is taken by the palm of the hand, which is at an angle to the arm; the wrist is then bent backwards and a sprain may occur.

If any beginner still have fear of a back-kick I would recommend him to set the levers right for starting and then spin the engine with the switch in the "off" position. Then he should switch on and give the starting handle a sharp pull upwards. His previous spinning will have filled the cylinders with gas, so that a sharp jerk will be all that is necessary. It helps matters considerably if the left hand rests upon some rigid part of the car, such as the dumb iron, so that one can take up a firm position and be better able to give the starting handle a hefty pull up.

Accidents and Speed.

"One of the greatest merits of the modern automobile," says Mr. Briscoe, "is its capability for sustaining rapid travel, and while it is not to be denied that there are certain dangers inseparable from all fast travel, the dangers are ordinarily much misrepresented and misunderstood.

"As a matter of fact, most automobile accidents occur, in a sense, independent of the speed, and are due more to carelessness and reckless driving than to the actual rate of going.

"Some of the worst accidents occur at the lowest speeds, for which reason legislation of high speed by no means precludes the possibility of accidents.

"It is perfectly demonstrable that fifty miles an hour, with a well-built machine in competent hands, and on a clear and perfect road, may be far less dangerous than six or eight miles an hour with a poor car in the hands of an inexperienced driver in crowded traffic.

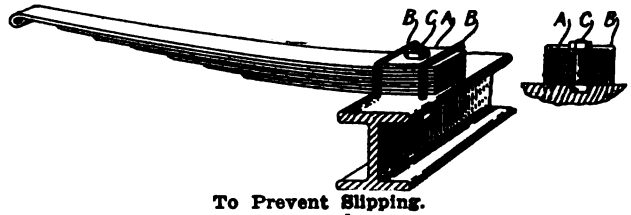
"There are circumstances when speed may become a downright factor of safety, since there are times when the least likelihood of accident is plainly to be insured by moving the car quickly from one point to another.

"The most pronounced effect of high speed on the automobile's control is to make steering easy. Yet in this very facility of response lies the greatest danger. Take the case of a car going sixty miles an hour along a straight road twenty feet wide. This means, if the car is of 56-inch tread, and is kept on the crown of the road, it must run seven and one-half feet to one side before it possibly can run into the ditch. This in turn requires that the road wheels be held at an angle of about half an inch out of the straight for the car to go into the ditch in an onward travel of 270 feet.

"This seems, and at low speed is, a great enough distance to guard against the slightest possibility of danger, but if the car is going at sixty miles an hour, or travels eighty-eight feet a second, it follows that a derangement of the steering to the extent of half an inch will put the car into the ditch in about three seconds unless the wrong steering is corrected within that time."

For a Slipping Spring.

Automobile springs have been known to slip on the axle even when the clamps are closely driven. Those on the front axle are most likely to slip. This can be overcome by cutting a piece of spring



To Prevent Slipping.

A, the same width as the automobile spring and just long enough to fit snugly between the clamps B, and fastening it in place with the same bolt C, that passes through the spring. The piece of spring rests against the clamps on either side and prevents the spring from shifting on the axle in case the clamps come loose.

Fitting Small Screws.

Small machine and other types of screws having fine threads, are often very difficult to start into the work, and many times they are dropped into places not easily accessible. There are several methods of preventing this as well as making the work easy. One is to take a piece of annealed wire, bend it double at one end, and slip it under the head of the screw. This will hold the screw steady while the screwdriver is being used. Another method is to cut a V slot in a strip of sheet brass or tin. This has an advantage as it will enable its use with screws of different diameters. Another way is to push the screw through a strip of stiff paper.

When it is not practical to employ these methods, take a piece of wood and cut the end so that it can be forced into the slot of the screw. This will enable one to catch the thread. Magnets are sometimes used where the work permits. Small iron or steel screws can be magnetized by rubbing them on a horseshoe magnet.

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WEIGHT REDUCTIONS.

Mr. Duryea Says the Car of the Future Will Be Much Lighter.

From Charles E. Duryea, Dean of Auto Engineers. —When the average man thinks of light weight with reference to his automobile, he of course considers only the total weight of the car and too often snorts, "What matter about the weight? Does not the engine pull it?" Arguments as to efficiency and the various other gains have in days gone by been all too deep for him. He could only appreciate that which he saw, and he could see a big car with its massive parts and imposing bearing. It impressed him with the idea of power and speed. So the massive heavy construction won.

But right never dies. Merit is immortal and sooner or later will bob up after the fallacies have had time to explode and blow away. So light weight is rapidly coming into its own.

That the modern auto will closely follow the history of the horse-drawn carriages and the bicycle and eventually become lightened to a degree even now considered impossible has long been in the minds of many, but that this lightening would be pre-eminent at some of the places where it is now found was not foreseen. And the future undoubtedly holds still further surprises for us.

The first form of lightening the car came in the choice of better materials. The early structural steels, amply good and probably best for their purpose, were far from being the best materials for auto construction. The still scarce metal aluminum was introduced for crankcases in 1895. It was tried for many other services in the next few years by different builders, but not largely used, because at that time suitable alloys and proper foundry handling could not be had. But better steels came, better shop practice became common until the modern auto is a marvel of strength and endurance. And so gradual has this all been that we have not thought of the weight that would have been required had it been possible to use enough of the older materials to secure the modern strength.

Since the last automobile show there has been another long step forward in the matter of light weight. The use of aluminum for pistons marks the success of experiments begun several years before the end of the last century. The light piston permits light connecting rods and light bearings. It permits high speeds and thus a reduction of engine weight. High speeds accompany small cylinders, which in turn mean many cylinders, with the result that the engine needs almost no flywheel, and the strain on the transmission and driving shafts is both light and continuous instead of a series of heavy impulses that require heavy parts to resist.

So the use of aluminum pistons not only saves a small amount of weight in the pistons, but it saves weight every inch of the way to the wheels. This saving permits lighter wheels, lighter frames, and of course lighter springs and lighter tires to carry these lighter loads. It has been stated, and it is doubtless well within the truth, that a pound saved at the flywheel of the engine permits five pounds to be saved in the weight of the car.

Of the money value of this weight saving much should be said. The light car burns less fuel and thus every day pays toward the cost of its lighter weight. But best of all, it is more flexible and responsive, and is more of a pleasure to drive. It starts and stops quicker and is therefore more safe. The light car is the car of the near future.

Coming Events

January 22-29—Montreal, Que., show.
January 22-29—Chicago show.
January 24-29—Portland, Ore., show.
January 24-29—Buffalo, N. Y., show.
January 25-27—Montgomery, Ala., show.
January 29-February 5—Columbus, O., show.
January 29-February 5—Minneapolis, Minn., show
February 1- 5—York, Pa., show.
February 7-12—Kansas City, Mo., show.
February 9-12—Peoria, Ill., show.
February 12-19—Hartford, Conn., show.
February 14-19—Des Moines, Ia., show.
February 20-27—Grand Rapids, Mich., show.
February 21-26—Louisville, Ky., show.
February 21-26—Omaha, Neb., show.
February 21-26—Syracuse, N. Y., show.
February 29-March 4—Sioux City, Ia., show.
February 29-March 4—Fort Dodge, Ia., show.
March 4-11—Boston show.
March 8-11—Davenport-Rock Island-Moline show.
March 8-11—Mason City, Ia., show.
March 9-11—Kenosha, Wis., show.
March 21-25—Deadwood, S. D., show.
April 10-17—Seattle, Wash., show.

RACES.

May 13—New York City, Sheepshead Bay speedway race.
May 30—Indianapolis speedway race.
June 17—Chicago speedway race.
June 28—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
July 15—Omaha, Neb., speedway race.
August 5—Tacoma speedway race.
August 18-19—Elgin road race.
September 15—Indianapolis speedway race.
September 30—New York City Sheepshead Bay speedway race.
October 7—Omaha speedway race.
October 14—Chicago speedway race.

Cold Weather Starting.

From Chas. L. Haney, Pennsylvania.—I learned quite accidentally how to start motors in cold weather. Instead of priming by filling up or pouring into the priming cups, I use a fine nozzle oil gun and shoot spray and then shoot air into the cups immediately after. Result: Motor goes at the touch of the starter, whereas I had to spin considerable before I discovered this stunt. This may be old to some folks but it is at least new to me, and works like a charm on my Studebaker '16 in the coldest of weather.

Hudson Regains Valvoline Trophy.

The Hudson again holds the famous $1,000 Valvoline Trophy, the most highly prized on the Pacific Coast. The Hudson regained possession of the cup by again lowering the record from Sacramento to Tallac, reducing the record of the best previous time three hours and twenty-six minutes by four minutes. The Hudosn set a new record under somewhat adverse conditions.

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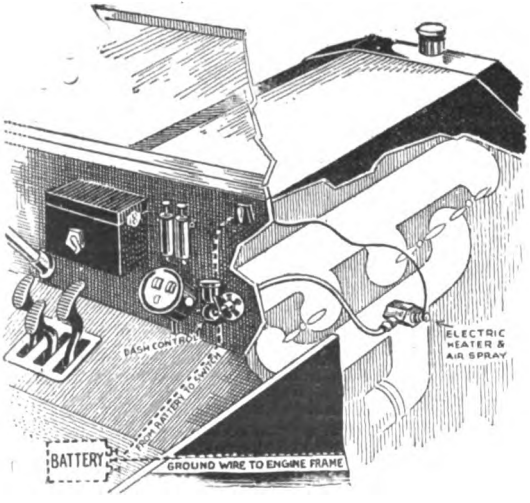
NEW AND INTERESTING THINGS IN MOTORDOM

Steer Warms for Winter Driving.

Anyone who has driven a car in the cold weather of winter realizes how much trouble there is from stiffness of the hands which sometimes renders it almost impossible to grasp the steering wheel and more than one accident has undoubtedly happened from this cause.



With Steer Warms which are illustrated herewith you can drive in comfort, even in the zero day. This device consists of two neat leather covered grips, one for each hand which lace on the steering wheel at any place convenient for driving. They operate on the same principle as an electric heating pad. They are simple, efficient and cost very little to maintain. An enormous sale has been made of this article during the present season and jobbers and dealers who have not already stocked up should do so as soon as possible. Another winter device which is highly recommended is the Ieco Electric Manifold Plug, which we also illustrate. This plug puts a hot vaporized mixture into the cylinders causing the engine to start at once. They start the engine on the first or second turn anywhere, and when a heavy starter is used it saves the battery. This plug is inexpensive to maintain, easy to install, simple and compact and guaranteed against burning out within two years. If not as claimed the money will be refunded. The Steer Warms for Ford cars sell for $5.00 and for other makes $7.50; in Canada $7.25 for the Ford car and $11.00 for other cars. The price of the Ieco Electric Manifold Plug is $5.00 in the United States and $7.25 in Canada. Both of these live winter specialties are manufactured by the Interstate Electric Co., 1845 Perdido Street, New Orleans, La.



Imperial Process for Repairing Aluminum.

This is a new system of repairing aluminum, which is so simple that anyone without previous experience can make a permanent repair in a very few minutes. This process does not weaken or warp any part of the crank or transmission case. A heat of only 340 degrees is used. This process is handy, cheap and effective. The complete outfit which only costs $3, is made by the Imperial Specialty Sales Co., 1777 Broadway, New York City.

Big Advertising Campaign for Premier Vulcanizers.

Twelve million people will be reached by the extensive advertising campaign which has been planned for introducing the Premier Automatic Electric Vulcanizer. Among other mediums of large circulation, the manufacturers will use the Saturday Evening Post and Literary Digest. This marvelously simple, yet effective little vulcanizer is made by the Premier Electric Co., 4038 Ravenswood Avenue, Chicago, Ill.

Universal Specialties for Ford Cars.

A very strong line of specialties for the Ford cars is manufactured by the Universal Car Equipment Co., 255 East Jefferson Avenue, Detroit, Mich. This line includes a special touring body, raceabout body, Universal stream line radiator, one-man top and the celebrated Spranger demountable rim wire wheels. Readers are referred for illustrations and particulars in regard to some of these specialties to the full page advertisement from this company which appears in the present issue of our magazine, and for the other specialties not illustrated in this advertisement, direct correspondence with the manufacturers is invited.

Tire-Doh.

This is a preparation for repairing tires and the best evidence of its merit is that for six years it has been used by ever increasing thousands of car owners for making all kinds of repairs in inner tubes and casings. It is now used by over 250,000 car owners, and is sold by 10,000 dealers and 300 jobbers. Tire-Doh is now made in three sizes by the manufacturers, the Atlas Auto Supply Co., 612 West Austin Avenue, Chicago, Ill.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

Se-Ment-Ol Radiator Cement.

This is a self-acting radiator cement, which works like magic and is simple as A B C to use. It finds a leak and fixes it in fifteen minutes. This preparation dissolves the water and congeals into cement on the edge of the leak. It sells for 75 cents retail for a generous package. The same manufacturers also make a large line of other specialties, including Carbonox, which is described as the chemically correct carbon remover, also the Pioneer Valve Grinding Compound and a list of twenty other live specialties which should interest every dealer. Write for interesting printed matter and full information in regard to these specialties to The Northwestern Chemical Co., Marietta, Ohio.

The Dover Two-Lite Bulb Case for Ford Cars.

This is an entirely new product which has been brought out by the Dover Stamping & Manufacturing Co., of Cambridge, Mass., and the illustration gives our readers a fair idea of its appearance. It is a case 2¼ inches in diameter by 7½ inches long, and it consists of a steel cylindrical tube with a



The Dover Bulb.

removable cover on each end held securely in place by a bayonet locking device. Each cover, when removed, has a socket with spring to securely hold a standard electric headlight bulb. The bulb is inserted in the socket, and the cover put on the end of the tube. This gives the case absolute protection to the bulbs which of course are very delicate and likely to breakage, and the body of the device is that which sells for the extremely low price of 35 cents, enabling the owner of a Ford car to properly care for extra light bulbs in the most convenient manner imaginable.

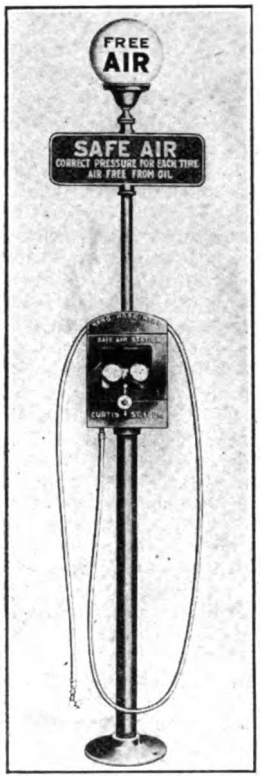
National Rubber Tirefiller.

This is a substitute for air in automobile tires which is very popular and has had a large sale. This Tirefiller is made of pure rubber, cut in small particles treated, moulded and vulcanized by a special steam process. The object is to do away with the expense of buying, repairing and replacing inner tubes. A small sample will be sent free to anyone interested by the National Rubber Filler Co., 208 College Street, Midlothian, Texas.

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Tires Filled Absolutely Correct.

There are more tires ruined due to improper inflation than any other cause. The soft tire rides easy, but wears out quickly and causes loosened fabric, friction between the plies of fabric, blow outs and rim cuts. The average car owner drives up to the free air station, and unless he carries an air gauge with him in most cases the pressure that he will put



in his tire is merely guess-work. Tire manufacturers tell us that much damage is being done by over inflation, especially the last year and a half, due to the fact that garage men are using a higher air line pressure than formerly, in turn due to the fact that they wish to save the time of the automobile owner, claiming that the higher pressure permits the tire user to inflate his tire in less time.

In many cases the man with a 3½ tire will put in the same at pressure that is suited for 4½ or 5-inch tire, and in many cases if his casing is worn, it results in a blow-out which he never thinks to attribute to the pressure, but usually attributes the cause to a faulty tire. Now with the Curtis Correct Pressure Tire Filling Station, the tire user does not have to carry an air gauge around with him, nor does he have to look at the pressure dial at all. He simply turns the handle in front of the station until the pointer inside of the box moves along a dial until it points to the size tire he wishes to fill. He can then get ready and fill his tire, and even if he should hold the tire connected all day, it will be impossible for him to get a greater pressure in his tire than the manufacturer specifies is correct.

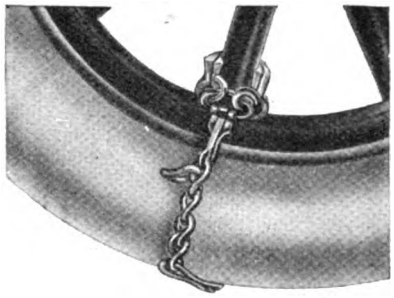
This almost indispensable business getter for garages is called the "Correct Pressure Tire Filling Station," and is made by the Curtis Pneumatic Mchy. Co., St. Louis, Mo., to whom letters should be addressed for further information.

Acetylene Gas Generators.

From The Fort Wayne Journal-Gazette—Herman Bohne and Archibald D. Spear, the two employes of the Day-Lite Gas Company, who were blown to pieces when the terrific explosion of an acetylene gas generator wrecked the plant, northwest of the city, near the Bass farm, on December 10, were not informed of the fact that the pressure carried was more than fifteen pounds. They were not aware of the danger which threatened to destroy them at any moment, is the significant finding in the verdict which Coroner Edward H. Kruse has submitted relative to the case. Louis Wagschal, who invented and installed the system of generator that ran the gas pressure beyond all reasonable bounds of safety, is severely arraigned, as the latter was advised, according to the investigation, not to employ so dangerous a system which had been condemned by all reliable authorities on the subject of acetylene gas generation.

Trouble-Proof Tires and Easyon Chains.

Illustrated herewith are two valuable tire specialties, both of which are manufactured by the Leather Tire Goods Co., of Niagara Falls, N. Y. Woodworth Trouble-Proof Tires have a leather strip in them which makes them puncture-proof without making them at all stiff or hard riding. They are guaranteed against punctures or blow-outs for 5,000 miles, and the manufacturers state that on



light machines they generally last from 10,000 to 15,000 miles.. These tires are very carefully made from the very best material obtainable and it is claimed that they will last so much longer than



ordinary tires that they are cheaper in the long run. We also illustrate the Easyon Chains, which are individual chains fastened to the spokes with leather covered fasteners that do not injure the paint. The cross chains are of such design that they cannot cut or wear the rubber. By the use of these chains, instead of wearing out both your tires and chains by using them continuously in wet weather, you can run with bare tires when the weather is good and put the chains on only when they are needed, thus saving a great deal of wear on both tires and chains. For prices and full particulars, write direct to the Leather Tire Goods Co., at Niagara Falls, N. Y., and they will also be pleased to send you printed matter in regard to several other specialties which they manufacture, including fan belts, tire overshoes and spring oiler straps.

A Tire Patch for Ford Cars.

We illustrate the Atco Tire Patch for the special use of Ford Car owners. This patch is made to be used on either 3



or 3½ inch tires. It is made of the best leather to be had. It has a simple locking device which makes it easy for application. It will repair rim cuts as well as blow-outs at any place in the tire. To apply the patch it is only necessary to place around the inner-tube and insert the fasteners through the desired row of slots, and mash the fasteners down with your thumb. This is a neat, tough and durable patch and especially handy for road-side repairs. It sells for only $1.00 and is guaranteed to give perfect satisfaction. This patch is manufactured by the Autocrat Tire Company of Midlothian, Texas.

Giant Non-Skid Tires.

These are high grade tires of standard make which have been rebuilt to extra strength and with a heavy non-skid tread added. The tread and the body of the old tire are vulcanized into one strong unit in live steam, making a tire the same as a new standard make, in quality and appearance, but frequently giving thousands of miles of service. These rebuilt tires are sold at extremely low prices, which will undoubtedly interest a great many of our readers. Dealers can be furnished in quantities at special prices. Made by the Giant Tire & Rubber Co., 101 North Street, Akron, Ohio.

The Stone $10 Shock Absorber.

This is a reliable and effective shock absorber which is placed on the market to retail at the very low price of $10. It is an especially attractive proposition for dealers as it will induce people to buy shock absorbers at this low price who would not feel like paying the ordinary prices. This shock absorber will be advertised extensively throughout the country, and good territory is now open for dealers who will act promptly. For complete particulars write direct to the Universal Rim Co., Department B, 1301 Michigan Avenue, Chicago, Ill.

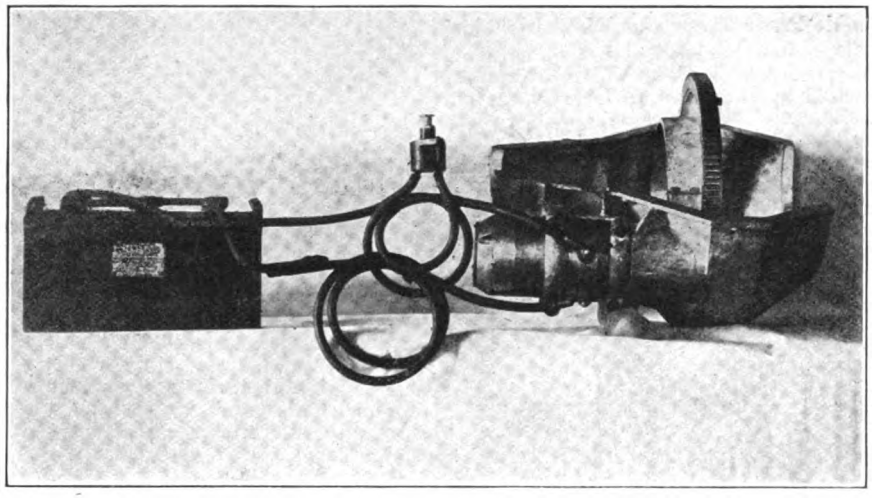
Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.
71-73 Murray Street, New York

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Electric Starter for Packard Cars.

Throughout the country there are many owners of 1912 and 1913 model Packard cars who are likely to be in the market for a starting device, as at the time these cars were made of course the old cranking system was in vogue. We illustrate herewith an excellent equipment for these cars, which is manufactured by the Wagner Specialty Co., 1902 Broadway, New York City. To those having any mechanical knowledge, the illustration will almost be self-explanatory. The system is light in weight, only 50 pounds with starting motor, not including batteries. The starting motor is but 5 inches in diameter, weighs 23 pounds, and develops 27 foot pounds stalling torque. It is only necessary for the owners of 1913 Packard cars to purchase starting systems, as these model cars are already equipped with lighting generators, which will charge the starting battery, but, on the 1912 Packard cars it is necessary to equip with a charging generator to charge the battery and light the lights. For prices and full particulars in regard to this starting equipment for 1912 and 1913 model Packard cars, write direct to the manufacturers for particulars. They guarantee the efficiency of the outfit.



For 1912-13 Packard Cars.

The Oswego Package and Luggage Carrier.

An interesting accessory for Overland, Buick, Studebaker and Ford cars has just been introduced which will be appreciated particularly by farmers, retail merchants and country store owners. This is a good carrier that slips over the hood and is easily and rigidly fastened to the frame and dash. The device is called the Oswego Carrier and consists of a light, strong steel frame, with two supporting standards that are attached to two brackets simply by tightening four thumb screws. The brackets in turn are quickly fixed to the car without need of drilling or machine work. Access to the engine is not interfered with.

The principal advantage claimed for the Oswego Carrier is that it enables the passenger-carrying car to be used for carrying merchandise or luggage when necessary without blocking the running board or crowding up and littering the tonneau.

It is provided along the front and back top edges with slots for straps; in some designs a detachable wire basket is added which sets into the carrier and provides a convenient package delivery carrier. Price, ready to attach, $6.75 to $10.00, according to styles. Manufactured by the Oswego Machine Works, Oswego, N. Y.

A New Company and New Product.

A new company known as the Motor Appurtenances Corporation has recently been incorporated under the laws of the State of New York, with main offices at Broadway and Fifty-eighth Street, New York City, to promote the sale of automobile accessories both as manufacturers and manufacturers' representatives. They have established a factory at Newark, N. J., where they have started the turn-out of automobile horns. The horn is known as the "Wondertone" and looks to be a winner. It is sold for a moderate price and is guaranteed for life. Its mechanism is of the simplest construction, and by the elimination of gear wheels and wearing parts it appears to be durable. The officers of the new corporation are: Edwin T. Vanderpoel, President, formerly Comptroller of the Otis Elevator Company, George Fritz, Vice President and General Sales Manager, for several years representative of the J. & B. Manufacturing Company, manufacturers of Master Vibrators, etc., and Thomas M. Daly, Secretary and Treasurer. Mr. Daly was in Wall Street for a great many years as a partner of a well-known stock exchange house. The company has placed a number of well-known salesmen on the road covering the major portion of the United States, and also has in contemplation the opening of branch offices in Chicago and Boston. Mr. George Fritz is well known to the trade and doubtless his many friends will be glad to learn of his larger scope of operations.

Solderall.

This is a genuine solder. With a match it easily mends and solders metals permanently. It is very handy for the house-wife, farmer, electrician, automobilist, moving picture operator, jeweler, merchant and mechanic. Good agents are wanted everywhere. It comes packed in a large tube which sells for only 50 cents, and it does not require any special mechanical skill to use it. It is also sold under a money back guarantee. For full particulars, terms to agents, etc., write to the Emenar Co., 52 East 23rd Street, New York City.

Perfection Pedal Pads.

These are well described as a safeguard against accident as they prevent the foot from slipping at a critical time, and enable the driver to get instant action in stopping or starting the car. They are made to fit all makes and models of cars, and they are standard equipment on the Stutz, National, Owens-Magnetic and Lewis cars. Write for prices and full particulars direct to the Auto Pedal Pad Co., Inc., 792 Seventh Avenue, New York City.

The Aitchandee Shock Absorber for Ford Cars.

This is a new device especially made for the Ford car and backed by a tremendous advertising campaign. Although new on the market, this shock absorber has been thoroughly tried out for a year all over the country. It will be advertised in a national way through such well known publications as the Saturday Evening Post, Collier's, the leading automobile publications and a list of farm papers, and large space will be used in all these mediums. This shock absorber is made on the true cantilever principle, and it has the long sought different tension between the upward and the downward thrust. It is claimed that this shock absorber absolutely prevents the breakage of springs, because of special added resiliency. The device is practically invisible and does not mar the appearance of the car. It is easy to attach, with no holes to bore, and everything is furnished for the complete job. Good agents are wanted for this device throughout the country, and it certainly ought to be a quick seller, especially as the retail price has been placed at only $10. Dealers who would like to handle the Aitchandee Shock Absorber are urged to write for interesting printed matter and full particulars direct to the H. & D. Company, 46 Marion Street, Goodland, Indiana. Remember this shock absorber is guaranteed for the life of the car, and it is practically indestructible.

Cristalene for Windshields.

This is an effective preparation for keeping the windshield clear so that accidents may be prevented. All drivers know the great disadvantage of obscured windshields, but if this preparation is applied to the windshield its transparency is fully maintained in all kinds of weather, as snow, rain or steam cannot accumulate on the surface which has been trated. The 25c size of this preparation is ample for fifty applications, and dealers are furnished with attractive display cards, and they are also given such a discount that this will be found a very profitable line. Dealers, car owners and all others who may be interested are urged to write for prices and full particulars to the Utility Manufacturing Co., 601-605 E. Court Avenue, Des Moines, Iowa.

Patent for Vulcanizer Issued.

Letters patent of the United States has been issued to Wallace G. Sandford of Davenport, Iowa, on a portable steam tire vulcanizer. Mr. Sandford is assignor of this patent to the Positive Supply Co., manufacturers of Positive Steam Vulcanizers. This company, however, has recently consolidated with the Midland Supply Co., of Davenport, Iowa, and the business is now being conducted under the latter name.

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The Ideal Lawn Mower Grinder.

This machine is a thoroughly practical one, and many of our readers can make considerable extra money by installing one of these machines and grinding lawn mowers for the same customers who come to have their automobiles repaired. This machine will grind any make of lawn mower perfectly in fifteen minutes without removing the wheels, ratchets or reel-knife. It will also grind a straight knife without removing from mower. The machine is operated by either hand or power. It has a skate sharpener attachment for sharpening skates. Here is a great labor saver and money maker for your shop. Write today for prices and full particulars direct to the Root-Heath Mfg. Co., Plymouth, O.

Adamson Vulcanizers.

This is a very simple device by which the car owner can make his own tire repairs, either on the road or in the garage. No watching or regulating is required in using this vulcanizer. Common gasoline is used for fuel, and the vulcanizer is practically automatic. It will make a tire repair instantly, right on the spot wherever you are, at a cost of a few cents only for each repair. Write for interesting free booklet, "Repair and Care of Tires," to the Adamson Manufacturing Co., East Palestine, Ohio.

Change of Ownership.

The Reliance Engine Company of Lansing, Mich., have purchased the Seager Engine Works of Lansing, manufacturers of the well known "Olds" line of gas and kerosene engines which have been extensively used for light power in blacksmith shops and also by farmers for many years. We understand that the new company intends to manufacture engines on a larger scale than ever and many of our readers will doubtless be interested.

Motor-Driven and Hand Horns.

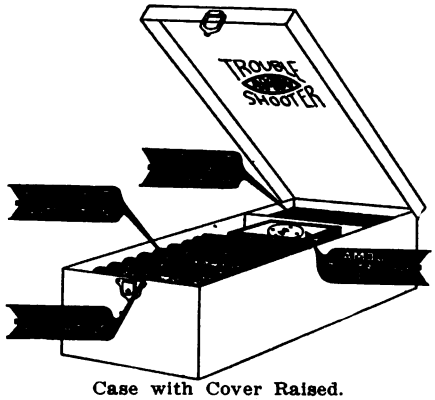
A very attractive line of motor-driven ınd hand warning signals for motorists s manufactured by the American Elecric Co., State and 64th Streets, Chicago, ll. This line includes the Samson-Lion ıutomobile hand horn which is a push-lown horn; length 9¾" over all; attracively finished in black with nickel trim; ist price complete, $4.50. The same ompany also manufactures the Victor 'ibrator horn, which sells for $4, and the amson Jr. Motor-driven horn, a very igh grade warning signal which sells or only $10. Interested readers should rite direct to the manuafcturers for an lustrated catalog showing their comlete line.

U. S. Two-Stage Air Compressors.

These are excellent air compressors or use in garages and they are made in ifferent sizes suitable for the large or nall shop. They will start quickly with-ıt strain. They run smoothly and ıietly, and the load is divided between igh and low pressure cylinders. It is ated that there is practically no wear-ıt or repair expense on these machines, ıd they are put out on thirty days trial, ıd unlimited guarantee, also terms to ıit your convenience. For prices and ıll particulars write to the United ates Air Compressor Co., 6534 Car-egie Avenue, Cleveland, Ohio.

The Story of Ambu.

A new department of labor which has been put upon the garage and repair man is that which has to do with adjusting and repairing of electric starting and lighting systems. The American Bureau of Engineering has put upon the market a system which enables the repair and garage man to definitely locate and correct any trouble in any electrical or starting system standard on American made cars. The instrument called

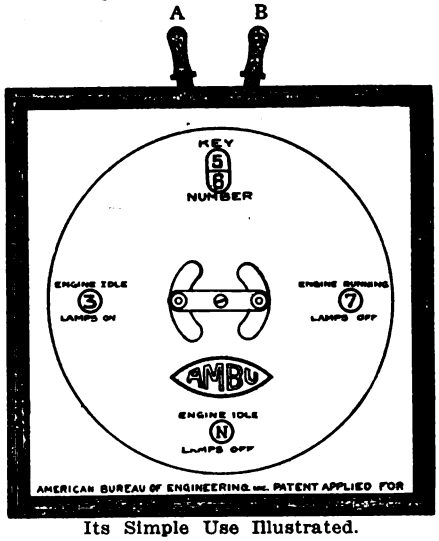


Case with Cover Raised.

Ambu, which is used to locate and detect the source or position of the trouble, is round, measuring 6 inches in diameter. In its construction, finish, and general appearance it reflects the ability to do the work claimed for it.

As the heart of any system is the storage battery, the instrument is attached for reading between the battery and battery cable. A remarkable part of its performance is that it may be calibrated or keyed to the particular make of car or system under test. Figures show up on the dial to which the arrow points and a reference to the instruction books, charts and diagrams of wiring, will give the necessary information for the correction of the trouble.

Every phase of every system is cov-



Its Simple Use Illustrated.

ered in the instruction books. Each diagram shows the system of wiring, the location of switches, dynamos, motors, starters, lamps, battery, etc., in their relative positions as installed on the particular make of car treated.

Ambu, the Electric Trouble Shooter, fills a long felt want in many ways. It relieves the motorist of the expense of sending parts to service stations or factory because his local garage man can handle it for him if he has Ambu. It relieves the factory or service station of the necessity of being bothered by time consuming jobs which don't pay but must be done if the stuff is sent into the factory. It saves the motorist extra expense involved in shipping, it saves time and it most surely lowers the overhead of the manufacturer because of the lack of a necessity of so great a force to care for somewhat insignificant repairs. The instrument has astonished even seasoned experts. It is claimed by the makers of Ambu that the instrument and the complete Ambu service will place the average garage and repair man in a position to handle the most intricate jobs of repair and adjustment work in the starting and lighting systems standard in American cars.

Ambu service consists of Ambu, the instrument, Ambu instruction books, Ambu wiring diagrams, Ambu repair charts, Ambu service bulletins, and Ambu engineering advice.

The entire service is contained in a steel box with book—dust-proof and secure, and the garage or repair or service station possessing this remarkable system is identified by a service sign—an enameled steel sign of a noticeable design—furnished free by the American Bureau of Engineering. This is to be extensively advertised to fix in Motor Car owners' minds the proper places to obtain an efficient and authoritative service both on the electric system as well as on other parts of the car.

A Special Reamer for Ford Cylinders.

Many garage owners and repairmen will be interested in the special Critchley Expanding Reamer for Ford and Dodge cars which is manufactured by Chadwick & Trefethen, 32 Bow Street, Portsmouth, N. H. This is a shell reamer with taper slots and fitted with eight semi-speed steel cutters. To make the reamer cut larger, it is only necessary to loosen the top nut and screw on the lower one, making a practically perfect adjustment. For particulars and prices, write direct to the manufacturers.

Service Stations.

It is remarkable how the demand for tire service stations has grown and developed during the past few years. Motorists not only appreciate, but look for this kind of service, and the Miller Rubber Company was quick to appreciate it and supply the quick and handy repair facilities now being enjoyed by car owners in most cities. There is a Miller Service Station in most of the numerous cities in which the company has dealers or branches. More are being established from time to time. Location in a town is a cardinal point in the estimation of the Miller Rubber Company. Practically all of their Service Stations are located with the one big thought foremost in mind—quick service! And quick service is given, as any of the thousands of motorists who have put it to the test will enthusiastically testify. The best part of it all is the fact that the Miller Rubber Company offers this remarkably quick, courteous and efficient service absolutely free of charge at any hour of the day or night, to any motorist, whether he is using Miller Tires or not.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

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Invincible Inner Tires.

It is contended by many that the proper place for strengthening the tire is on the inside where the blow-outs always start, and Invincible inner tires are manufactured with this principle in view. By their reserved strength, these inner tires render tire trouble almost impossible. It is claimed that they save 40 per cent of tire expense, and 90 per cent of tire trouble, and tires which have run three or four thousand miles can sometimes be made to do as much more by the use of these inner tires. For full particulars write to the Invincible Tire Company, 53 Sabin Street, Providence, R. I.

Superior Radiators and Hoods for Ford Cars.

An unusually complete line of special radiators and hoods for the Ford car is manufactured by the Superior Lamp Mfg. Co., 136 West 52nd Street, New York City. The same company also manufactures lamps, crown fenders, commercial fenders, demountable wheels, convertible lamp brackets, cowl windshields, ventilator windshields, zig-zag windshields, and an almost endless variety of specialties for the Ford and other cars.

The Hart-Bell Carbon Remover.

This is a device for introducing live steam into the cylinders of the motor. Carbon cannot be dissolved; it can only be loosened, and live steam is the best agency for this loosening process. The carbon is then blown out through the exhaust while the motor is running. This carbon remover is permanently attached (you can attach it yourself) and can be used as often as desired. It is guaranteed that this device will do all that is claimed for it, and if found unsatisfactory, the full purchase price will be refunded on return of same within ten days to the agent from whom it was purchased, or from the manufacturers if purchased direct. This carbon remover retails complete for only $5. Made by the Utility Products Co., 1414 Times Building, New York City.

R & M Conform Piston Ring.

These rings are not only provided with sealed joints, but they have the power of conforming to irregular and worn cylinders. They are the most effective when used with the R & M Alluminum Alloy pistons and the manufacturers will furnish four R & M Aluminum Alloy Piston Rings for only $30. These rings, however, are suitable and most economical for all kinds of pistons, such as are used in automobiles, marine engines, steam packings, oil pumps, and all air appliances where rings are used. Write for prices and full particulars direct to the distributors, The Superior Auto Parts Co., 938 Ft. Wayne Ave., Indianapolis, Ind.

The Wilmo One-Piece Combination Manifold.

This is a device for increasing the power of an automobile motor, eliminating carbon troubles, and otherwise improving the working of the motor. The manufacturers state that with this device in operation your motor will run as smoothly in winter as in summer. A drop of gasoline on a hot griddle vaporizes immediately, and in the same way the hot plate which is an important part of this invention causes prompt and complete vaporization with the delivery of the fullest amount of power into the cylinders of the motor. This device is made for all cars, and the special manifold for Ford cars sells for $5.00; for other cars the price is $10.00. The invention is guaranteed to wear and give satisfaction for ten years. For prices and full particulars write direct to the manufacturers, the Wilmo Company, 209 South Fifth Avenue, Chicago, Ill.

Calorite Spark Plugs.

The discovery of a new insulating material known as Calorite and its adoption by the Hartford Machine Screw Company, manufacturers of Master Spark Plugs, has revolutionized the spark plug industry. In Master Calorite Spark Plugs, automobile owners are assured of a spark plug that will not break under the most extreme heat and cold



Calorite Spark Plugs.

conditions. The new Calorite insulator for Master Spark Plugs was adopted only after being subjected to the most terrific tests. The plug was first heated until white hot, then plunged into cold running water, a test so severe that it has never before been attempted. This great instant change in temperature had no effect on the Calorite Insulator nor were there any signs of fracture when this alternate heating and cooling was repeated 10 times. A break down test was also conducted which consisted of heating the Calorite Spark Plug to a bright red heat and instantly plunging it into cold running water. This alternate heating and instant cooling was repeated 26 times without fracture. The ordinary porcelain insulator was put to the same test but broke before reaching a white heat and without being put into the water at all.

With the creation of 8 and 12 cylinder engines—refinements and perfection of design and manufacture—spark plugs must suffer more abuse than ever before. This fact could not be better illustrated than by citing last summer's automobile races in which spark plug failures put a big percentage of cars out of the running. The terrific heating caused porcelain plug insulators to crack with the resulting sacrifice in time and loss of drivers' and automobile manufacturers' prestige.

The old days of broken spark plug insulators are over. Master Calorite Spark Plugs are proof against fracture in service—they won't break when subjected to extreme heat and cold (as proved by the tests just described) and the whole design assures complete freedom from trouble.

Three Live Specialties.

The Manufacturers Distributing Company of America, 246 West 56th Street, New York, is putting on the market quite a number of desirable specialties for motorists. One of these is the Nite-Lite, a search lamp which can be turned at any angle to search out danger and read signs along the road. Something of this kind is almost an absolute necessity for night driving, and ought to appeal to a great many of our readers. The same company is marketing the Detroit limousine top for Ford cars, which is a luxurious winter top at a low price; also the V Hot Air Valve, which is a device attached to the intake manifold just above the carburetor, so it will admit superheated air into the gas as it passes from the carburetor to the cylinders, preventing all carburetor troubles. It is claimed this device will save one gallon of gasoline out of every four, at the same time increasing the power of your car. Readers who are interested in any of these specialties should write direct to the manufacturers at the above address.

Lightning Repair Sets for Ford Cars.

A complete assortment of taps, dies and reamers has been selected by the Greenfield Tap and Die Corporation, Wiley & Russell Mfg. Co. Division, of Greenfield, Mass., to meet the demands from garages and repair shops for spe- The tools are of the celebrated Light- cial use in handling repairs on Ford cars. ning quality which have been in the front rank for nearly 45 years. This set sells at retail for $14.50, and it is very dependable and complete for the purpose designed. Write for full particulars direct to the manufacturers.

Finding a Treasure.

The manufacturers of the Waterhouse Oxy-Acetylene Welding Equipment state that it is like finding a treasure for any blacksmith who will purchase one of these outfits, and this is no exaggeration, because if you get this outfit and commence to do repair work in your part of the country, you can soon make a large income from this source alone, in addition to the regular work in your shop. This is not an expensive outfit, although it is reliable and complete, because the total price is only $42 with 5 per cent discount for cash. If welding materials are desired to go with the outfit, there is an additional expense of $4.50 which is also subject to the 5 per cent discount. This is not a great deal of money when you consider that it will practically set you up in a new line of busines. Write for full particulars direct to the manufacturers, the Waterhouse Welding Co., 16 Pelham St. Boston, Mass.

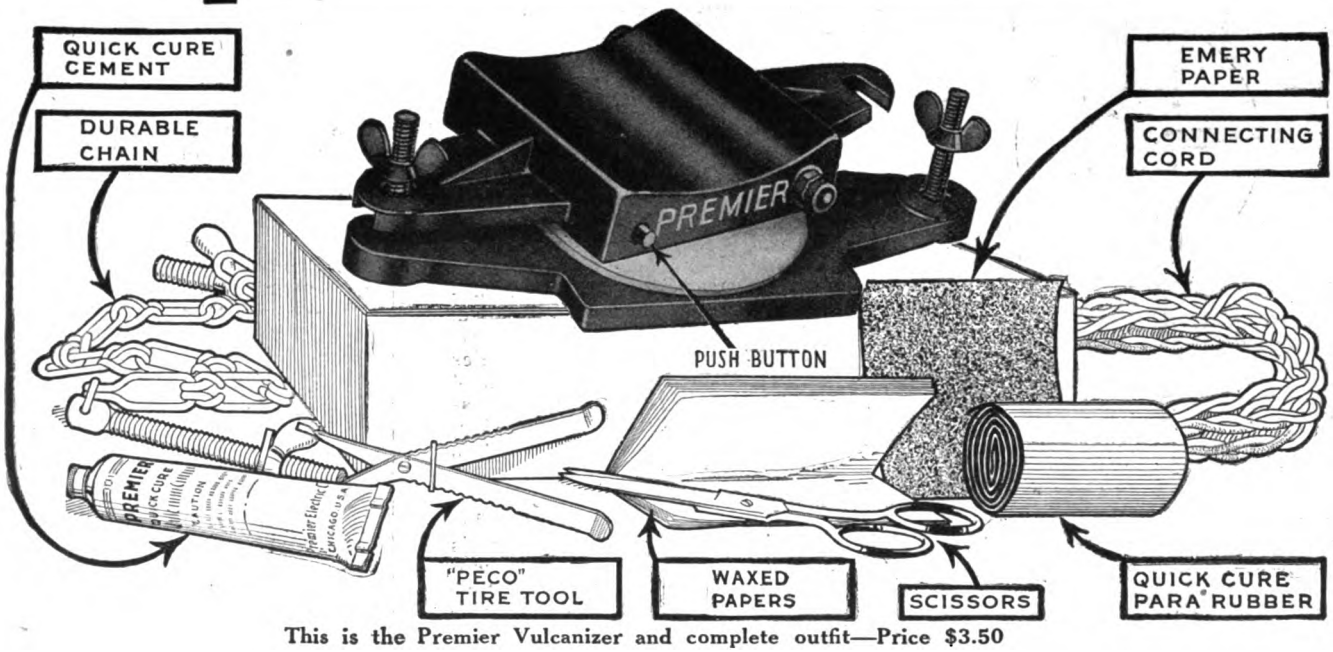
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Twelve Million People
will see the Big National Advertising in the



of the

PREMIER AUTOMATIC ELECTRIC VULCANIZER



This is the Premier Vulcanizer and complete outfit—Price $3.50

Price $3.50

To supplement our advertising in the trade press, thousands of dollars will be spent in the "Post" and "Digest" to tell the motoring public all about this latest electrical vulcanizing device.

Price $3.50

Superior to Gasoline or Steam Types

The Premier is simplicity itself—operates from electric light socket or from a storage battery. Current is automatically shut off when vulcanizing is done and stays shut off till next job is ready. The Premier lessens the fire hazard and reduces the insurance risk.

Dealers, Garages and Supply Houses

Write us for Dealers' Discounts and be prepared for the demand our National Advertising will create. It's easier to sell something the public wants than to sell them something they don't want. If you don't sell the Premier you have got to compete with it.

PREMIER ELECTRIC CO., 4038 Ravenswood Ave., Chicago

CANADIAN DISTRIBUTORS—Northern Electric Company LIMITED

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The Hartford Auto Jack.

This is popular with its big army of users. It's the ingenious arrangement of its gears that accomplishes big results with little effort. Fifteen pounds of pressure on its handle lifts one thou-



The way it comes to you.

sand pounds of car. So strongly and substantially is it made that it will, with reasonable care, outlast at least three cars. Its gears are solid steel; its casing is toughest malleable iron. It looks the thoroughbred that it is. Price, $6.50. Last month by mistake we inserted a cut of an entirely different



It lifts so easy.

jack, manufactured by the same company, called the Red Rack Jack. We regret the mistake made, and the Red Rack will be described in a later issue of this magazine.

Private Portable Garages.

Many car owners can avoid rent charges by erecting on their own premises a good portable garage, which it is

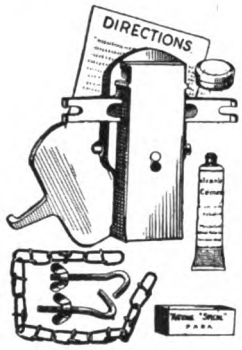


A Fine Garage.

claimed, can be obtained at a much lower price than it would be possible to build with the aid of local contractors. We illustrate a neat pattern of garage which is manufactured by the Garage Factory, Beaver Springs, Pa., and they have brought out a new illustrated catalogue describing a complete line of low-priced garages. We understand that this will be mailed free to any of our readers who will take the trouble to write for it.

Sure-Cure Automatic Steam Vulcanizer.

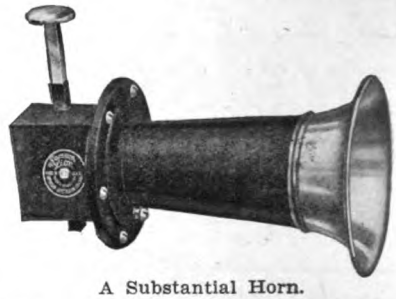
The Sure-Cure Vulcanizer is the latest product of the oldest and largest manufacturer of portable steam vulcanizers in the United States. It represents the last word in vulcanizers for the car owner to use at home or on the road. The "Sure-Cure" is a metal body partly filled with water at the factory and never needs refilling. Heated by gasoline, forming the water into steam. Steam thoroughly cures raw rubber with no danger of burning it. Anyone without experience can easily do perfect vulcanizing the first trial, as this vulcanizer is so simple in operation. It is especially fine for tourists, as it is practically cyclone proof, burning evenly in the strongest wind. Requires no watch-



ing after lighting. Does its work quickly, and you can always rely on a "sure-cure" every time. Double the life of your casings by keeping those small cuts repaired. Vulcanize the punctures and blowouts in tubes, and they are as good as new. This vulcanizer will pay for itself many times over during a season. Satisfaction absolutely guaranteed by makers or money refunded. Nicely nickel plated and packed in neat box with slide cover with all supplies and instructions. Shipping weight, 4 lbs. Price, $2.25. For further information and description, write the manufacturers, The National Motor Supply Co., 5611 Euclid Avenue, Cleveland, O.

The Samson-Lion 1916 Hand Horn.

Safety of life and property depends upon the selection of a horn, which will give a loud and penetrating tone that will clear the road, and which is easy to operate. The purchaser must select a horn which will not break down at a critical moment, but will give ample and substantial service for the money invested, and last indefinitely. In this respect the Samson-Lion horn is common with the rest of the Samson Horn line. A guarantee covers this horn absolutely in that the manufacturer will replace or repair without charge any portion which develops a mechanical defect within a period of one year from the date of manufacture, the manufacturer being exceedingly liberal in the interpretation of this guarantee. The more gears used in a horn, the greater the friction and the more bearings required. Some horns have as many as four gears to catch, break or wear out. Only one shaft is used in this 1916 horn—the Samson-Lion. The pinion and strike wheel are cut from solid pieces of special, high-grade steel, afterwards case-hardened, and every tooth on the strike wheel is ground to a clean edge, so it will absolutely produce a uniform tone. There are no soldered joints for constant vibration to work loose, but all such parts are riveted and bolted to last. The pressed steel rectangular back is small and neat; it does not protrude in way

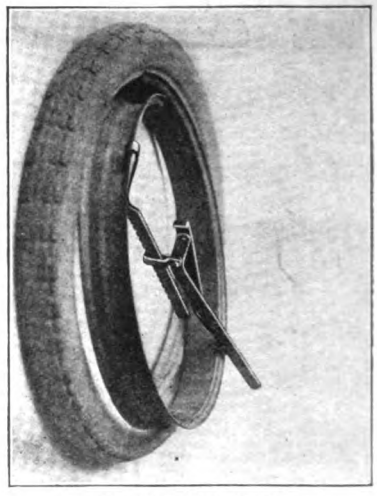


A Substantial Horn.

of driver. It is just as easy to operate the Samson-Lion as any electric or hand horn made. By holding down the plunger a prolonged warning is obtained, but the second it is released all unnecessary noise is stopped. It is the one dependable warning signal and will outlast the life of the car. Length, 9¾ inches over all. Attractively finished in all black and black with brass or nickel trim. Manufactured by American Electric Company, State and 64th Streets, Chicago, makers of a complete line of automobile and motorcycle horns.

The L. & L. Handy Tire Tool.

This is a very handy tool, which can be used on all sizes of split demountable rims, either clincher or straight side. It is guaranteed to remove or replace casings in less than one minute. The illus-



Handy Tire Tool.

tration shows quite clearly how this tool is used. It is made by John C. Hoof & Co., 38 South Dearborn Street, Chicago, and it retails for only $2.

The General Tire and Rubber Co.

This company, successor of the Western Tire & Rubber Co., Kansas City, Mo., has a very large factory plant at Akron, Ohio, which is located on an elevated twelve-acre plot of ground on the outskirts of the city. The capacity of the plant is 400 tires and 1,000 tubes per day and an output of tire accessories double that of the old Western Tire & Rubber Co.

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DEALERS! Here It Is!

A $10 Shock Absorber



Here is a shock absorber that gives satisfaction, that you can sell for $10.00, and make your profit on it.

$10 STONE SHOCK ABSORBER

It's bound to be a great success. Owners are going to stop paying more when they learn about the Stone Shock Absorber.

It makes riding easier — people will use their cars more when installed with Stone Absorbers.

It makes people buy shock absorbers who didn't feel like paying the old prices.

It makes friends of everybody you sell it to.

Get Ready

We are going to advertise the Stone Absorber at $10.00 heavily in leading motor magazines reaching thousands of owners. They'll be looking for Stone dealers. Get ready for them. Write your jobber for particulars about this shock absorber at the sensational price, $10.00.

The Universal Rim Co.

Makers of the Baker Rim

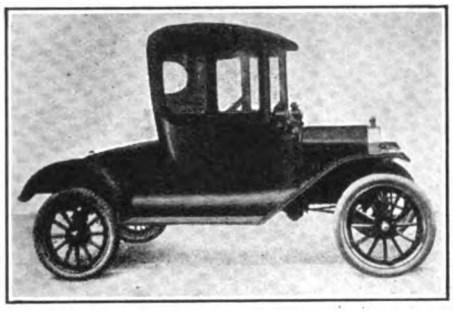
Dept. B, 1301 Michigan Ave., Chicago

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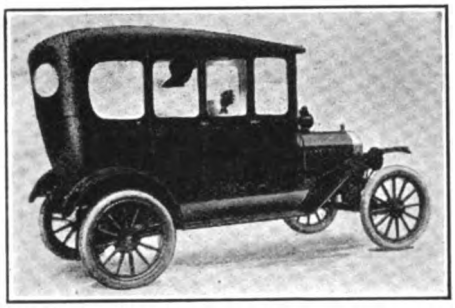
To Winterize Ford Cars.

The Anchor Buggy Company of Cincinnati offer the Anchor sedan top for the Ford touring car and Anchor coupe top for the roadster. These tops can be quickly attached to the regular body by anyone. They are the result of months of development. The roof, back and



Anchor Coupe Top for Ford Roadsters.

panels are wood, covered with high grade upholstering material. All windows are glass, even the round pane in the back. Inside is neatly trimmed with attractive light colored whipcord. Doors of the top and car-doors open together, operated by a single patented locking device. These closed bodies convert a Ford car into a comfortable limousine, making it possible to use the car all year around with comfort. Windows can be let down for ventilation in moderate weather. In pleasant warm weather, doors and side



Anchor Sedan Top for Ford Touring Cars.

windows may be removed and regular curtains used. These tops combine light weight, strong construction, attractive lines and excellent finish. Their low price is made possible by large production. Complete for touring car, $57.50. Complete for roadster, $47.50.

Refilling Prest-O-Lite Tanks.

J. T. Wall and Harry T. Ream, of Sacramento, Cal., have filed suit against The Sun-Lite Co., of Indianapolis, and O. K. Stuart, its president, charging fraud in the sale of apparatus to be used for the purpose of filling Prest-O-Lite tanks. Wall and Ream set forth that they purchased the apparatus from Stuart in March, 1915, and that Stuart represented that the device would refill 30 Prest-O-Lite tanks of 40-foot capacity at the cost of a few cents each. They claim that Stuart grossly misrepresented this filling cost, and also that the filling of tanks, instead of being the whole cost, was only one item in the cost of conducting an acetylene exchange business. The complainants charge that Stuart represented the business of "refilling" Prest-O-Lite tanks as being a lawful one, whereas after purchasing they found that the practice has been enjoined by a large number of United States Courts and that they could lawfully operate only by removing the Prest-O-Lite marks from the tanks and converting it into a Sunlite tank which was then not acceptable by Prest-O-Lite dealers for exchange when empty. They also charge that the device sold them by Stuart for the generation of acetylene gas at high pressure was extremely dangerous and that the Stuart's own plant at Indianapolis was destroyed by fire resulting from an explosion of one of these machines, and it was then abandoned and never rebuilt. The Sun-Lite Co., of Indianapolis, is engaged in the manufacture of acetylene generating outfits, for the refilling of gas tanks.

The Watchdog of a Motor's Power.

The above is the very effective slogan which has been adopted by the Micro Piston Ring Co., 1960 Broadway, New York City, and we illustrate herewith the clever trade mark of this company with the accompanying slogan. This trade mark will be extensively used for adver-



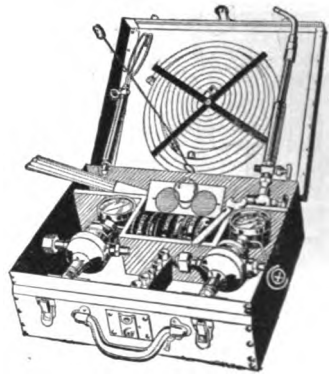
tising purposes all over the country, not only in the trade journals but also on the sign boards, and dealers will be helped materially by this extensive campaign. We also illustrate the Micro piston ring itself, and of course it is the mechanical construction of this ring which has made it so very successful. This ring consists of two assembled members; a main ring with inter-fitting stepped joint and a plain-jointed auxiliary ring. In expanding, the two-ring parts act with the flexibility of the leaves of a spring to assure good contact and the absorption of a minimized



amount of power in frictional drag and wear. Obviously this design conforms well to a perfect cylinder and is most apt to hold on a badly worn cylinder. One great point in favor of this ring is that there can be no break in the continuity of the bearing surface and the pressure tightness of the ring as a whole, either when the ring is new or after the joint openings have enlarged from service. Thus perfect tightness is secured without using any pins or other devices of a shape to score the cylinder walls. Users of the Micro Piston Rings are enthusiastic in their praise, and it is claimed that they will increase the power of the motor, prevent carbonization, and give a greater degree of efficiency and durability under all conditions. The strongest inducements are made to good dealers on these rings, and during the season of 1916 they will be pushed harder than ever, as the manufacturers are planning to do business on a much larger scale. Write for prices, terms and full particulars direct to the Micro Piston Ring Co., 1960 Broadway, New York City.

A Welding Outfit for $50.

We illustrate herewith the New Model B Welder which retails for $50



New Model B Welder.

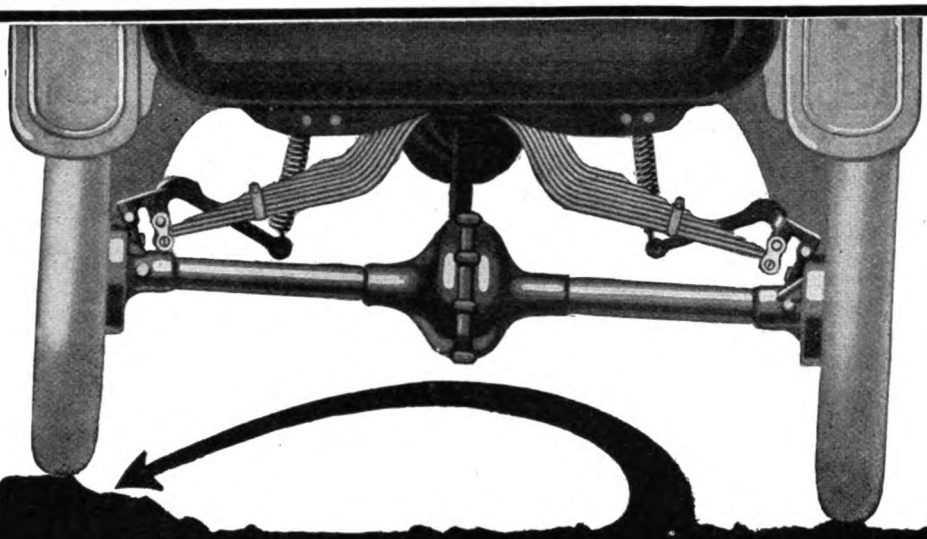
and which has been recently brought out by the Cox Brass Mfg. Co., of Albany, N. Y. This is a very complete welding and decarbonizing outfit backed by the strongest possible guarantee. It is only necessary for the user to connect the outfit to the gas tank and he will be in a position with the material and apparatus supplied to handle any average job of repair work which may come to him in the line of oxy-acetylene welding. The cut will give an excellent idea of the appearance of this outfit.

The Wagner Auto Engine Cleaner.

Nearly every motorist realizes the value of a clean engine and the Wagner Auto Engine Cleaner is an excellent device for cleaning your motor. This invention will soon pay for itself, as it eliminates wear, saving half your repair bills. One quart of kerosene and six pounds air pressure removes all dirt, grit and grease from any engine. This tool is quick, economical, thorough, easy, and cleanly to operate. Write to-day for price and full particulars to the Wagner Specialty Co., 18-20 West 63rd Street, New York City.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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See How The Body of the CAR Remains Level!

Greater Profit for Dealers

Now comes a real shock absorber for Fords, backed by a tremendous advertising campaign. It is new in a way, yet it has been tried out for a year all over the country. It is new in name and new in improvements and new in its sales plan.

Maybe you have heard of it in its test form—when we called it the H. & D. Now it has been christened Aitchandee Shock Absorber. It is about to be nationally introduced to the Ford owners of America through such publications as The Saturday Evening Post, Collier's, all the automobile papers and the chief farm papers. Not in small space, but in large space.

The bettered product retains all the successful essentials which have made it universally praised by owners. All that has been done is to add a few improvements—a few refinements.

Aitchandee Shock Absorbers
For Fords—$10.00

There are numerous reasons why Aitchandee Shock Absorbers will take first place. All cannot be given here, but some of them are:

1. **Aitchandee is the original shock absorber with the true cantilever principle.**
2. **Aitchandee is the only one that has the long-sought different tension between the upward and downward thrust.**
3. **Aitchandee absolutely prevents breakage of springs, because of special added resiliency.**
4. **Aitchandee is the only one that is practically invisible. It does not mar the appearance of a car.**
5. **Aitchandee is easy to attach. No holes to bore. Everything is furnished for the complete job.**

These are bare summaries of a few features. We might go further and explain each statement. For instance, our cantilever principle *removes* those "side slaps" and thrusts which make steering hard over rough roads or at a high speed; being made of specially annealed malleable iron, breakage is eliminated. There are endless advantages such as these.

Every good business man knows that the wisest strategy in the game of business is pushing the winners. To be known as "the man who sells Aitchandee Shock Absorbers" will mean a lot to you. It will affect the other departments of your business. Aitchandee is bound to be coveted by progressive dealers.

But what you are more interested in is the amount of profit you will make and the satisfaction you will give your customers. We have a plan that you will like. We go further in giving you advantageous terms. Our shock absorbers have been retailing at $15. Now, because of such increased volume, we have cut the price to $10. Yet your profits have been increased.

We back you up on the merits of the Aitchandee Shock Absorber by guaranteeing it for the life of the car. This, we believe, is the best sort of guarantee, and that it will please your customers.

You are interested, too, in all that we will do in creating a desire among Ford owners for Aitchandee Shock Absorbers. You will want to look over our advertising campaign. Then send for our circular, which gives detailed particulars. Once you read it, you will become enthusiastic, and see just how Aitchandee will triumph.

This circular will tell you all about your profits, and it will make a special offer to you which will astound. You will learn just how far we have planned to go in helping the dealers. Write today—don't delay.

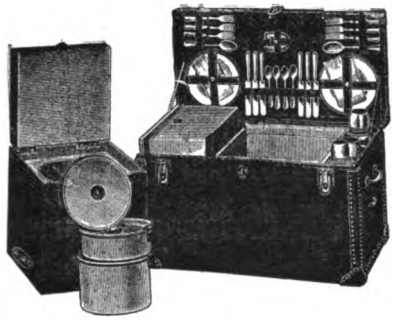
THE H. & D. COMPANY, Inc.
46 Marion Street, Goodland, Indiana

We have an interesting profit sharing proposition for wide awake dealers in open territory. Write us today for particulars. (6)

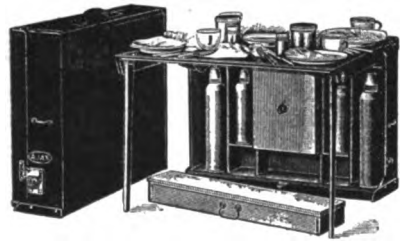
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A Motor Restaurant and Fireless Cooker.

We illustrate herewith two very clever devices for motorists, which have recently been brought out by the Ajax Trunk and Sample Case Co., 91 Mercer Street, New York City. The Motor Restaurant, so-called, closes up in the



shape of a suit-case. When opened up it acts as a table. It has space for two pint and two-quart vacuum bottles, two very large sandwich boxes, white enamel cups and plates, knives, forks, spoons, etc., with a service for six persons. This outfit retails for only $35, and it is certainly a boon to the tourist who does not want to depend on the bad hotels or boarding-houses which are frequently found in the country, and this restaurant renders it possible to dine in picnic fashion by the side of the road in the woods or at any convenient place. As to the fireless cooker, it fills a long-felt want for motoring. This cooker is practically the same as the Duplex Fireless Cooker, which is no doubt familiar to many of our readers. The Cooker has a space for two quart vacuum bot-



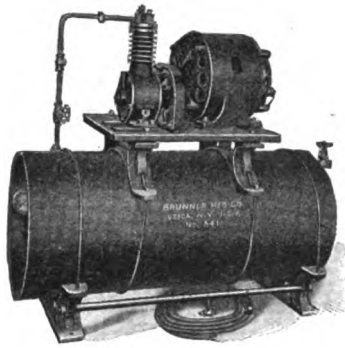
tles and a spacious tin box for sandwiches, etc. With it, goes an outfit of enamel cups, plates, knives, forks, spoons, with a service for six persons. This outfit retails for $40.

Ball Bearings and Their Commercial Application.

This is the title of a book which has recently been brought out by the New Departure Manufacturing Co., of Bristol, Conn., and it will be found very useful by any manufacturer of automobiles, or any proprietor of a garage or repair shop. Though the book is published by the New Departure Manufacturing Co., and the opening and closing chapters have to do with their special make of ball bearings, it is true that the bulk of the book is a discussion of applications of ball bearings to various forms and types of modern mechanism without specific or definite reference to New Departure Products and it is a strictly educational book containing information which is etxremely useful for every-day mechanical practice. We understand that a copy of this book will be sent entirely free to our readers if they will take the trouble to ask for it.

Motor Driven Air Compressors.

The Brunner Manufacturing Company, of Utica, is exhibiting at the National Shows what they claim to be the largest and most complete line of belt and motor driven air compressors manufactured for tire service and among these outfits will be found their No. 541 motor driven assembled unit, as illustrated. This outfit consists of a standard No. 101 Brunner vertical air compressor, geared by means of a cloth pinion and cut cast iron spur gear to a ½ horsepower motor, securely bolted to a substantial iron base and mounted on a 32-gallon, welded, open-hearth flange steel tank, tested to 300 lbs. air pressure to the square inch. The tank when charged to 160 lbs. and without the motor operating will fully inflate four flat 35 by



The Brunner Compressor.

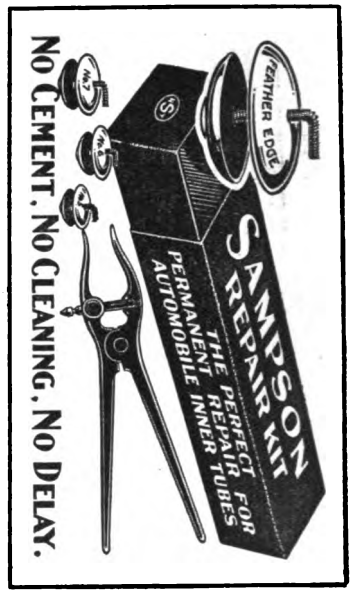
4½-inch tires to 90 lbs. pressure and will harden up 20 to 25 soft tires according to size. This makes a most complete and convenient outfit for tire filling purposes where the available space is limited or in case the purchaser does not wish to go to the trouble of installing an outfit. The compressor has a capacity of 1¼ cubic feet per minute at 350 R. P. M. The Brunner Manufacturing Company are also putting out a No. 542 outfit, which is identically the same as the No. 541, except that it has a two-cylinder compressor of just double the capacity of the air compressor supplied on the No. 541 outfit. The No. 541 is recommended for garages housing up to 35 cars and the No. 542 for garages housing up to 50 cars.

Marvel Mist.

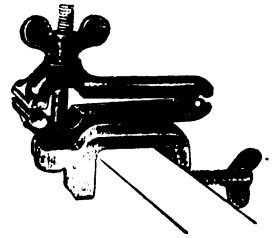
This is a product prepared by one of the leading chemists affiliated with the automobile body cleansing and polishing industry. Marvel Mist is non-inflammable, non-combustible and contains no alkali to injure the varnished surface. It is used effectively for cleaning and polishing automobile bodies, fenders, hoods, wind-shields, leather upholstery and also for furniture, floors, marble, tile and in fact any surface with a polished or varnished finish. This preparation comes in a retainer, packed in a box with cheese-cloth, ready for instant use. Fifteen minutes is all that is required to clean a large touring car. You simply spray on the liquid and wipe dry with the cheese-cloth to obtain a gloss that will rival factory finish. Those who have used this preparation in the garage would not be without it for anything. Marvel Mist is made by the Marvel Mist Manufacturing Co., Inc., 56 Greenpoint Avenue, Brooklyn, N. Y.

Stevens Exhibit at New York Show.

The exhibit of Stevens & Co., 375 Broadway, New York City, at the New York Automobile Show, attracted much



attention. This exhibit included the Sampson Featheredge Inner Tube Repair Kit selling at 50 cents. See illustration. Also a complete line of service reamers for Ford cars, including a new crank shaft aligning reamer for main bearings, which is listed at $10.00. A hand-vise, illustrated herewith, was also



The Stevens Clamp.

shown which sells for $1 complete. The clamp sells for 25 cents, and will fit any Stevens Hand Vise.

Perfection Pedal Pads.

Among these pads is one designed for the Pierce-Arrow, another for the Cadillac, and still another for the Ford car. The Ford Pedal Pad was patented in December, 1915. These pads are a safeguard against accident as they prevent the foot from slipping at a critical time and give instant action when it is necessary to get the car out of a bad place. The manufacturers make pads to fit all makes and models of cars, and this article is standard equipment on the Stutz, National, Owens-Magnetic, and Lewis cars. Readers who are interested should send for prices and full particulars direct to the manufacturers, The Auto Pedal Pad Co. Inc., 792 Seventh Ave., New York City.

Stoddard-Dayton Parts.

A complete stock of parts for the Stoddard-Dayton car is carried by the Dayton Auto Repair Co., 353 West 52d Street, New York City.

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There Are Times When You Are Called Upon to Supply a Bearing—Quick—Then What!

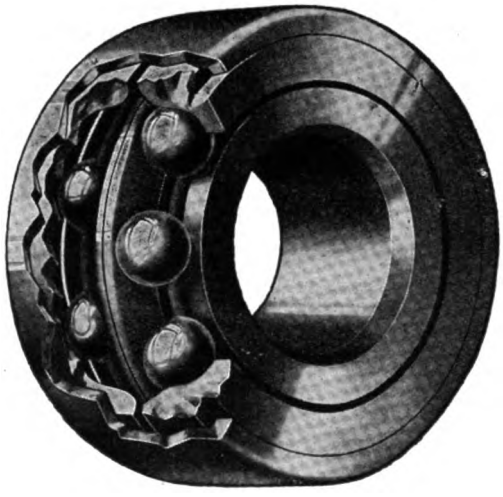
NEW DEPARTURE BALL BEARINGS

American Made for American Trade

Are the Bearings you should carry to meet this demand for—two reasons

Quality is first. Satisfy yourself that the bearing you use is well designed, well made and will stand up to its work.

New Departures meet every quality requirement, will outlive the life of the car in which they are used and reduce the cost of upkeep.



Service—No matter how good a bearing may be, it is of no use unless you supply it promptly.

New Departures may be had from our factory, from our Detroit Branch, in all trade centers—or—better yet, carry a few of the leading sizes in stock yourself.

New Departure Ball Bearings are Guaranteed and we stand back of our guarantee without a quibble

Send for our List of Distributors

THE NEW DEPARTURE MANUFACTURING CO.

BRISTOL, CONN., U. S. A.

Conrad Patent Licensee

Western Branch: 1016-17 Ford Building, Detroit, Michigan

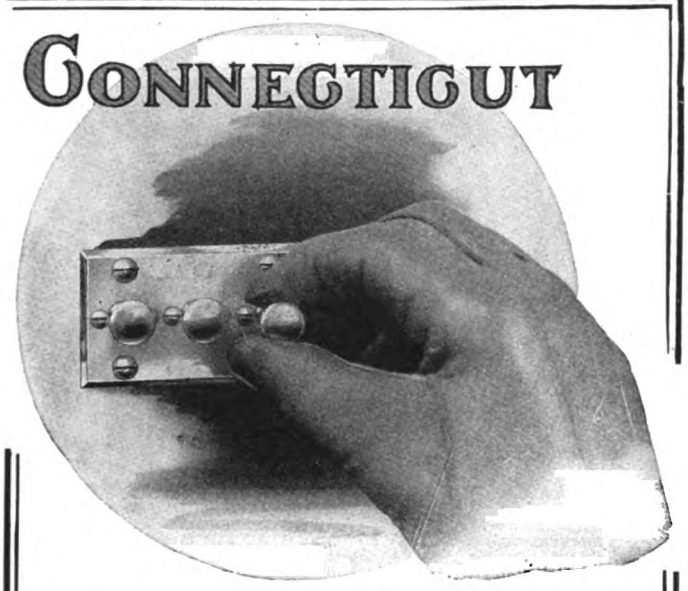
Distributors in Trade Centers Throughout the United States

For Continent of Europe: Jacob Holst Copenhagen, Freeport, Denmark

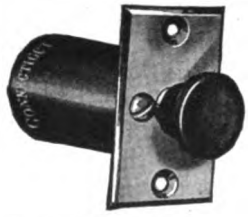
Sole British Agents: Brown Bros., Ltd. London & Manchester

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CONNECTICUT



Lighting Switches



are the neatest, simplest and most easily installed equipment of their kind on the market.

They are designed to provide every arrangement of lighting control that can be desired.

HEAD LIGHTS

The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS

Head and tail lamps on and off together. Side and tail lamps on and off together.

DASH LAMP

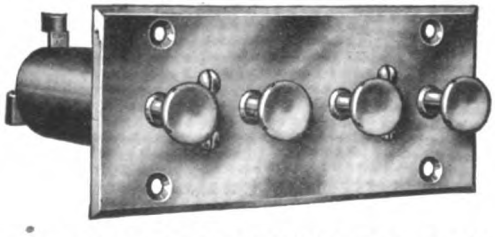
Individually of in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practicable arrangement has its switch.

One switch for all lights, individual switches for each, or any choice of functions individual or in combination.

Simple construction insures unending service and satisfaction.

Easily operated with a gauntleted hand.

Trade catalog illustrating and describing full line upon request.



CONNECTICUT TELEPHONE & ELECTRIC COMPANY

MERIDEN, CONN.

Starting the Car With a Dishrag.

If your car balks and does not start one of these frosty Fall mornings, go into the kitchen, appropriate your wife's dishcloth and her kettle of hot water, wrap the dishcloth around the carburetor manifold or intake, pour on the hot water, spin your flywheel a few times and you probably will have the engine humming.

This was the advice given to an inquirer by H. C. Brokaw, principal of the automobile school of the West Side Y. M. C. A., 318 West Fifty-seventh street, New York. It was the inquirer's first season with a car, or he might not have asked, and because there are thousands like him Mr. Brokaw passes on the advice for their benefit. "There are other things which may be the cause of trouble," he said, "but that is the first thing to try. The cold affects the vaporization of the gas, the moisture in the air may condense and precipitate directly after the vaporization and make trouble. Heat remedies this quickly. Cold weather knocks the efficiency of the storage battery, also, and it will not give off as hot a spark. This, with the partially vaporized mixture is very vexing. When the short days come more light is used and the battery runs out quicker, and a low voltage will make trouble. The larger use of the starter necessary on cold days is another drain on the battery which must be taken into consideration. The two things to remember when the car does not start on a cold morning are: Either the mixture is not vaporizing, or the ignition is faulty. Sometimes enriching the mixture will remedy the former. Modern cars have a device for that purpose. If that fails, try the dishrag."

201 Pounds of Parts by Parcel Post.

The largest package of motor parts that has ever been sent to a foreign country via parcel post, so far as known, is the shipment made by the Mitchell-Lewis Motor Co., Racine, Wis., through the Racine postoffice, and destined to Petrograd, Russia. Owing to the refusal of the express companies to accept large parcels for foreign shipment, the company was obliged to resort to the parcel post system to facilitate delivery of the parts, which were on a rush order. The parcel weighed 201 pounds and the postage amounted to $96.84. It was necessary to use 129 stamps of the 75 cent denomination and a few stamps of lesser denominations.

JOBBERS, DEALERS AND REPAIR SHOPS

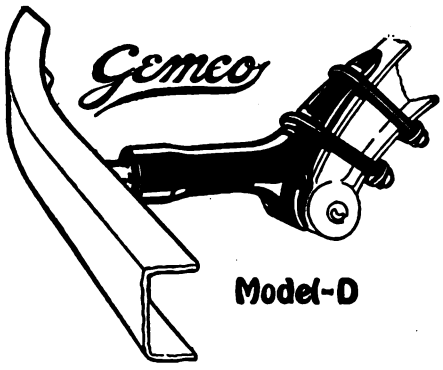
We manufacture speedometer parts, swivel joints, flexible shafts and fibre gears for every speedometer on the market. Goods superior and prices lower than any others.

Request Catalogue.

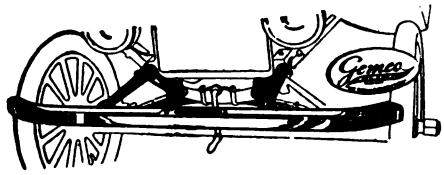
OGDEN MANUFACTURING COMPANY

COLUMBUS INDIANA

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Model-D



GEMCO BUMPERS

Clamp on without machine work, all styles for all type cars. Patents make Gemco Bumpers the nearest to the all-car bumper. Bumpers for Fords in spring bar, and clamp on types, all style bars.

THE BIG LINE OF ACCESSORIES FOR FORD CARS

Including

The Gemco Bumper

Gemco Bumpers and the Gemco Transmission Bands for Fords—alone are two of the most saleable Accessories for Fords yet patented.

Look Up Gemco Exhibits at the Shows.

Gemco MILWAUKEE

Accessories

Get the Gemco Catalog—it means money-saving in fully equipping any car—and cost-saving in making many replacements.

The Gemco line is manufactured by a responsible pioneer concern in the accessory business — with national distribution through leading wholesalers, which gives you quick service on assortment orders.

WRITE FOR CATALOG.

Gemco Manufacturing Co.,
656 So. Pierce St., Milwaukee, Wis.



Display Your Tires

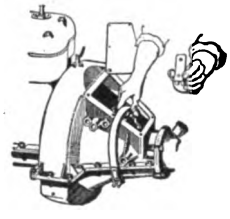
For use in windows, on counters, near doors, etc. The cheapest way for the dealer to advertise tires.





GEMCO REAR-END TIRE HOLDERS

Clamps to rear member and springs. Substantial. Also tire holders for running board.



GEMCO TRANSMISSION BANDS For Fords

For transmission and brakes—spring steel, with brake lining—saves tearing down car.

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Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange,** at the uniform price of **five cents a word,** including the name and address, for each insertion, payable in advance. **No advertisement will be inserted for less than 75 cents, however small.** Remittances may be made in postage stamps or in any convenient way.

Special rate of 30 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Auto Accessories

Accessory Dealers' Catalog

Oldest Established Publishers

Standard Lines List Prices

Mail order and cut price houses make it imperative that

THE GENUINE DEALER

should distribute his own catalog, with his name and address on Front Cover

OUR 1916 EDITION

2½ to 5 Cents per Catalog

Ready for delivery in February.

See us at the show or write for sample copy.

CATALOG PRINTING CO., Inc.

1731-37 Broadway New York City

WE SPECIALIZE IN SUPPLIES

NOT CARRIED BY OTHERS

Including bearings, $1.00 up; Stromberg and Schebler Carburetors, Springs, Transmissions, Axles, Tops, Motors, Bodies, Windshields, Radiators, Steering Gears, Presto Rings, etc. Order any of this material specified with the distinct understanding that if you are not entirely satisfied you may return it and get your money back.

Send for PRICE WRECKER listing 3000 bargains.

TIMES SQUARE AUTOMOBILE CO.

World's Largest Dealers

S. W. corner 56th Street and Broadway, New York

1210 Michigan Avenue, Chicago, Ill.

BUY WRITE—Get Our New Catalog before placing your orders.

NEW YORK & BROOKLYN AUTO SUPPLY CO.

1717-1719 Broadway Established 1905 New York

FALL BARGAINS

Black and nickel elec. head lamps, 11¼", $5.85; mechanical hand horns, guaranteed, $2.75; motor-driven elec. horns, guaranteed, $4.65; windshield searchlights, 4½", $4.25; 7½", $6.75; one-man Pantasote and Mohair tops, $26.00; steering gears, $9.00 up; Stromberg carburetors, all models and sizes, $8.00 up; Schebler model R, 1¼", $11.00, model L, 1¼", $8.00; Marvel, Holley or Kingston, 1½" carburetors, $3.00 each; model B Prest-O-Lite tanks, $10.00 each; Stewart model B Speedometers ($50.00 list), $12.50; same with clock and elec. light comb. ($85.00 list), $20.50; magnetos, Bosch DU, 6-cylinder high tension, $52.50; Eisemann high tension EMIR 6-cylinder, $42.50; Splitdorf model D or X, 4-cylinder, $14.75; Splitdorf model Y, 6-cylinder, $16.75; Splitdorf T.S. transformer coils for above, $12.50. Rambler motors, second-hand, thoroughly overhauled, guaranteed to be in perfect condition, all models, $115.00 with carburetor; D.W.F., Hess-Bright, New Departure, Timken, and other standard bearings, new at prices of reground. Send numbers of bearings for prices. Other parts and accessories at equally low prices.

RADIATORS.

Model T, Honeycomb, V-shaped for Ford	$22.50
Buick 16 and 17, Honeycomb	33.50
Buick 16 and 17, tubular	28.50
Buick 10	20.00
Hudson 20, 32 and 33	28.50
Chalmers 30	30.00
Cuttings, models A and B, 40 and T 35	30.00
Colby, models 40 and 50	30.00
Rambler radiators, all models	26.00

Write for prices and other makes.

AUTOMOBILE APPLIANCE COMPANY

1438 Michigan Avenue Chicago, Illinois

ALL TYPES OF BEARINGS

The New Departure Service Station

THE GWILLIAM COMPANY

ENGINEERS

Specialists in Bearings

NEW YORK, 253 West 58th Street, (at Broadway)

PHILADELPHIA, 1314 Arch Street.

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete

$25.00 Models

Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00.

Odometers reset to zero, 25c.

All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.

51 West 63rd Street New York, N. Y.

AUTO DEALERS, REPAIR AND GARAGE MEN

We want you to come in and see us when visiting New York Show. Will have some special bargains for you.

(SEE OUR 1916 HAND HORN.)

WESTCHESTER ACCESSORIES COMPANY

1777 BROADWAY NEW YORK CITY

Wholesale Only.

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

ONE MAN TOPS—$20, $25

Fit Fords and others. Top enveloped, $1.

20th CENTURY COMPANY, 1694 Broadway cor. 53d St., N. Y.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Auto Accessories

Ford Book Free

Tells you how to take care of your car. And it tells how to buy your supplies at prices cut to the bone. Besides the amazingly low prices, the quality is absolutely guaranteed. Ask for your Free Copy of Ford Book DR.

General Automobile Supply Company

1671-1673 Broadway New York City

Magnetos and Batteries

Hecht's Magneto Exchange

INCORPORATED

Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.

We have always on hand a large assortment of high and low tension magnetos, BOSCH, SPLITDORF, REMY, EISEMANN, and all other standard makes, at 50% off list.

Expert Repairing of All Makes.

Express your Magneto to us. Same will be repaired and returned same day received.

Distributors and Service Station for

MICHIGAN and NATIONAL MAGNETOS

—— Also ——

Esterline Generators, Norma Ball Bearings and Gould Storage Batteries

230 West 49th Street NEW YORK CITY

MAGNETO SALES CO.

Official Bosch Service Station. Expert repairing guaranteed. All types of magnetos and coils bought and sold

1779 Broadway - New York City

MAGNETOS

Of all makes repaired and guaranteed.

Manufacturers of **ISCO** Starting Coils

IGNITION SPECIALTIES COMPANY

798 Seventh Avenue New York City

Official Service Station for

SIMMS, WILLARD, BERLING

MAGNETO AND BATTERY TESTER—Magneto, storage or dry battery troubles easily located. In strong case, with full instructions. One dollar postpaid. R. Henderson, Palmer, Ill.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

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Tires

SAVE 75%
ON YOUR
TIRE BILLS
BY USING OUR
DOUBLE TREAD
TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED 3500 MILES

A special discount of 2% on all cash orders will be offered on all tires for February only.

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

We also carry a complete line of new inner tubes. prices as follows:
30x3.....$2.00 30x3½.....$2.25 34x4.....$3.25

For retreading your old tires we charge you 40% off above prices.

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

We carry a full line of 1st and 2nd Tires of all makes. Prices upon request.

Terms: 10% Deposit, Balance C. O. D.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

Tires Guaranteed

Our Double Tread Tires are vulcanized together instead of stitched or riveted together. There are no stitches or rivets to cut your inner tubes. They are practically blowout and puncture-proof. Let us send one to you to-day for trial. Money back if not satisfactory. Our new catalogue will describe to you the advantages of our Double Tread Tires.

These tires average about 5,000 miles.

Size	Tires	Tubes	Size	Tires	Tubes
28x3	$4.50	$1.75	33x4	$9.00	$3.15
30x3	5.00	1.93	34x4	9.75	3.20
30x3½	7.50	2.25	35x4	10.00	3.50
31x3½	7.75	2.25	36x4	10.00	3.58
32x3½	8.00	2.25	34x4½	11.50	3.60
34x3½	8.50	2.50	35x4½	11.75	3.75
30x4	8.00	3.00	36x4½	11.85	4.00
31x4	8.25	3.00	37x4½	12.00	4.50
32x4	8.50	3.15	37x5	14.75	4.75

Tires are sent subject to examination.

C. O. D. Shipments 10% Deposit Required.
Tubes Are Guaranteed.

TUXEDO AUTO TIRE EXCHANGE
304 W. 54th Street NEW YORK CITY

,000 TIRES—BIG CUT IN PRICES—Diamond, Empire, American, Mansfield and fcGraw Tires. New, fresh stock. Money ack if not as represented.

0x3	$6.00	31x4	$12.00	34x4½	$16.50
0x3½	8.00	33x4	12.50	35x4½	16.00
1x3½	8.00	34x4	11.00	36x4½	16.50
2x3½	9.80	35x4	12.00	37x4½	16.50
4x3½	9.00	40x4	16.00	36x5	18.00
)x4	10.00	33x4½	16.00	37x5	20.00

All other sizes in proportion. Special rices on orders of five tires or more. A en per cent deposit required on all orders hipped subject to examination. Serlin Tire o., S. W. Cor. 13th and Michigan Ave., hicago, Ill.

Tires

Cut YOUR Tire Bills
Save 75 Per Cent
—USE OUR—
Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

Write us for all other prices and for full particulars.

Be sure to state the bead, whether Q.D., Straight or Clincher.

M. LIBEN & CO.
27A East 110th St. NEW YORK CITY
Branch: 205A W. 48th St., New York City

DOUBLE TREAD TIRES
AT 75% SAVING
GUARANTEED 3500 MILES

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3	$4.25	$4.75	36x4	$8.00	$9.00
30x3½	5.50	6.00	34x4½	8.50	9.50
32x3½	6.00	6.50	35x4½	8.50	9.50
32x4	7.00	8.00	36x4½	9.00	9.50
33x4	7.50	8.25	37x4½	9.00	9.50
34x4	7.50	8.25	37x5	10.00	11.00
35x4	8.00	8.75			

These Tires are absolutely Puncture Proof.

Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
243a West 56th Street NEW YORK

BIG TIRE BARGAINS

Look at these prices for absolutely new Diamond, Blackstone, Imperial, Pullman and Congress second tires that were originally guaranteed for 3,500 miles.

Size	Plain	Skid	Guar. Tube
30x3	$5.40	$5.65	$1.75
30x3½	6.95	7.35	2.05
32x3½	8.00	8.40	2.15
33x4	11.45	12.00	2.95
34x4	11.65	12.20	3.05
36x4½	16.40	17.22	3.90

Should we not have the tire you order we will send you the next best. All orders must be accompanied by 10 per cent. of the amount of purchase. We have other sizes. Write for prices. Henschel Tire and Rubber Co., 1675 Broadway, New York City.

Tires

TIRES TIRES
Double Tread Tires
GUARANTEED 3500 Miles
AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
NEW YORK CITY
The Home of Double-Tread Tires

SAVE YOUR OLD TIRES

Send us **2 OLD TIRES**, one with a good bead and the other with a good tread, and **WE WILL COMBINE** them by our **DOUBLE TREAD SYSTEM** into a **SOUND ONE** for a cost from $2 to $4, according to size.

If you have **ONLY ONE** tire in this shape, we can **Furnish** you with the **Other** one at a cost from $4 to $9.

If you have **NO OLD TIRES** to have remade, you can **Order Ready Remade ones**, that we carry in stock from $4 to $12.

POSNER & BLOCK
1211A Bedford Ave. BROOKLYN, N. Y.

TIRES

Every Tire User is aware of the great savings by using Double Tread Tires; providing he buys the right kind of Double Tread Tires of the right kind of people Buy of us and you know that you get the right kind at the following prices

30 x 3	$4.50	34 x 4½	$9.00
30 x 3½	5.50	35 x 4½	9.50
32 x 3½	6.50	36 x 4½	9.50
34 x 4	8.00	37 x 4½	10.50
36 x 4	9.00	37 x 5	11.00

One dollar extra for non-skid.

A deposit of 10% is required on all C.O.D orders. You can save C.O.D. charge by sending a money order. Please specify in order whether Q.D. Clincher or Straight Side desired.

For rebuilding the old tires the price is 40% from above list.

R. K. TIRE CO.
1401 Ridge Avenue PHILADELPHIA, PA.

NEW TIRES CHEAP

30 x 3	$4.75	34 x 4	$9.50
30 x 3½	6.90	37 x 5	14.75

Other sizes in proportion.

NEW YORK STEAM AUTO TIRE WORKS, Inc.
312 West 52nd Street New York City

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Tires

TRAVELING NOTICE

The perplexing question answered in

Double Applied Tires

consist of eight (8) to ten (10) layers of fabric with a tough road tested rubber tread.

WRITTEN GUARANTEE WITH EVERY ONE

Put our guarantee to a test; we stand back of every word of it. There will be no delays in adjusting. Our customers' satisfaction comes first.

	Plain	N. Skid		Plain	N. Skid
30x3	$4.75	$5.55	36x4	$9.50	$10.40
30x3½	6.75	7.35	35x4½	10.75	11.70
32x3½	7.50	8.30	36x4½	11.50	12.50
31x4	7.75	8.55	37x4½	11.75	12.80
33x4	8.25	9.00	35x5	11.20	12.20
34x4	8.75	9.50	36x5	12.50	13.50
35x4	9.00	9.75	37x5	13.50	14.40

All orders must state whether Q. D. Clincher or Straight Side.

Prices subject to change without notice.

WE PAY FREIGHT CHARGES.

10% Deposit required on C.O.D. orders.
Money Orders accepted.

TUXEDO TIRE CO., Inc., BRONX, N. Y.

TIRE BARGAINS

Exceptionally low prices on New Selected Factory Seconds, comprising all the standard makes, including Diamond, McGraw, Congress, Pullman, Ten Broeck, Empire, Atlas and Firestone.

Size	Plain	Non-skid	Guar. Tubes
30x3½	$7.15	$7.75	$1.75
32x3½	7.85	8.65	2.00
33x4	11.25	12.40	2.50
34x4	11.35	12.80	3.00
36x4½	16.55	18.15	3.75
37x5	19.00	21.00	4.75

We also have a number of Factory Seconds of a well known brand which we will guarantee for 2,500 miles and sell at 25 per cent. off their list. We have over 5,000 tires and tubes in stock at all times, all sizes and makes. Mail orders shipped same day received. Jandorf Automobile Company, 1763 Broadway, New York.

SAVE YOUR OLD TIRES

AND HAVE THEM

Reclaimed for $2.00 to $4.00

ACCORDING TO SIZE.

SQUARE DEAL TIRE EXCHANGE

247 West 49th Street NEW YORK CITY

Write for catalogue on Double Tread Tires.

Starting & Lighting Systems

Starting and Lighting Systems

of all makes repaired.

All repair work done under our guarantee.

IGNITION SPECIALTIES COMPANY

798 Seventh Avenue New York City

SIMMS-HUFF SERVICE STATION

BRUSHES

Metallic and Carbon Brushes

for every make of

Starting and Lighting System

Magnetos and Generators Repaired

CARLILE & DOUGHTY

846 No. Broad Street PHILADELPHIA, PA.

Position Wanted

AUTOMOBILE MECHANIC AND MACHINIST—Expert in vulcanizing; several years' experience; best of references. Route No. 1, Box 47, Genoa Junction, Wis.

Investors

WILL SHARE PROFITS with party furnishing money to put my Tilting Steering Wheel on the market. J. Cook, 156 Fourth Street, Leominster, Mass.

Radiators and Lamps

WE REPAIR Lamps, Radiators, Windshields and Fenders, of every description. Largest repair plant in New York. Great accessory bargains on hand for immediate delivery.

HUDSON AUTO LAMP WORKS
1650 Broadway, New York City
BRANCH 1054 Bedford Avenue, Brooklyn, N. Y.

RADIATORS OF QUALITY

WRIGHT HAS IT IN STOCK.

Abbott-Detroit, 30-1910-11; Ames, Buick, 16-29-39; Cadillac, 1909-10-11; Chalmers, F30-1909, 30-1912; Cino, Courier, 1910; Flanders 20, Ford T, Henry 40, Hudson 33, Hudson 54. Hupmobile, 20-1910-11; Hupmobile 32, Imperial 30-1910; Little Four, Marion 30-1911; Michigan F, 1911; Moline 30-1910; Nyberg, 1912; Oakland 40-1910, Oakland 30-1912; Oldsmobile Special, 1910; Overland 51-56-1911; Premier 4-40-1910; R. C. H., 1912; Regal 20-30, Richmond K, Studebaker Garford 40-1910; Studebaker 1913; 25-H.P., Velie 30, 1909; Warren-Detroit 30, 1910, and many others. New Radiators built to specifications in two days. Fully guaranteed.

WRIGHT RADIATOR & HOOD MFG. CO.
1253-55 S. Michigan Ave., Chicago.

Magneto Parts

MAGNETO PARTS

We manufacture parts for all types of

Bosch, Eisemann, Mea, Splitdorf and Remy Magnetos

Liberal discount to the trade.

Illustrated Catalogue on request.

MAGNETO PARTS CO., Inc.

1790 Broadway New York City, N. Y.

If interested in agency write for particulars.

Welding

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gearteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet. Atlas Welding Works, Rahway, N. J.

WELDING PLANTS--$25 to $250

LIBERAL TERMS TO RESPONSIBLE PERSONS OR FIRMS.

Write at once to Manager Dept. B.

BERMO WELDING APPARATUS CO. OMAHA, NEBR.

Patents

PATENTS SECURED—C. L. Parker, Patent attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

IMPROVEMENTS WANTED—Send for free bulletins and advice. Book, "Inventions—Patenting and Promoting," free. Lancaster and Allwine, 212 Ouray Building, Washington, D. C.

PROTECTIVE PATENTS PROCURED PROMPTLY—Blue Book on Patents sent on request. Trade-Marks Registered. Robb & Robb, 288-292 Southern Building Washington, D. C.

RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

JOHN M. McLACHLEN, ATTORNEY AT LAW.—Patents, Trade Marks. Union Trust Bldg., Washington, D. C.

Personal

BROTHER—Accidentally discovered root, cures tobacco habit and indigestion. Gladly send particulars. G. A. Stokes, Mohawk, Fla.

For Sale

FOR SALE.—25 Lincoln milling machines; $35 to $100 each. Lucas & Son, Bridgeport, Conn.

PYRMA ALUMINUM HEEL PLATES cover or prevent unsightly holes in floor board coverings, 75 cents each. These plates and PYRMA ALUMINUM MATTING for sale by all up-to-date dealers. Metallic Automobile Matting Co., Rochester, N. Y.

MAKE YOUR FORD STEER EASY by using Young's Axle Aligner to align your front axle and strengthen your radius rods. Your check for $2.50 brings one postpaid. J. H. Young, Turkey, Texas.

FOUR LINCOLN MILLING MACHINES $50.00 each. Send for photo. Lucas & Son, No. 3 Fox St., Bridgeport, Conn.

SACRIFICE—Full set "Essenkay" 34x4. Slightly used. Cost $105. Sacrifice for Twenty-five Dollars. Eberwine, Marblehead, Ohio.

FOR SALE—1910 Model D Franklin Touring Car—Thoroughly rebuilt and in A No. 1 condition. Ray Perrigo, Burke, N. Y.

AUTOMOBILES sold on easy monthly payments. All we ask to start you is a deposit with order. We ship the car. Pay while you ride. Write us for illustrated catalogue. Eureka Auto Co., Rebuilders, Dept. 25, Beavertown, Pa.

EXCELLENT OPPORTUNITY is offered to the man with $12,500 to invest in an automobile business, established twelve years. Rebuilding of cars our specialty. Good business local and mail order. Don't answer if you are not in a position to pay cash. Reason for selling going to retire. E., care Auto Dealer and Repairer, New York City, N. Y.

Metal Spinning

METAL SPINNING OF ALL KINDS

Parts for Auto Lamps made to order. Auto Lamps repaired and made as good as new. Experimental work a specialty. No job too small, or we will figure on large contracts for the trade. Send sample or blue prints and specifications for estimates.

COLLINS & COMPANY

150½ ELM STREET AMESBURY, MASS.

Solder

Imperial Aluminum Solder

Will Solder Without High Temperature

Used exclusively by leading Automobile Mfrs., Body Builders and Welders. Names on request.

A sample, sent free, will demonstrate its merits. We guarantee satisfaction.

$2.50 PER LB.

IMPERIAL SPECIALTY SALES COMPANY
1777 Broadway, New York City

Miscellaneous

CYLINDERS REBORED

Best quality piston and rings fitted, any make and size. $3.00 and up.

KENNEY COLWELL CO., NORFOLK, NEBR.

CYLINDER GRINDING on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them. Oxy-Acetylene Welding. Cracked cylinders a specialty. Adapt Machinery Co., 1632 So. Wabash Ave., Chicago, Ill.

CYLINDER GRINDING

NEW PISTONS AND RINGS FITTED CORRECTLY

GEARS and other parts to order. Prompt and reasonable.

NILSON-MILLER COMPANY
1302 Hudson Street, HOBOKEN, N. J.

Wanted

AGENCY for good auto under $1,000, also manufacturer's lists for all kinds of accessories for autos. Lewis V. Fox, electrical and mechanical engineer, Kuala Lumpur, Federated Malay States.

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Bearings

BEARINGS--At Attractive Discounts

Annular Single Row Quan.	No.	Make
600	530	D. W. F.
870	53	F. & S.
160	205	F. & S.
200	206	F. & S.
360	207	F. & S.
112	208	D. W. F.
280	209	F. & S.
120	1210	N. D.
106	212	D. W. F.
530	300	D. W. F.
120	302	F. & S.
45	306	F. & S.
56	317	D. W. F.
125	318	D. W. F.
235	403	D. W. F.
42	404	Gurney
480	406	F. & S.
968	406	D. W. F. (8530)
78	406	S. R. B.

Double Row Quantity	No.	Make
34	207	N.D.
20	8210	H.B.
28	8307	H.B.
122	307 (1.2495)	N.D.
20	319	N.D.
72	407	N.D.
120	408 (1.365)	N.D.

Bower Roller (With Cup)

Quantity	No.
70	305N
68	310A
40	315T
495	317T
265	317T (less cup)
123	375T
33	444T

Standard Roller Bearings

S. R. B. Taper Roller Bearings G. Type, Heavy Duty

Timken Roller Quantity	No.	Price
322	316	$1.75
71	317	1.75
98	375	2.70

Quantity	No.
15	G20C-33R
14	G24K-43R
39	G24A-42R
69	G25A-45R

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Cylinder Grinding and Parts.

Motorists who are interested in having their cylinders reground, or wish to obtain any machine part for any car, domestic or foreign, should get in touch with the Nilson-Miller Co., 1302 Hudson Street, Hoboken, N. J. This company makes a specialty of grinding cylinders, supplying over-size piston rings and fitting them, and they also supply gears and sprockets of every description, and spare parts for all cars. All work is done promptly and at reasonable prices, and correspondence is invited from all of our readers.

Hel-Fi Spark Plugs.

These plugs are guaranteed to prove their efficiency the moment they get into action, and it is claimed that they will save gas and produce more power than ordinary spark plugs. They retail at $1.25 each, and are fully guaranteed. Write for proposition direct to the Motor Accessories Mfg. Co., Division 4, Marshalltown, Iowa.

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Don't do without an engine Now!

It is cheaper now to have a WITTE engine than to do without. Easy to start, without cranking; easy to manage; and easy to own on any suitable, reasonable terms of payment during a year.

Look at These New Prices!
(F. O. B Factory)

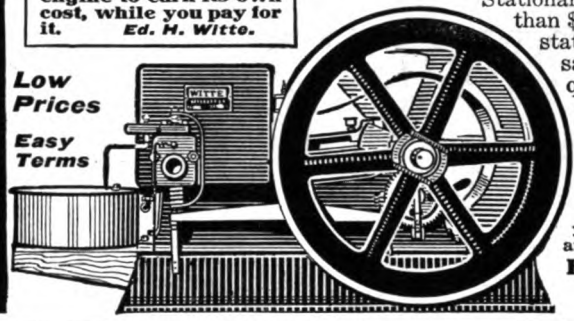
SIZE H-P	STATIONARY ENGINES	PORTABLE ENGINES
2	$ 34.95	$ 39.95
3	52.45	60.50
4	69.75	82.75
6	97.75	127.75
8	139.65	174.65
12	197.00	237.00
16	279.70	329.70
22	359.80	412.30

Engine Saw-rigs Complete.
4 H-P, $124.25; 6 H-P, $152.25
8 H-P, 202.15; 12 H-P, 267.00

Fuel-Saving **WITTE ENGINES**
Gasoline, Kerosene, Distillate and Gas

Let me send you an engine to earn its own cost, while you pay for it. Ed. H. Witte.

Low Prices
Easy Terms



Stationary engines for prices averaging less than $17.50 per horse-power. Eight sizes, stationary and portables, four sizes saw-rig outfits. Guaranteed high quality—through and through—as durable as superior design, the best of materials and workmanship can make. Get my engine facts before decide to get any engine.

Book Free: My book, "*How to Judge Engines*," will show you how to save and make money in getting and using an engine. Write for it today, addressing nearest office.

ED. H. WITTE, Witte Engine Works,
2495 Oakland Ave., Kansas City, Missouri.
2495 Empire Bldg., - Pittsburgh, Penna.

5-Year Guarantee
Cash or Easy Terms

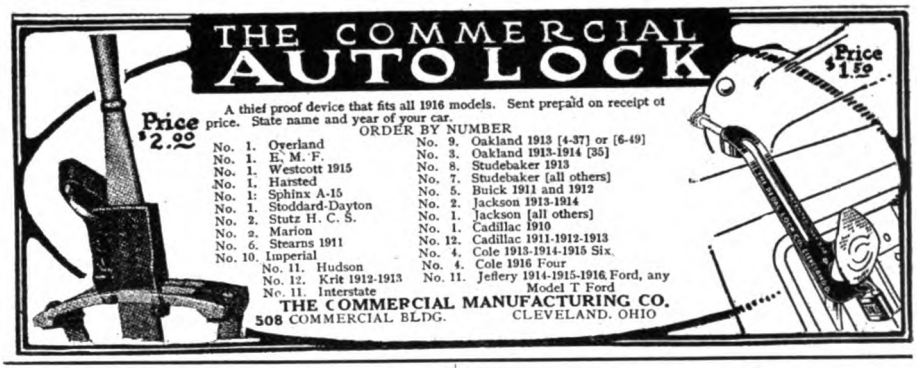
LESS THAN $17.50 Per Horse Power
WITTE ENGINES
Why Pay More

The Inland One-Piece Piston Ring.

This is described by the manufacturers as "perfection in a one-piece ring." Positive gas-tight service is guaranteed by the use of this ring and money will be refunded on any ring that fails to give perfect satisfaction after ninety days trial. Although this ring is perfectly and permanently gas-tight, its simple construction allows it to be sold at a low price. Made by the Inland Machine Works, 802 Mound St., St. Louis, Mo. Dealers should get the special proposition which is made by this company.

Connecticut Electrical Specialties.

A large line of electrical specialties for the motor car is manufactured by the Connecticut Telephone & Electric Company, of Meriden, Conn. This line includes lighting switches of the most approved design, also headlights, side and tail lights, dash lamps, and almost everything of an electrical nature to be used on an automobile. A trade catalog illustrating and describing their full line will be sent on request.



Waterhouse Welding Outfits.

Thousands of garagemen and repair shop proprietors have already installed oxy-acetylene welding equipments, but many others could do so to advantage, and the cost of a good outfit is surprisingly low. The Waterhouse Welding Co., 16 Pelham Street, Boston, Mass., is selling an entirely dependable outfit complete for $42.00, with 5 per cent discount for cash. If any welding materials are desired, it is necessary to add $4.50, which is also subject to a 5 per cent cash discount. Correspondence is invited.

Disco Starter for Fords.

One of the pioneer devices for starting or lighting the Ford car was the Disco Single Unit System. This device is simple, light, easily installed and reliable. It operates on a twelve-volt current, spinning the motor no matter how cold the weather. It charges the battery at a low engine speed, insuring a full charge at all times. It is absolutely automatic in operation with no adjustments to cause trouble. It is so strongly built and durable that it will give efficient service throughout the life of the car. The device sells for $75 complete, f. o. b. Detroit. Some good territory is still open for a few more responsible and live dealers. The manufacturers have an extraordinary proposition to make to car owners, dealers, jobbers and manufacturers. Write for full particulars direct to the Disco Electric Starter Corporation, Detroit, Mich.

Differential and Transmission Gears.

A complete line of differential and transmission gears and sprockets is manufactured by William Ganschow Company, Morgan and Washington Blvd., Chicago, Ill. These are made for all makes of cars and can be relied upon to be accurately machined, and of the highest grade material.

The Ambu Electric Trouble Shooter.

This is an exceedingly handy tool for use in any repair shop. The manufacturers state that it will save a great deal of time and labor as it enables you to locate any electrical troubles in the starting, lighting and ignition systems of the car. The attention is called to the fact that there are about 250 places for trouble in every one of 50 or more types and adaptations of starting and lighting systems, but the Ambu Electric Trouble Shooter will locate any of these defects instantly and automatically. The manufacturers of this device provide an attractive sign for any dealer, garage owner or repairman who is equipped with one of these trouble shooters, and car owners will learn to look for garages and repair shops displaying this sign. Interested readers are urged to write immediately for Ambu Repair charts, service bulletins, instruction book and other literature and be sure to address all your inquiries to the American Bureau of Engineering, 1018-1036 Wabash Ave., Chicago. So that your inquiry may be identified with this publication you are kindly urged to use the coupon attached to the advertisement of this company in our magazine.

Firestone Gets Perpetual Injunction.

Judge Vickery, in the Court of Common Pleas, Cuyahoga County, Ohio, December 16th, granted the Firestone Tire & Rubber Company, Akron, Ohio, a perpetual injunction against a raincoat company using the name "Firestone." This raincoat company was operating stores in Cleveland, Indianapolis and Detroit under the name of Firestone Raincoat Company."

Manley Garage and Shop Equipment.

A large number of handy machines and appliances for garages and repair shops are manufactured by the United Engine and Manufacturing Company, of Hanover, Pa. Their line includes auto presses, air compressors, portable cranes, portable table benches, engine stands and many other similar machines.

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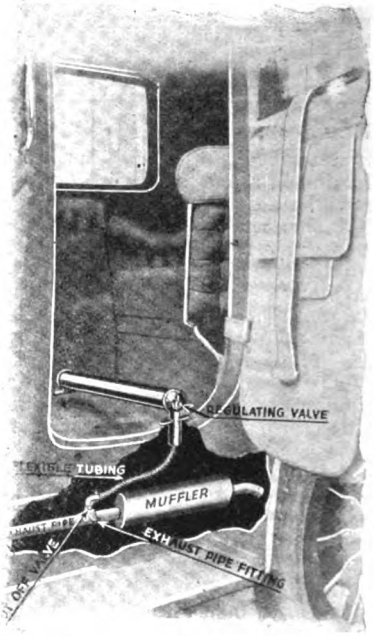


MAKE WINTER RIDING AS LUXURIOUS AS A SUMMER DAY

During the cold weather, irrespective of the temperature outside.

Eliminating the necessity of storing your car in the garage during extreme cold weather.

The Utility Heater is simplicity itself. The regulating valve is at the side of the heater within easy reach.



No Expense Added to the Car Upkeep

As the heat is the exhaust from the engine, which is otherwise wasted in the muffler.

No Odor or Noise. Burning of the Finest Material or Shoes Impossible

Cannot overheat or cause back pressure in the engine.

A half an hour is all the time needed to install. Only two small holes in the floor of the car and one in the exhaust pipe.

Handsomely furnished in nickel with all necessary attachments.

In ordering please give outside diameter of exhaust pipe before it enters the muffler.

UTILITY HEATER Complete, - $15.00
Utility Junior Heater (For Fords), $10.00

Dealers Can Make Money Handling This Needed Accessory



The Utility Socket Wrench Set

A set of automatic adjusting socket wrenches that takes all hex nuts from 5/16" to 7/8" and all square nuts from 1/4" to 13/16". The harder you pull, the harder the jaws grasp the nut. Made of the finest steels. Invaluable about the car.

Set of Three with T Handle, - - $2.50
Same Set with Detachable Brace also, $3.50



HILL PUMP VALVE CO.

18-22 East Kinzie Street CHICAGO, ILL.

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Warm Hands With STEER WARMS

This wonderful device keeps the hands warm in zero weather. With Steer Warms one can drive for hours on the coldest day and never grow numb or chilled. Steer Warms make winter driving a pleasure. They consist of two neat, leather covered grips, electrically heated from storage battery or magneto, that lace on steering wheel at any place convenient for driving. Anybody can install Steer Warms. No holes to bore—lace on—wire up—that's all. No cost to maintain.

Guarantee: The leading dealers stock Steer Warms. This proves their merit. The manufacturer guarantees Steer Warms for five years. This protects the user. Money refunded if not satisfactory.

Prices:

		In Canada
All Standard Gasoline Cars	$7.50	$11.00
Special Ford Type	5.00	7.25

(When ordering state voltage of battery. If Ford, whether '14 or '15 model.) Purchase from your dealer. If he hasn't them, we will ship prepaid upon receipt of purchase price, or C. O. D.

IECO ELECTRIC MANIFOLD PLUG

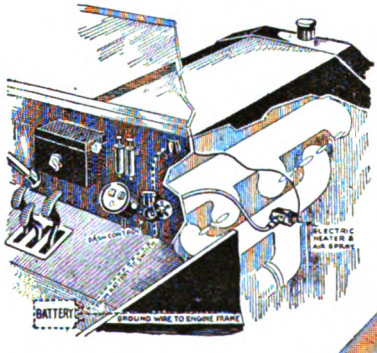
Starts Car Quick In Coldest Weather

Engine goes on first or second turnover. You don't have to waste time and wear yourself out cranking a cold engine or waste your batteries on self-starter. This electrically heated plug boils the gasoline and puts a hot vaporized mixture into your cylinders. The plug is really many devices in one. It primes from seat. It saves 25% on fuel bills, detects carburetor troubles, and removes carbon deposits. It is easy to install, simple and economical. Special type for Ford makes these cars easy to start.

Guarantee: The Ieco Manifold Plug is guaranteed for 2 years against burn out. Money will be refunded if not as claimed. Purchase from your dealer. If he hasn't it, upon receipt of price we will ship prepaid, or C. O. D.

Price: $5.00. In Canada $7.25

(Ford cars require 6 dry cells. In ordering specify if to be used on storage battery or dry cells.)



Shows Steer Warms Laced on Wheel

DESCRIPTIVE CIRCULAR ON REQUEST

INTERSTATE ELECTRIC CO.

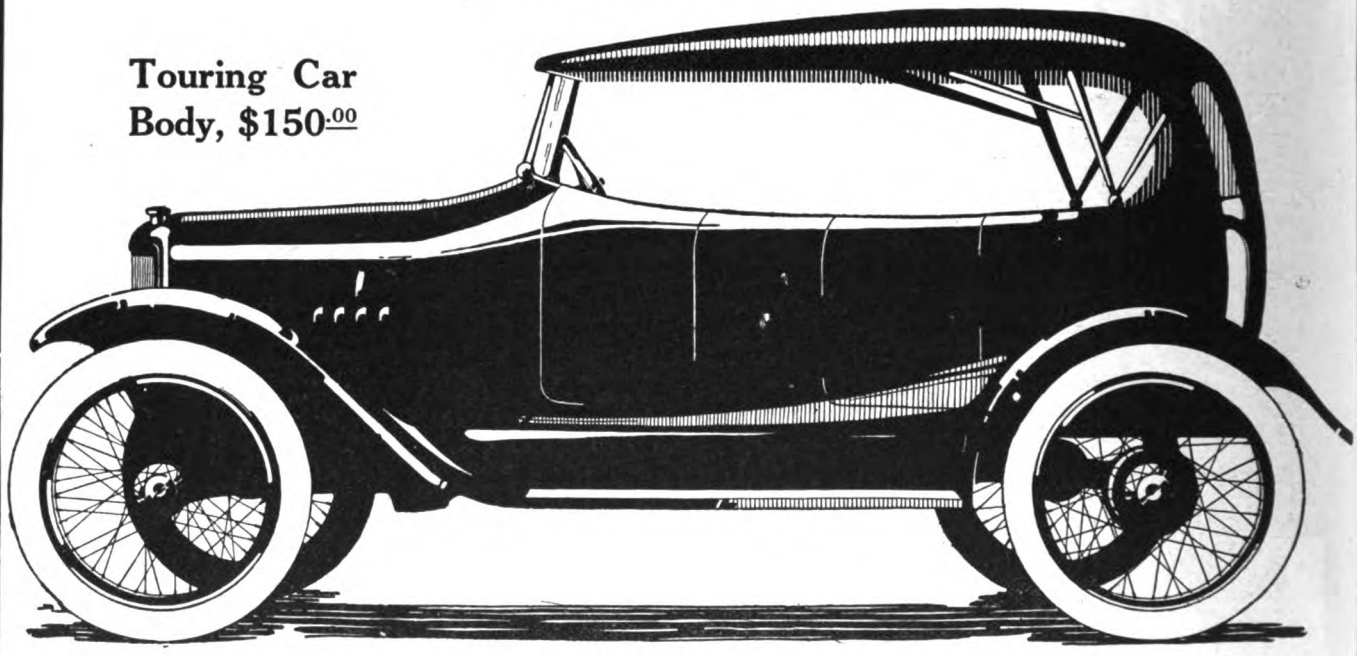
1845 Perdido Street, New Orleans, La.

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Big Money for Live Dealers
Universal Specialties

FOR FORDS

Touring Car
Body, $150.00



Touring Body---Raceabout Body
Universal Streamline Radiator---One-Man-Top
Spranger Demountable Rim Wire Wheels

Quick action means money to every dealer that takes on the Universal Line of Specialties for the Ford car. Look them over for yourself. There are no bodies to compete with these—and at such prices! Made by one of the largest body makers in the business—and painted and trimmed in true coach style. Only the bodies of the costliest cars are more luxuriously finished.

The raciest One-Man-Top made is furnished with the touring car. The Universal One-Man-Top for any Ford is a winner in high grade Mohair at $30.00.

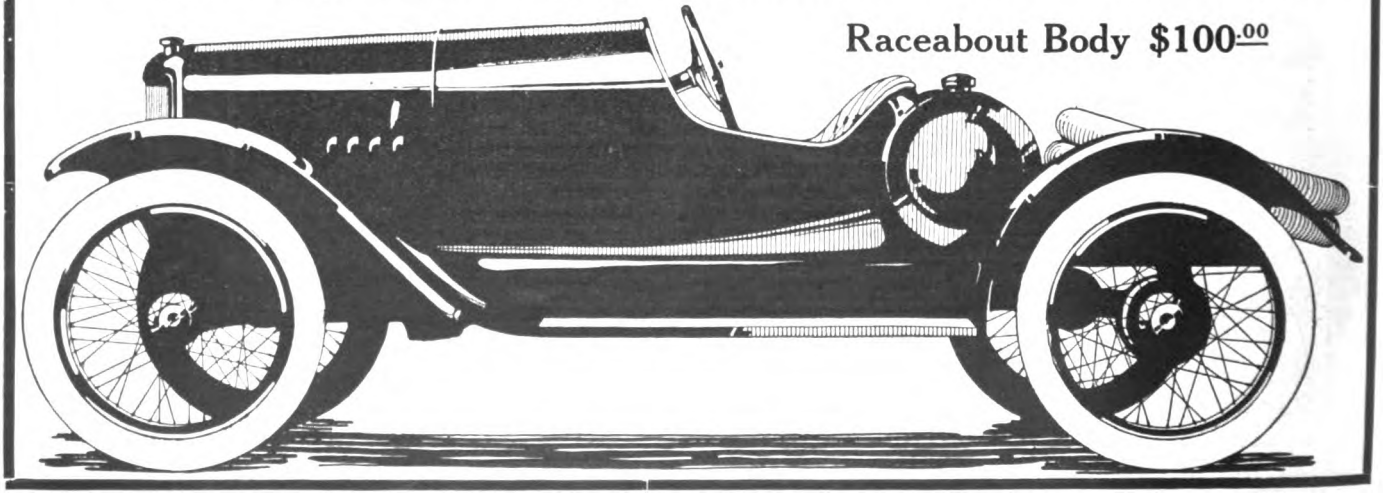
Universal Streamline Radiator with Hood is bound to be even more popular this year than last. Improves appearance 500%, fits any Model Ford. Get in on this ready seller, $45.00, black enamel or nickel finish.

Universal Demountable Rim Wire Wheels (Spranger Patent), are the latest and best in wire wheels. A few minutes' talk with your customer will convince him they are the best buy on the market at $35.00 per set (5 rims).

Every dealer should have complete details on the Universal Line. Discounts quoted to bonafide dealers only.

UNIVERSAL CAR EQUIPMENT CO.
255 East Jefferson Ave. Detroit, Michigan

Raceabout Body $100.00



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Subjected To This Supreme Test

The New MASTER

Calorite Spark Plug

Heated Red Hot - 1500 Degrees Fahrenheit
Plunged into cold water 40 degrees, 26 times

Heated White Hot - 2000 Degrees Fahrenheit
Plunged into cold water 40 degrees, 10 times

An Extreme Change of Temperature of 1960 Degrees

These two extreme tests convinced us absolutely of the marvelous efficiency and ability of Calorite as an insulating material to stand any strains to which it might be subjected in Spark Plugs in the modern motor car. We have long realized the necessity of an improvement and advancement in Spark Plug Construction as evidenced by prevalence of spark plug trouble in last season's races. Our observations, tests, analyses, etc., served to establish the fact that the seat of the trouble mostly was in the insulators.

Our MASTER shell design—our MASTER electrodes and the metal used in MASTER Spark Plugs have proven themselves eminently satisfactory and scientifically correct—there was no necessity of even considering a change there.

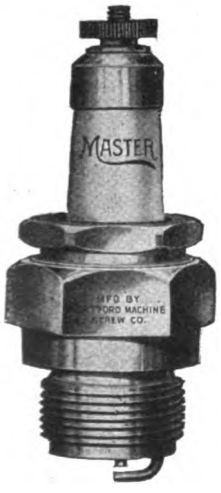
Until Calorite, the new insulating material was discovered, our porcelain was the best material obtainable for spark plug insulators. But, with the discovery of Calorite, the old belief in porcelain was shattered. The merits of Calorite are so many and it is so superior to porcelain that to continue using porcelain for our insulators would not be doing justice to the other Master quality specifications—nor to our long established policy of manufacturing only the best.

Calorite Makes Masters the Leaders

We saw its wonderful advantages—
We realized that we had at last found a material which should make us the world's leaders in spark plug manufacture.
But we could not afford to take the slightest chance of making a mistake—and we didn't.
We had made a wonderful success with our Master porcelain plugs—
If we were to change, the new material must be able to stand any abuse—
And so after exhausting all ordinary methods of test we determined to subject Calorite to the most brutal and destructive strains imaginable.

The First Test

Heated until white hot, 2000 degrees, and then plunged into cold running water. This heating and cooling was repeated—ten times—the MASTER CALORITE SPARK PLUG alternately heated to this terrific temperature and plunged into icy cold water.
The internal stresses set up by this instant change from white heat to icy coldness were terrific—yet the CALORITE insulator was just as sound after being put through this radical test as before being subjected to these immense temperature changes.



The Second Test

To exhaust every means of possibly wrecking this material, our engineers attempted a breakdown test. This consisted of heating the MASTER CALORITE SPARK PLUG to a red heat, 1500 degrees and instantly plunging it into cold running water. This alternate heating and cooling was repeated 26 times. MASTER CALORITE SPARK PLUGS came through both of these tests unscathed.
The remarkable qualities of Calorite were all demonstrated after it had emerged from these terrific tests.
Then and only then did we decide to adopt Calorite as the one and only material suitable to make Master Spark Plugs the actual leaders.
Porcelain a few months ago seemed the finest, most practical material for spark plug insulators.
BUT—the finest samples of porcelain—subjected to a fair test along with Calorite did not meet in any way the requirements we sought.
We wanted to be fair—
We gave porcelain its chance—but it couldn't stand the gaff—
Some of the best samples of porcelain—subjected to the same tests as Calorite—heated white hot—broke the first heating—never even got to the cold water.
MASTER CALORITE PLUGS will not break in service—no matter how severe.
Won't soot.
Won't leak compression.
Won't give any trouble at all—we have tested them in every variety of service and we know.
In Calorite we have adopted a material for the insulators of Master Plugs which easily makes Masters the most dependable, longest lived spark plugs in the world.
This plug should prove the most remarkable seller that has ever been offered to the motorists of the country.
A guarantee which is most liberal and comprehensive goes with each plug.
Every Master Calorite is now packed in a round wooden box decorated with a label which in itself attracts the customer's eye.
The progressive dealer and jobber will reap the harvest which will come to those taking this plug on first.
Write for the story of Calorite and Master Plugs and for complete information on the advantages of handling these remarkable plugs.



JOBBERS and DEALERS—A new schedule of quantity prices go into effect January 1st. The Trade will be advised specifically ample time in advance.

MASTER CALORITE SPARK PLUGS
Made in the U. S. A.

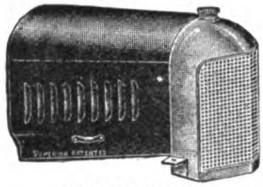
Manufactured and guaranteed by

HARTFORD MACHINE SCREW COMPANY
524 CAPITAL AVENUE **HARTFORD, CONN.**

Fifty years of prestige and successful manufacturing experience.

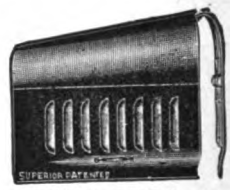
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"SUPERIOR" RADIATORS & HOODS for Ford Cars



"SUPERIOR" HOOD AND RADIATOR OUTFIT No. 12 $40.00 Complete

1916 "Superior" Products FOR FORD CARS LEAD THEM ALL!



"SUPERIOR" MODEL "A" SURE-FIT STREAMLINE HOOD (1912-13-14). $8.00 Complete



"SUPERIOR" Honey-Comb V-Type Radiator Brass, $34.70

START THE SEASON with the right line and you can't go wrong!

Get Our New Prices

REMEMBER—

Quality as well as Quantity still enter into the construction of "SUPERIOR" PRODUCTS

LAMPS
HOODS
RADIATORS



"SUPERIOR" Straight Front Honey-Comb Radiator Brass, $30.00

CROWN FENDERS
COMMERCIAL FENDERS
DEMOUNTABLE WHEELS
CONVERTIBLE LAMP BRACKETS
HOOD AND RADIATOR OUTFITS
COWL, ZIG-ZAG AND VENTILATOR WINDSHIELDS, Etc.



"SUPERIOR" Regular Type Radiator Brass, $15.00

ENORMOUS DAILY SALES PROVE IT!

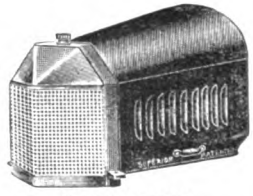
SEND FOR NEW SHEET!



"SUPERIOR" MODEL "B" SURE-FIT STREAMLINE HOOD (1915-16). $8.00 Complete

MR. FORD DEALER!

It's Your Move Next.
We Are Ready To Quote You.
WRITE TODAY.

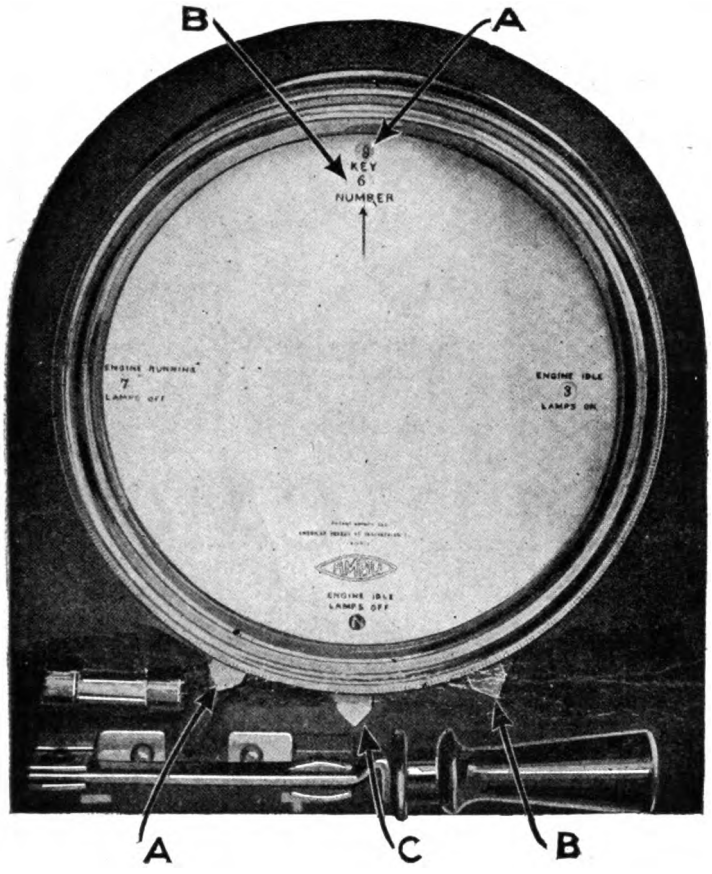


"SUPERIOR" HOOD AND RADIATOR OUTFIT No. 80 $40.00 Complete

Immediate Delivery

Superior Lamp Mfg. Co. 136 W. 52 d St. N.Y.

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With AMBU and AMBU Service

You Can Be the Electrical Engineer of Your Community.

Get the edge on your competitor by getting your AMBU outfit first. The motorists of your neighborhood will recognize in you an authority on electrical work of automobiles, and AMBU Trouble Shooter will enable you to correct the troubles on any make of American car quickly, accurately, and at a tremendous profit!

AMBU

TRADE MARK

Electric Trouble Shooter

Detects—Locates any trouble in any American made Starting and Lighting System used as standard on any American made car. Accurately and Quickly—

Autolite, Remy, Bijur and Rushmore, Delco Westinghouse, Dyneto and Entz, Gray & Davis Splitdorf and Aplco, North East and U. S. L. Wagner and Ward Leonard, Adlake, Deaco, Disco Allis-Chalmers, Bosch, Jesco, Esterline, National Leece-Neville, Simms-Huff

TELLS HOW TO CORRECT IT.

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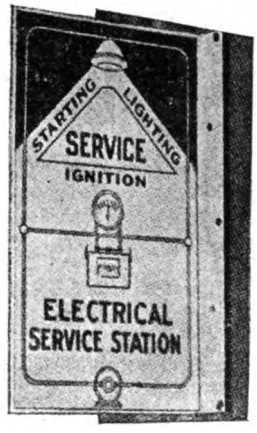
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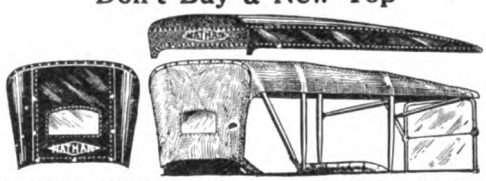






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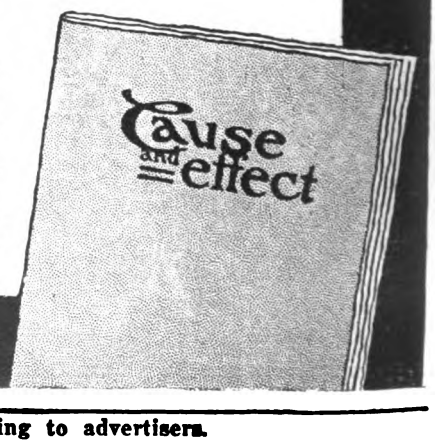
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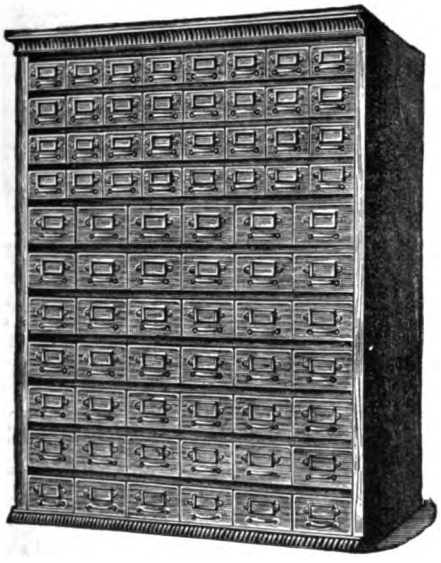


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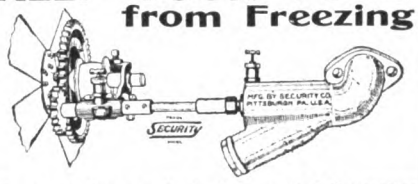
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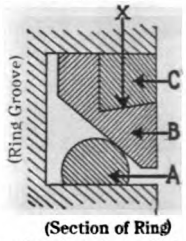
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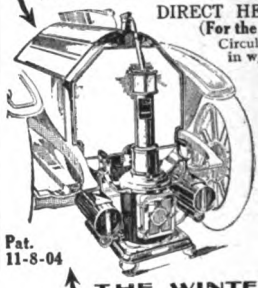
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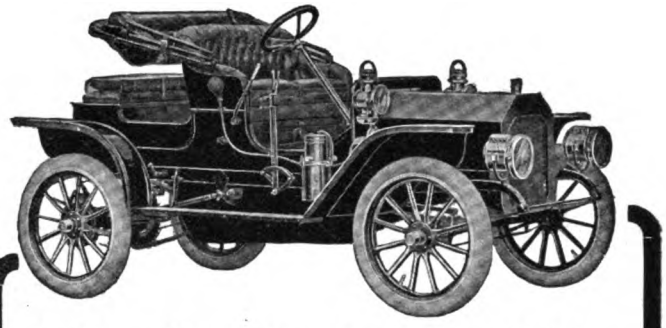
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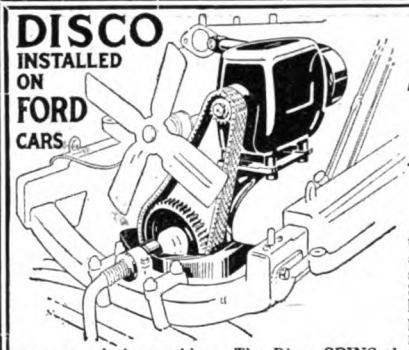
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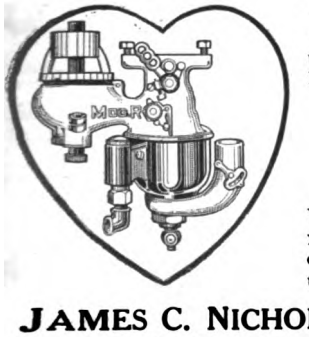
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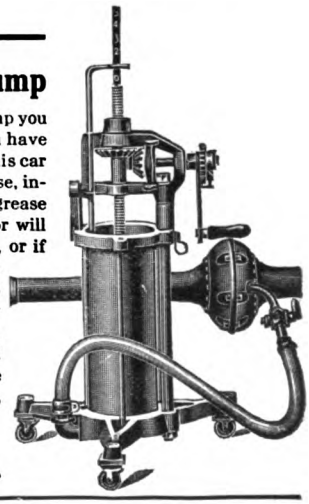
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OLD SOL ELECTRIC Spotlights

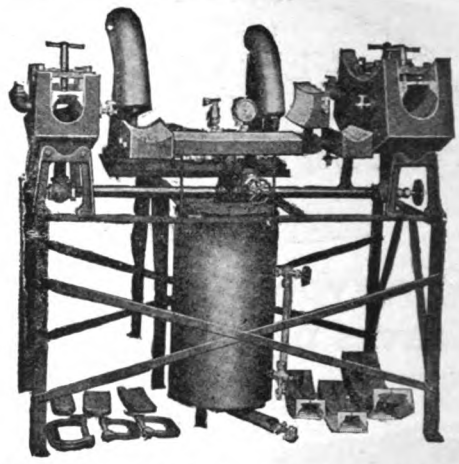
are the first choice of the motorist because of the unusual value he receives—a spotlight as well built as the finest automobile headlight for a price that is astonishingly low.

The many Old Sol features, including a mirrorscope for daytime use and an important focusing device make this line exclusive.

Quick sales are further stimulated by the use of an Old Sol Spotlight Silent Salesman—a handsome illustrated colored display stand given **ABSOLUTELY FREE** to OLD SOL Dealers.

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for Automobile, Motorcyc'e, Motorboat, Carriage, Bicycle and Hand Use
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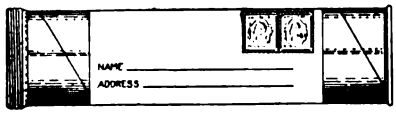
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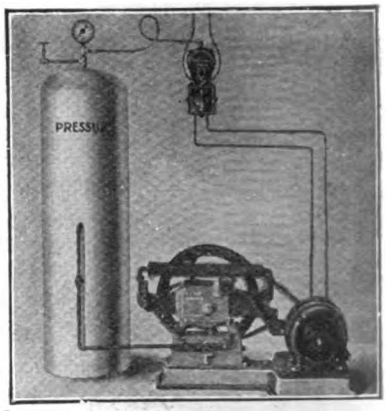
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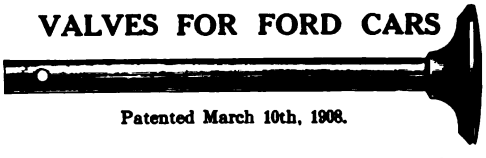
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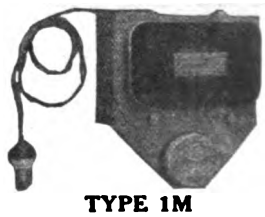
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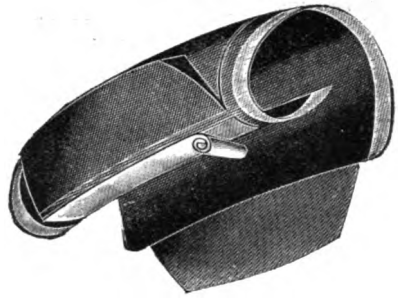
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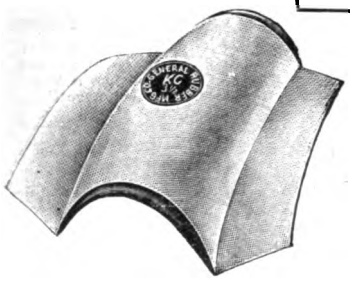
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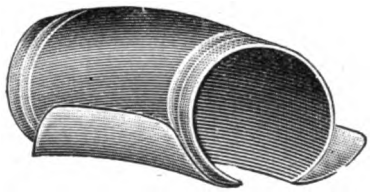
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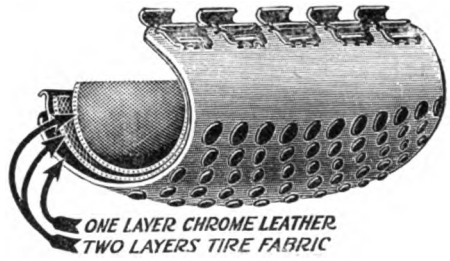
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Westinghouse Starting-Lighting-Ignition

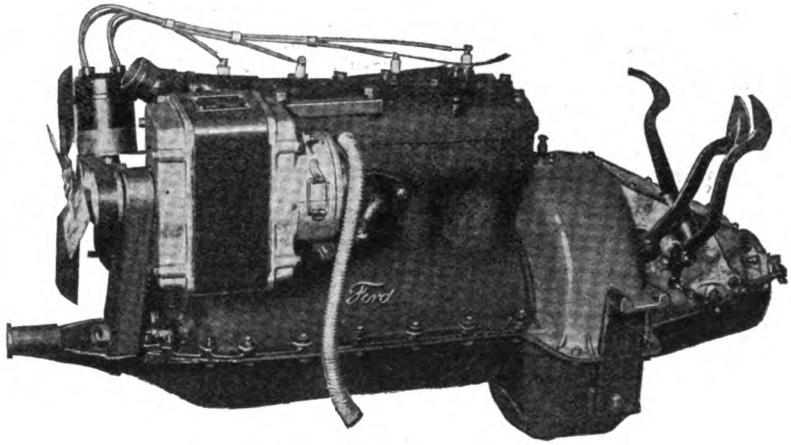
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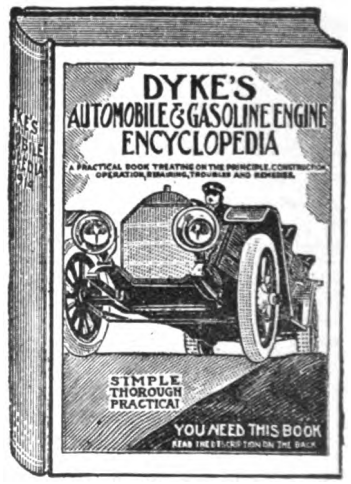
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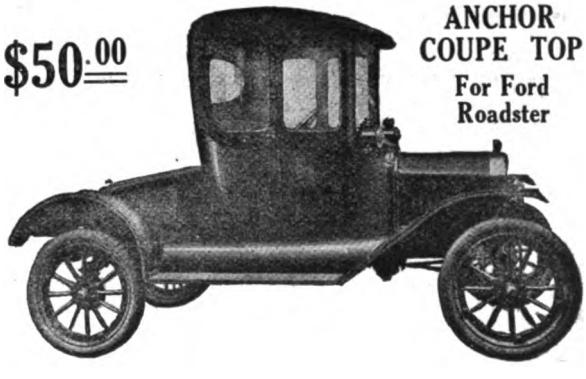
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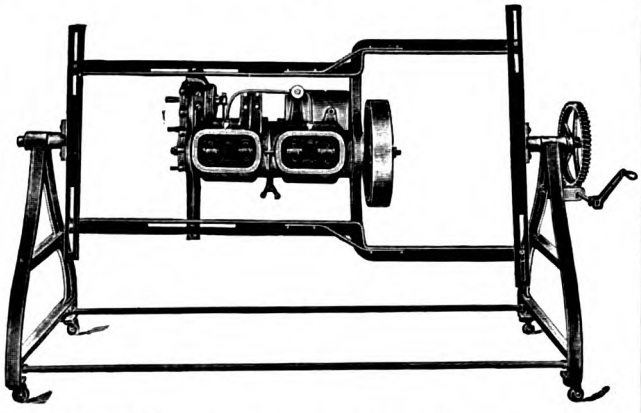
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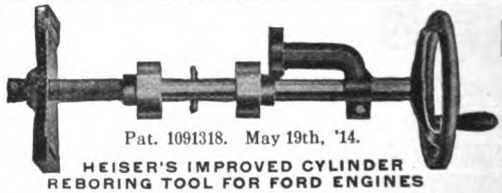


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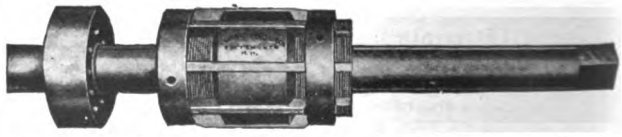
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The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.

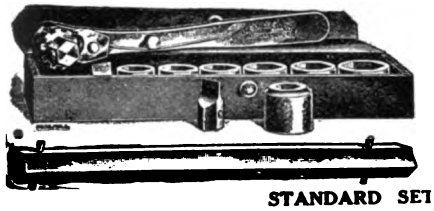


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Price—Four to a Set, $1.00.

(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY



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Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

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1 Handle 7 inches in length,
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Cap Screw Heads from 5-16 inch to 5-8 inch.
Price, in leather case, - - - - - $2.50

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1 Handle 7 inches in length.
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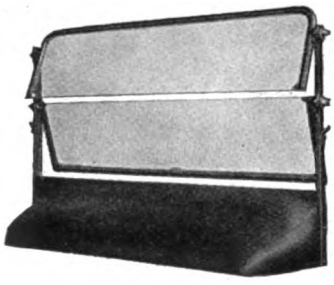
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Any packing in transmission, differential or crank cases that is destroyed by oil, grease, gasoline, hot or cold water is unsuitable for the service, and is sure to not only cause constant trouble, but is also expensive and wasteful of both lubricants and parts lubricated.

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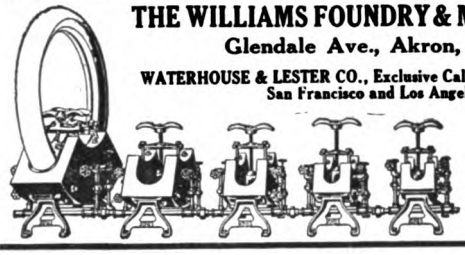
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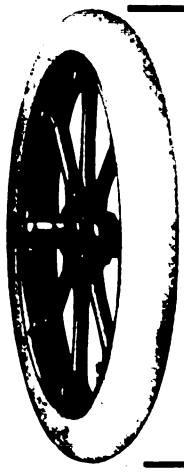
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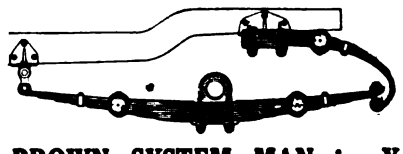
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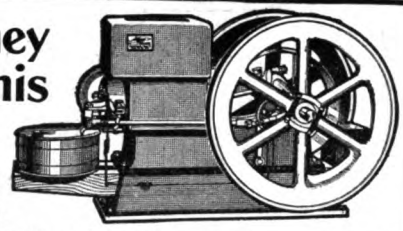
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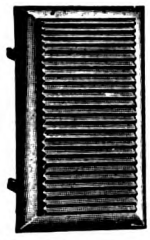
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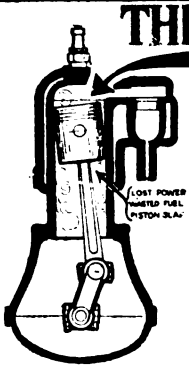
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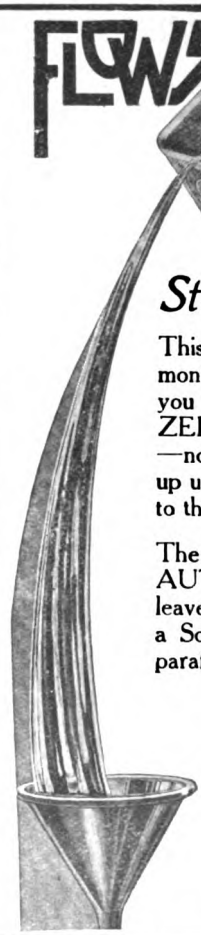
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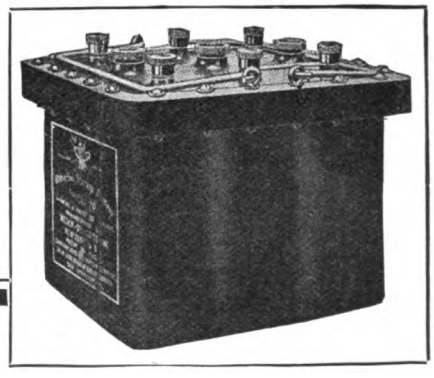
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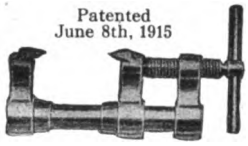


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Drop Forged

Nickel Plated and Polished

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Stops the Squeak

No. 1142280

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HEL-FI SPARK PLUGS

Prove their efficiency the moment they get into action. **Repair men,** install **gas saving, power producing HEL-FIES** and save further trouble. Retail price $1.25 each. Fully guaranteed.



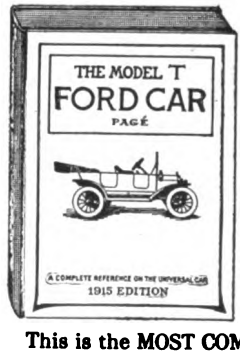
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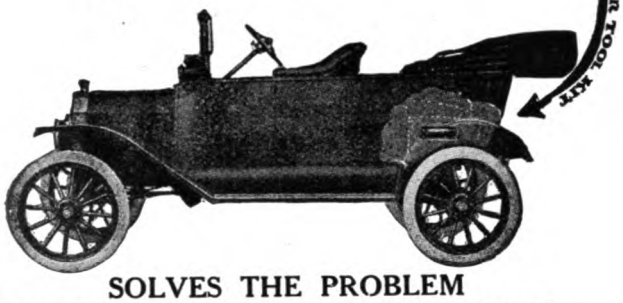
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of having extra bulbs always ready in case of accident or breakage.
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Keep your spare bulbs in the **DOVER TWO-LITE BULB CASE,** always ready when needed.
Carry it in your tool kit.

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PISTON RINGS

Your Safeguard

LESS CARBON-MORE POWER

EVER TIGHT PISTON RINGS have perfect elasticity from three points, meaning an even distribution of pressure all around, and a decrease in friction. You do not have to rebore cylinders.

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The Ever-Tight Piston Ring Co., Indianapolis, Ind.
St. Louis, Mo. July 8, 1915.

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Answers all the requirements to successfully handle this end of the business. With it and a little business judgment, success is certain. Every year adds thousands of new auto owners. They are looking more and more to economical tire service. The day of discarded tires is over, the Haywood Equipment makes this possible.

HERE IS YOUR OPPORTUNITY



Either as a side line to your present automobile business or as a business by itself, the Haywood Equipment will make money for you. **Tires go wrong all the time.** You know that. Keep them in tune. Give your customers complete service—repair their tires and all. This builds business and makes you rich. Experience unnecessary. You can learn easy—or teach a boy to handle this end. Be the boss and make the money. Learn the details now. Investigate. Act quick. Be the first. Send name and address only. A postal will do.

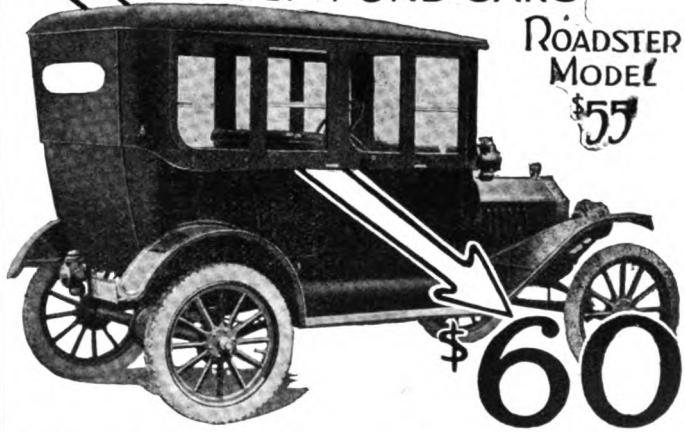
HAYWOOD TIRE & EQUIPMENT CO.
965 Capitol Ave., Indianapolis, Ind.

LIMOUSINE

WADSWORTH-ALL SEASON

For FORD CARS

ROADSTER MODEL $55



Warm and snug in winter. Cool and comfortable in summer. Fits flush to body of car—no overhang. Positively no rattle or squeak. Finished of same material as used in upholstering car. Glass doors and panels easily removed if desired and set of curtains used in their place. Get full details from your dealer, or write to us for illustrated catalog. In ordering specify whether for 1913, 1914 or 1915 car.

WADSWORTH MANUFACTURING CO.
1309 Jefferson Avenue Detroit, Michigan

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GOOD BUSINESS IN DULL SEASONS

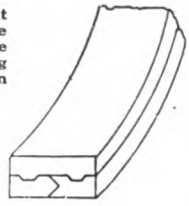
Show the car owner that K-P Rings will protect his motor against winter power losses. Show him how

K-P RINGS

are good insurance against the winter snows and heavy roads, by utilizing the whole force of each fuel charge and stopping the costly leakage of power and compression.

"Piston Ring Service is the Key to Perfect Compression."
—Efficiency Ed.

Show the car owner that K-P Rings will enable him to keep his car in use for the winter driving and you will cash in on your arguments.



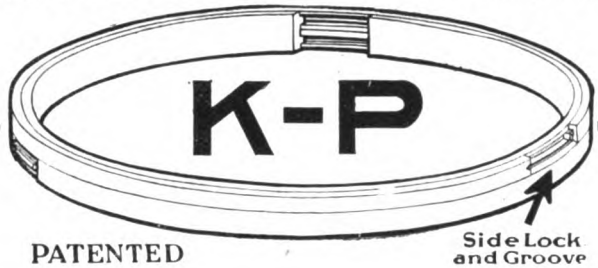
Special Inducements to Dealers and Agents.

Rings in All Sizes.

Write for booklet "Economy and Power"

Keys Piston Ring Company

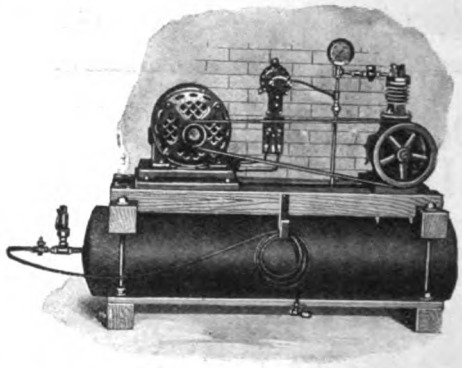
3037 Olive St. St. Louis, Mo.



PATENTED

Side Lock and Groove

The Standard Oil Company
Bought Several Hundred of these

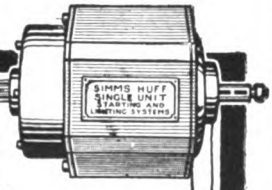


GARDNER FILLER STATION OUTFITS
FOR TIRE FILLING

These units passed the Standard Oil Company's tests, were adopted and are giving absolute satisfaction. If they can save money and give the best of service to The Standard Oil Company—why can't they do the same for you?

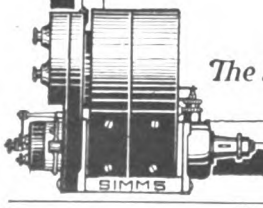
Just drop us a line for complete information today. It will interest you.

THE GARDNER GOVERNOR COMPANY,
Station R, QUINCY, ILL.



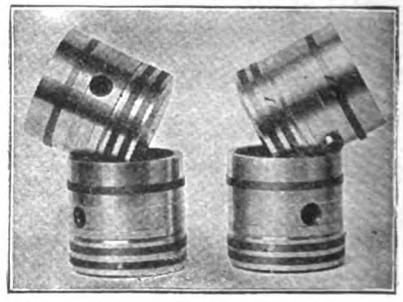
SIMMS MAGNETO
SIMMS-HUFF
ELECTRIC STARTING & LIGHTING

We demonstrate that we stand for quality, efficiency and reliability.



The SIMMS MAGNETO CO.
East Orange. N.J.

YOUR MOTOR NEEDS BUTLER'S SPECIAL ALLOY PISTONS



Vibration, Strain and Wear on bearings and parts reduced. The motor develops Higher Efficiency, is Easier cranked, has Quicker Pick-UP, More Speed, Less Carbon.

A universal success in over 60 different make motors.

They are an investment, not an expense.

Special Prices for:—Ford, Overland, Buick, Hupmobile, Chevrolet, Flanders, Maxwell 25 and Studebaker. Pistons for all make motors.

Cylinders Reground, Butler's Special Alloy, Light Semi Cast Iron or Standard Cast Iron Pistons.

Write at once for prices.

Established 1897. **BUTLER MFG. CO., Knightstown, Ind.**

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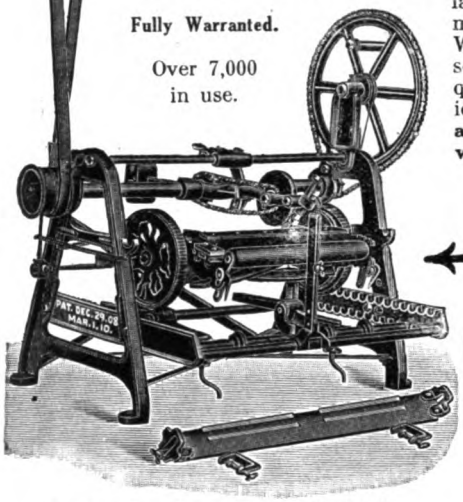
IDEAL
Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Will also grind straight knife without removing from mower. Operated by either hand or power. Ball bearing Alundum Grinding Wheel and Main Shaft. The only practical machine for sharpening Lawn Mowers on the market. Has Skate Sharpener Attachment for sharpening skates. **Write today** for full information of this great labor saver and money-maker. Will do the work so much better, quicker and easier, you **cannot afford to do without it.**

Fully Warranted.

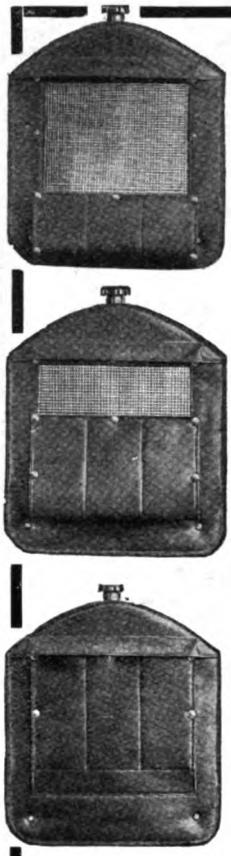
Over 7,000 in use.

Write today. Don't delay.



THE ROOT-HEATH MFG. CO.,
PLYMOUTH, OHIO.

"You Grind It as You Find It"



The
ALLEN
Radiator Cover

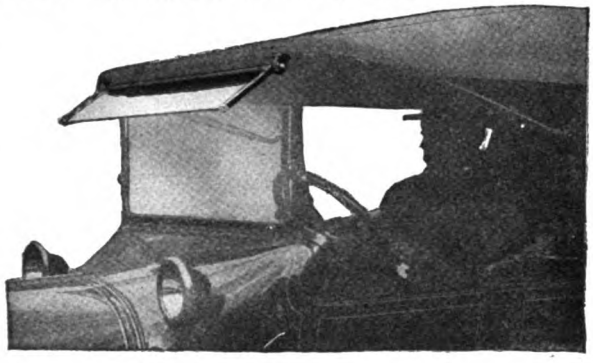
will keep your radiator from freezing in the severest weather. Quickly adjustable for varying temperatures and easily attached to the radiator. Made to order of Fabric Leather, fully lined with first quality Robe Plush at $6.00. Standard "Allen" quality work throughout.

DEALERS!
Write for our special price list.

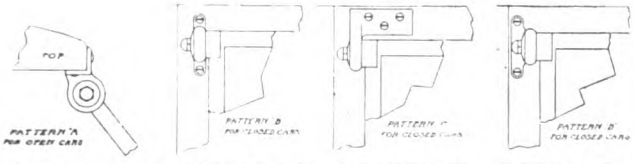
We also manufacture the Famous Allen Tire Case, the perfect protection for spare shoes, and the Allen Tyrometer, the handy, accurate, Tire Pressure Gauge.

The Allen Auto Specialty Co.
1926 Broadway NEW YORK — 1627 Michigan Ave. CHICAGO

HOW TO KEEP ALL STORM OFF YOUR WINDSHIELD WHEN DRIVING



Licensed under Hanlon Re-issue Patent



"ROAD-VIEW" SHIELD VISOR

This accessory is a great seller because it makes driving safer and more comfortable by modifying light reflections and keeping rain, snow or sleet from cutting off the view of the road. It is made of excellent plate glass with quality mountings, fastens to the front bow of the top and is adjustable to any desired angle—also made for coupes, limousines, winter tops, etc.

State how wide and how deep over all you want it **$8.00**

Prompt Deliveries Now *Liberal Discounts*

JOSEPH N. SMITH & COMPANY
DETROIT, MICHIGAN

HORN and FAN Combined



OAKES
$5
Gets the road
Cools the motor

No gears, motor, battery or wires to give trouble. Gives warning signal by merely pushing the button at driver's seat. Increases efficiency of fan and motor. Keeps radiator cool. Never fails to sound. Long life. Is easily interchangeable with fan on any Ford in a minute's time. Most reliable and safest horn.



Oakes Kranklock combination starting crank holder and lock and license holder. It holds the starting crank rigid and license tag securely.

Every Ford owner needs one. Can be put on easily in a few minutes. No holes to drill. Prevents thieves or boys from using or tampering with your car.

50c Without Padlock

$1.00 with special Yale Padlock.

Made by the makers of the famous Oakes Fans.

Any Oakes accessory shipped direct on receipt of price.

For Fords

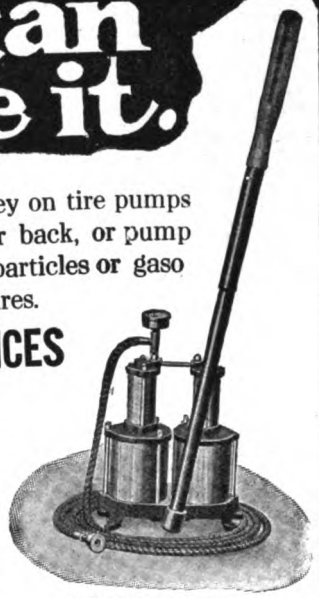
Write for complete description of our entire line.

THE OAKES CO. Dept. F INDIANAPOLIS, IND.

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At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.



"DEAD EASY"

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's **"Dead Easy."**

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

Give Your Car a Fair Show

Friction is slowly eating away the bearings and wearing down the gears.

It's but sound business to check this deterioration by using the highest grade and most efficient lubrication obtainable.

NON-FRICTION OIL

is recommended as such by a majority of the leading car builders.

Costs no more than common greases.
Packed only in orange-colored cans.

Get a can from your dealer or write for free samples.

N. Y. & N. J. LUBRICANT CO.
165 Broadway - New York

Every Repair Shop or Garage SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers in the United States or its territories a **Regulator Eight Day Calendar Clock** 38½ inches high, with a 12 inch dial, finished in **Oak** or **hand-rubbed Mahogany**, with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of **$3.90.** This clock cannot be sent to any foreign country except Canada, and Canadian subscribers must send **50 cents** more to cover extra postage on the paper.

Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

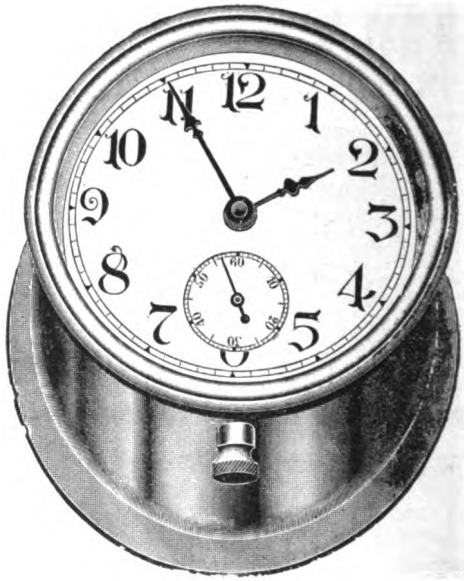
The engraving shown gives the correct appearance of this clock.

This offer is good for either old or new subscribers.

Remittances can be made in any convenient way. Be sure to state whether you want this clock in Oak or Hand-Rubbed Mahogany.

Address all orders to

THE MOTOR VEHICLE PUBLISHING CO.,
Publishers of THE AUTOMOBILE DEALER AND REPAIRER
71-73 Murray Street, NEW YORK, N. Y.



DO YOU WANT A MOTOR CLOCK

For your car, and a good one? The clock illustrated in this connection is manufactured by one of the most reliable clock companies in the country and is warranted in every respect. It is not liable to get out of order. It has interchangeable parts. It is the product of skilled labor combined with the most improved Waltham Automatic Machines. This clock is 3¾ inches high, and 2½ inches in diameter. It has a one day movement with second hand. It can be furnished in burnished brass or nickel plated whichever is preferred. The arrangement we have made enables us to furnish **one of these clocks and a subscription to the Automobile Dealer and Repairer for a year** to all residents of the United States and its territories for the precise price the clock retails for, namely, **$2.50.** If an eight day clock is preferred send 50 cents extra or **$3.00.** Canadian subscribers should add 50 cents extra to cover the extra postage required on the **Automobile Dealer and Repairer.** This clock cannot be sent to foreign countries. The clock can safely be sent by mail and will be forwarded postage prepaid to any part of the country. Remittances can be made in any convenient way. Address

MOTOR VEHICLE PUBLISHING CO.
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ROME RADIATORS

offer the utmost in

QUALITY EFFICIENCY
DURABILITY VALUE

We Repair and Replace all Makes of Radiators

Large stock of radiators on hand for immediate shipment.

ROME-TURNEY RADIATOR CO.
WHITESBORO STREET
ROME, NEW YORK



THE
BENTON
"THE CASE-HARDENED PLUG"

Unbreakable wound mica insulator quickly cleaned by opening metal-to-metal joint and scraping or washing mica. Joint always gas tight. No deterioration from cleaning. Case-hardened wrench and thread surfaces. Service guaranteed.

Price $1.00

Write for our liberal Agency Proposition and a copy of Booklet shown.



L. F. BENTON CO., VERGENNES, VERMONT

HASSLER

Shock Absorbers for Ford Cars

$15 for a Set of Four

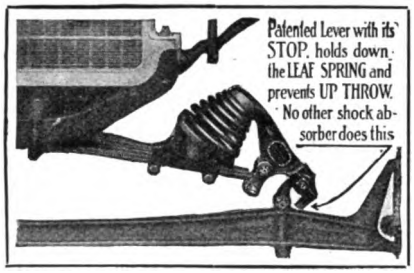
It is comparatively easy to make a shock absorber that will show strong in a shop test or a demonstration under ideal conditions.

The real job is to produce a shock absorber that will stand up under hard, continuous road service month after month — year after year.

The Hassler Shock Absorber has been in continuous use for four full years—over 50,000 owners are now driving Hassler-equipped Fords. That's why the Hassler is—

"Recognized as the Best"

DEALERS — Here is the only shock absorber that has no competition. You will find it a most satisfactory addition to your business. Good profits. Not sold through jobbers. We protect you. Send for our trial set proposition NOW.



ROBERT H. HASSLER
Incorporated
Indianapolis, Indiana



Did You Get Your FREE SAMPLE of GOLDEN STAR AUTO BODY POLISH?

Every reader of the Automobile Dealer and Repairer is entitled to a free sample.

Send for yours before the limited supply of samples gives out.

We want to prove to you that it is the

"WORLD'S BEST CLEANER and POLISHER."

Why pay $50.00 for refinishing your car?

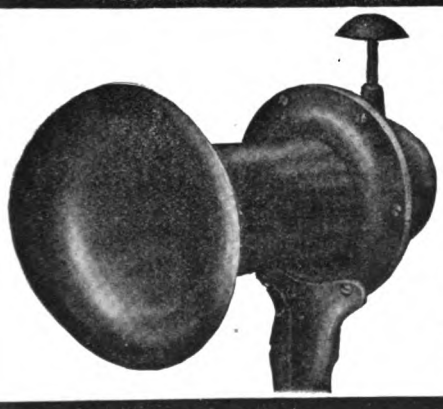
GOLDEN STAR will save you this expense. Contains no acid, alkali or grit, which destroy the finish.

Waterproof and weatherproof.

Dealers Can Make Money As It Is a Big Seller.

R. W. MORRIS MFG. CO.
INCORPORATED
Kansas City :: Missouri





WONDERTONE WARNING SIGNAL

Truly a wonder signal that gives you the right of way in any traffic. Gives a long, penetrating, powerful, commanding signal, or a sharp, instantaneous crash for ordinary signaling.

DEALERS:

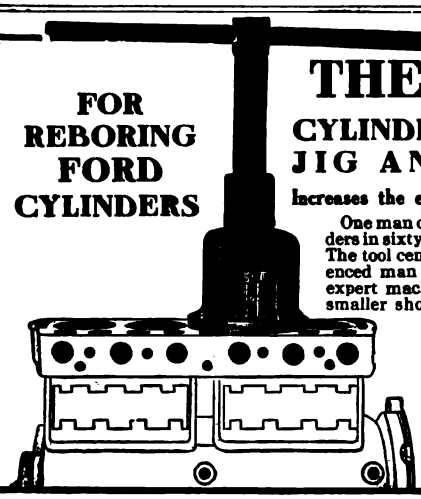
How about the "Wondertone" in your territory? It's a business maker and the sale profits count up fast.

LISTS AT $3.00. GUARANTEED FOR LIFE.

Write for prices.

MOTOR APPURTENANCES CORPORATION
Broadway and 8th Avenue at 58th Street NEW YORK CITY, N. Y.

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FOR REBORING FORD CYLINDERS

THE DAVIS

CYLINDER REBORING JIG AND REAMER

Increases the earning power of your shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

The Hinckley Machine Works
Hinckley, Ill.

TRADE APCO MARK

Specialties FOR FORD CARS

Write for Catalog today

AUTO PARTS COMPANY

Providence, Rhode Island

Sears-Cross Spedindicator

STANDARD FORD 1915 EQUIPMENT

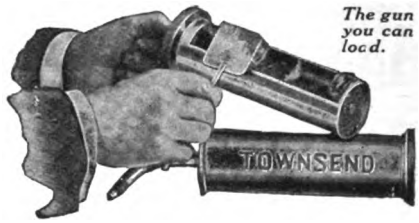
"Absolutely Accurate"

Special for Ford Cars

Mounted flush in a bracket on the cowl. A remarkable opportunity for dealers. Write or telegraph for details,

Sears-Cross Company

Bush Terminal **Brooklyn, New York**



The gun you can load.

It can be filled— *others cannot.*

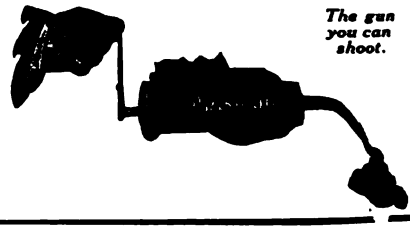
It is clean— *others are dirty.*

Easy of Operation— *others difficult*

Fill with a steel paddle, sent with the gun, slip one tube into the other, secure with cap and turn the handle. You can load and shoot a pound in a minute. Not a particle of grease gets on your hands or clothing.

6 Oz., $3.00 8 Oz., $3.50
12 Oz., $4.00 16 Oz., $5.00

S. P. Townsend & Co.,
Orange, N. J.

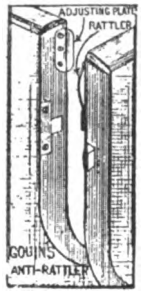


The gun you can shoot.

Gouin ANTI-RATTLERS for Ford Cars and Any Car With or Without Door Jambs

Every FORD owner is interested in this Device as it will stop that troublesome rattle of the car doors.
Send us your check or money order for a set of three for your FORD.
Price, $1.00 or send us $1.25 for a set of four if you have Four Doors and kindly mention your dealer's name.
Dealers, write for our prices and secure your share of this business.

ASK YOUR JOBBER



Manufactured by L. J. GOUIN COMPANY,
14 Roosevelt Ave., POUGHKEEPSIE, N. Y.

CHANSLOR & LYON CO., 1238 Van Ness Avenue, San Francisco, Cal., Distributors for the Pacific Coast.

!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS,
SMOOTH FORGED OR FINISHED
COMPLETE, READY TO
ASSEMBLE : : : : :
SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY

(PLANT AT CUDAHY) **MILWAUKEE, WIS.**

THE STALIT HEATING PLUG



Eliminates all trouble in starting a motor in cold weather. No priming of the cylinders or tickling the carburetors necessary.

SIMPLY TURN ON THE SWITCH

a minute before starting, after the Stalit Plug has been attached to the inlet manifold,

THE AIR IN THE PIPE IS HEATED, AND THE RESULT IS MIRACULOUS

Also indispensable when used in conjunction with the electric starter, as it will save the intense strain due to continuously turning over the cold motor.

YOU GIVE THE ENGINE ONE YANK AND OFF SHE GOES

Write today for prices and terms.

GEO. STAATS & CO., 250 Lorimer St., Brooklyn, N.Y.

"There's a mighty big difference in lubricators!"



Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.
Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.

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THE ATCO PATCH

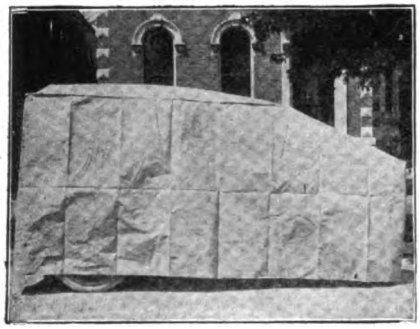
For Use On Ford Cars



PRICE $1.00

Made of best leather. Will wear longer and give
BETTER SERVICE THAN ANY OTHER PATCH
The Best Seller You Can Handle
Don't let some other jobber stock your trade. GIVE US A TRIAL ORDER.
Liberal Discounts to Jobbers and Dealers
AUTOCRAT TIRE CO., Main and F Sts., Midlothian, Tex.

KENNEDY AUTO STORAGE COVERS



To meet the need of an inexpensive and efficient cover for automobiles while in dead storage we are making a paper cover, which is proving the right thing for this purpose.

These covers are made of strong heavy paper, properly reinforced to prevent tearing.

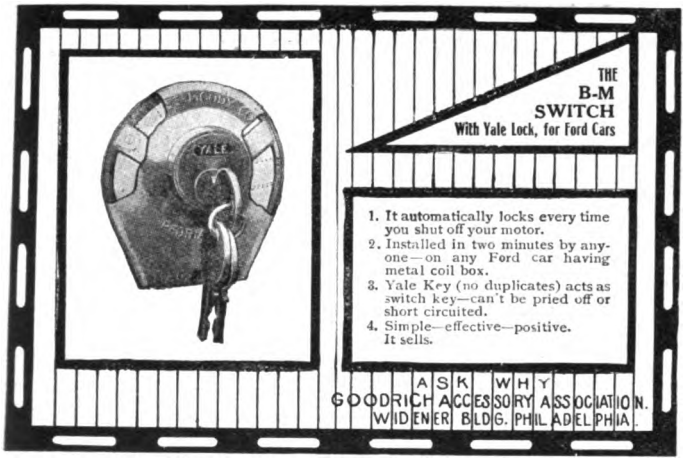
They protect the car against dirt, dust and moisture and will prevent the polished portions from tarnishing and the finish from checking in cold weather.

These covers are salable to individual car owners at a good profit as well as to furnish the dealer a protection for his stock of new cars.

We make them in four sizes: 7 PASSENGER, 5 PASSENGER, FORD SPECIAL, ELECTRIC.

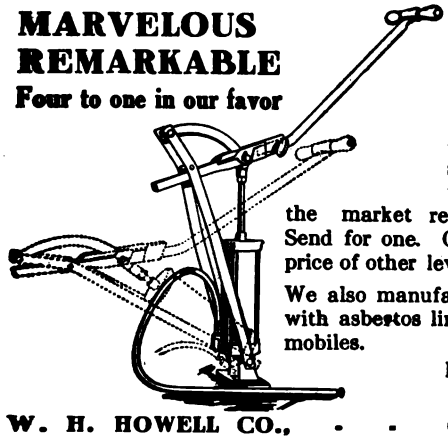
Winter will soon be here and dealers can handle these covers with satisfaction and profit. Further information on request.

THE KENNEDY CAR LINER & BAG CO., Shelbyville, Indiana



MARVELOUS REMARKABLE

Four to one in our favor



The Jensen Lever Pump inflates four tires with less effort than a compound hand pump inflates one tire, It is absolutely the easiest working pump on the market regardless of price. Send for one. Only about half the price of other lever pumps.

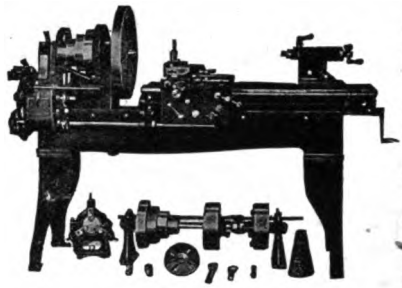
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IS OUR 14-24" SLIDING EXTENSION GAP LATHE



Saves investing in a large expensive lathe. Swings 14½" over top bed, and 24" through gap. The 7½ ft. machine takes 8 ft. between centers.

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are unequalled for repairing leaks in water jackets, boilers, tanks, screw-thread joints, flanged joints, etc., also for keeping nuts and bolts tight.

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All work absolutely GUARANTEED

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Also for all other automobiles where oil lamps are used.

Made singly or in quantities, any size or style.

LAMPS REPAIRED
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Send samples, blue prints or specifications for estimates.

EXPERIMENTAL WORK A SPECIALTY

Prompt Service
Expert Workmen
Reasonable Prices

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For Ford Cars

These Fan Belts are especially made for Ford cars, as this class of owners insist on the

100% SERVICE

Furnished by our Belt.

No trouble or inconvenience, possible from broken belts made of inferior material.

ABSOLUTELY GUARANTEED

Not to stretch and is oil proof, made in endless belt style. No chance for defective seams.

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Easy Money

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COMBINATION CRANK HOLDER and NUMBER BRACKET No. 80

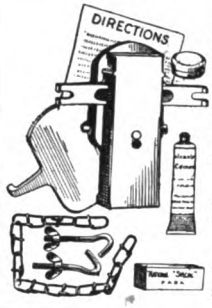
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New Price, 50c.

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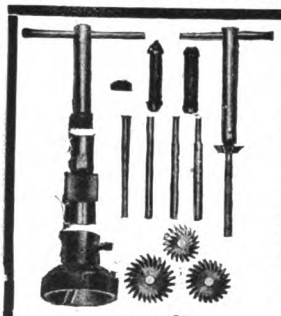
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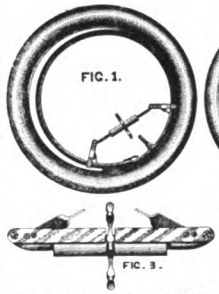
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Including Manifold and Hot Air Tube.

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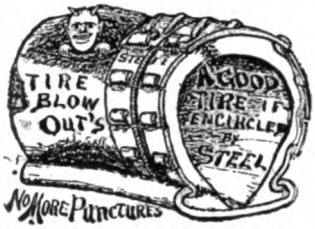
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Friction will ruin your car.

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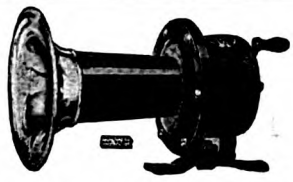
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reduces friction to a minimum. The selected flake motor graphite contained in it graphitizes all bearing surfaces to absolute smoothness, preventing metal-to-metal contact. Booklet No. 184-G free upon request.

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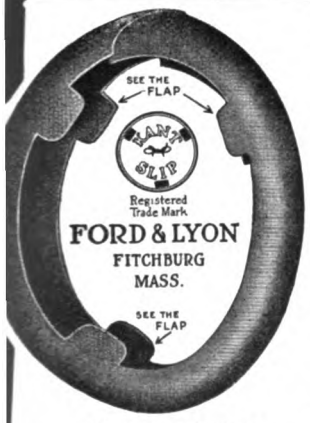
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A powerful, Commanding Warning Signal—the surprise in Mechanical Horns. Operated by touch of hand—turning either right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

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INNER LINER

Is one of the best on the market, as it cannot slip inside of the casing. When this liner is placed inside of the tire, and the tire properly inflated, the liner

WILL STAY JUST WHERE IT IS PUT

And cannot slip.

The Kant Slip Inner Liner is also a complete inside fabric reinforcement, extending the full length of the tire from bead to bead.

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Inner Liner can be re-used after old casing has been discarded, wearing twice as long as any other.

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Manufacturers of KANT SLIP PRODUCTS

THE OLD RELIABLE
POLSON'S PATCHES
WON'T PINCH!

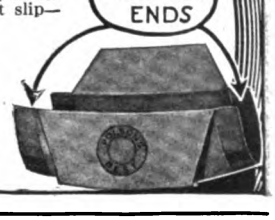
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Severe tests prove them the strongest patches made. Polson's Blow-out Patches can't slip—once on they forever "stay put." The rubber ends prevent pinching.

Demand Polson's Reliners, Blow-out Patches, Tire Boots, and Tube Patches. They cost no more than others. If your dealer can't supply you, write us.

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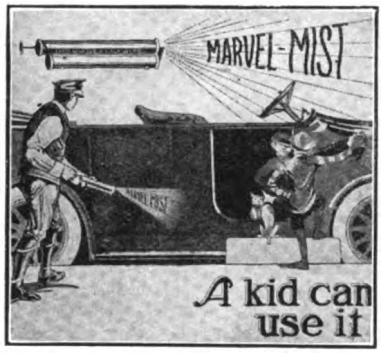
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Removes Road Tar, Oil and Grease. Prevents Rain Streaks.

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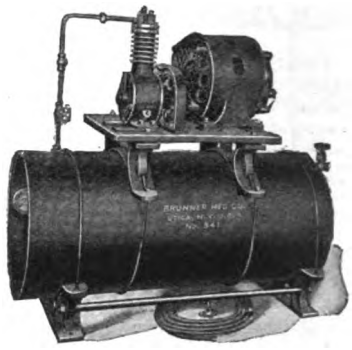
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Two sizes—High-grade metal construction throughout—No troublesome belts—No wooden parts to warp and throw compressor out of alignment.

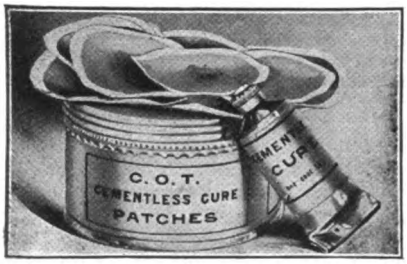
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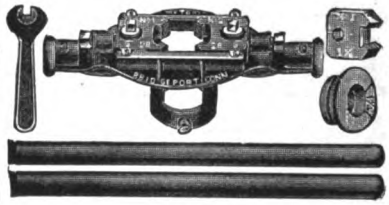
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Have a feather edge. Guaranteed to stick and stay stuck in hot or cold weather. There is no uncured rubber; therefore, no chance for slipping.

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It Is Different.
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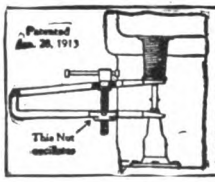
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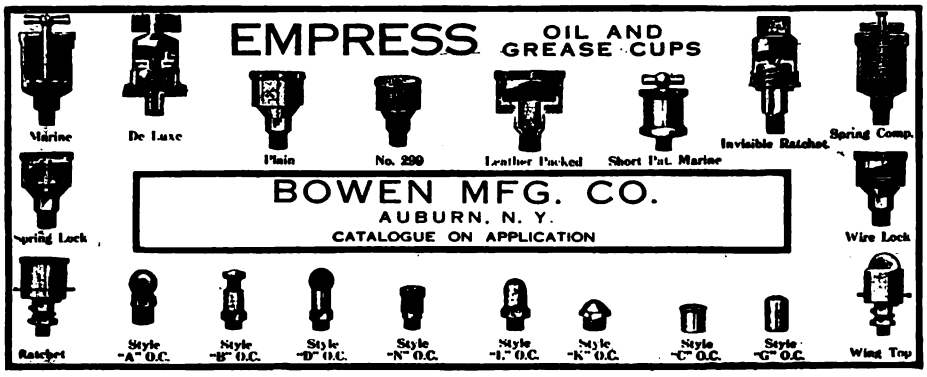
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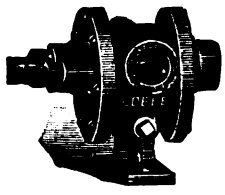
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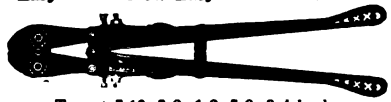
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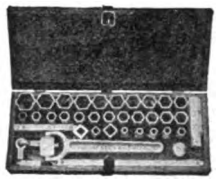
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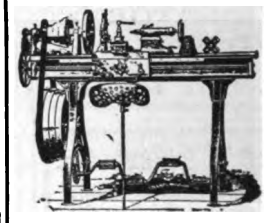
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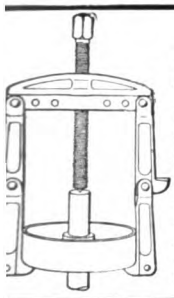
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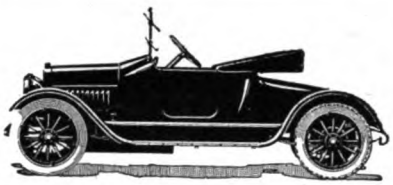


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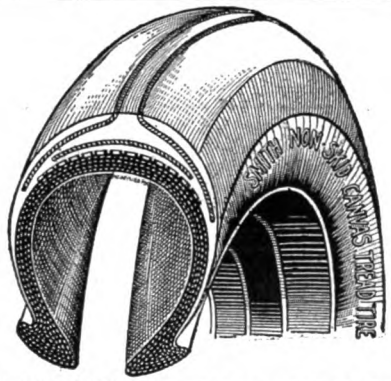
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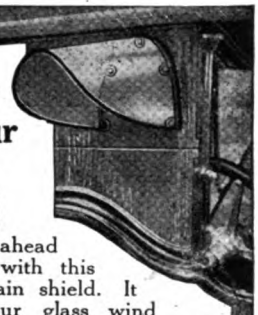
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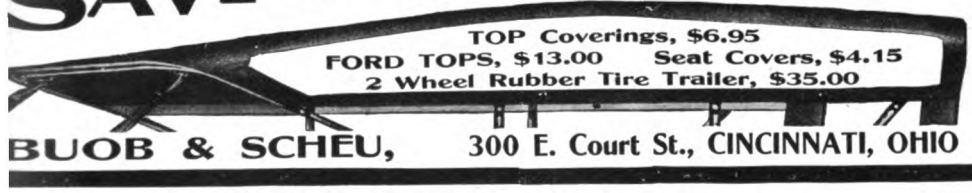
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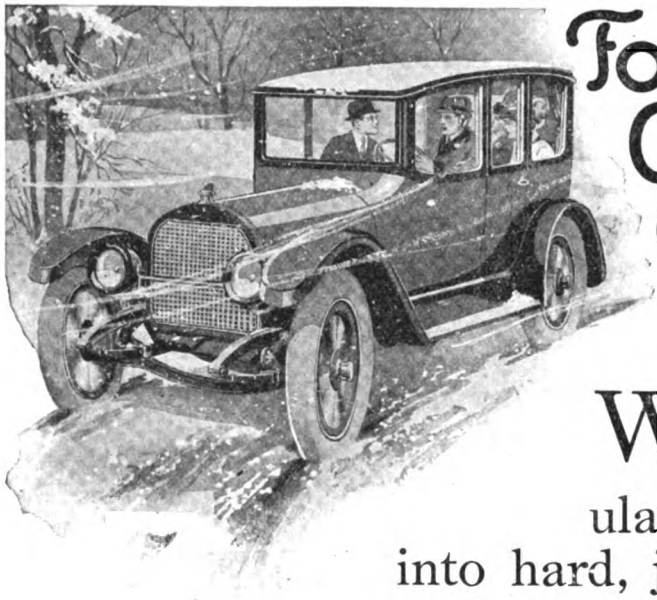
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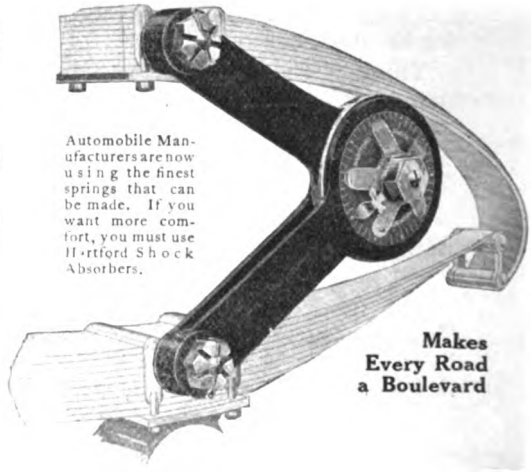


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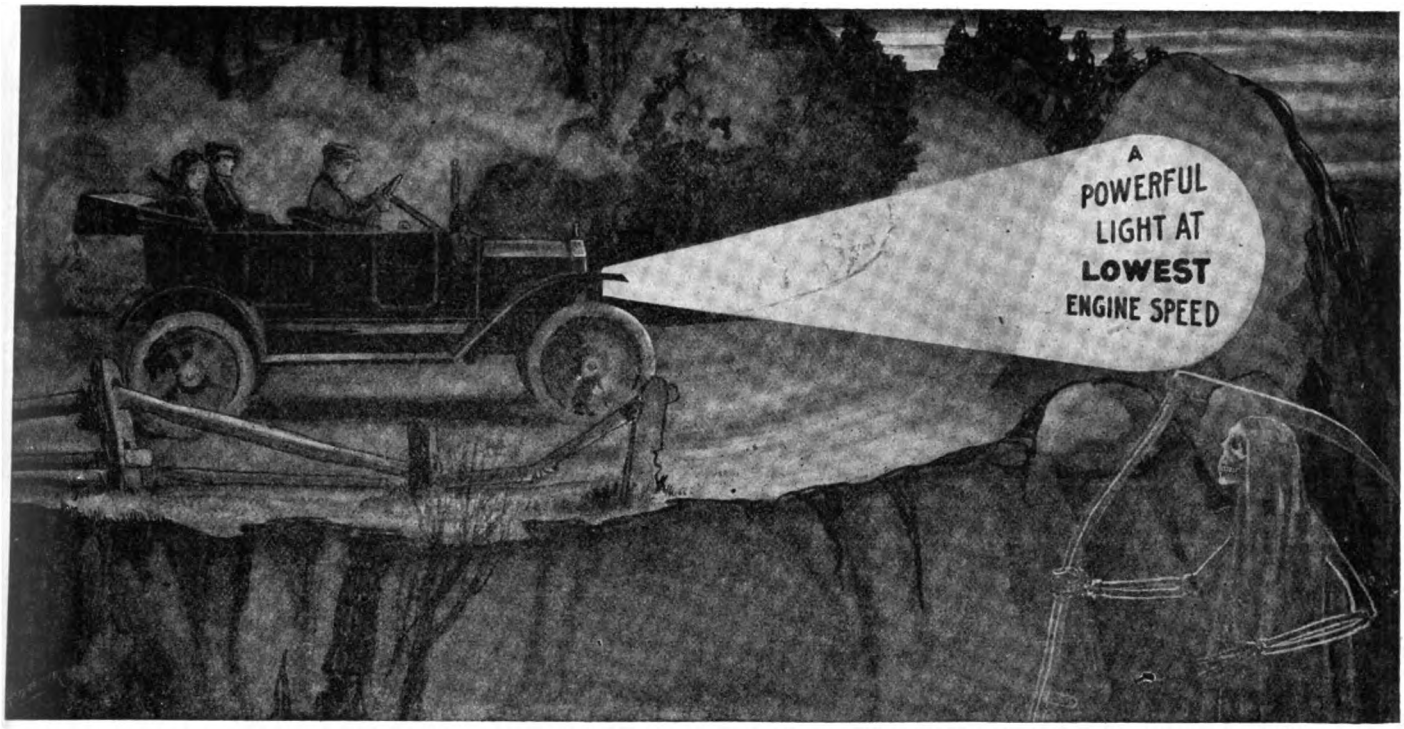
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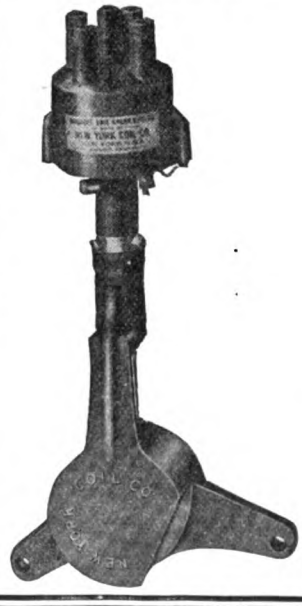
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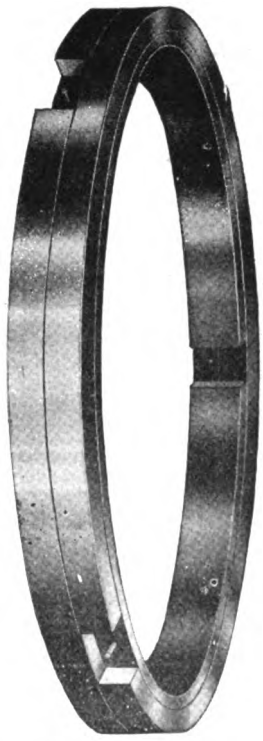
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We honestly believe that there are no auto upholstery covers manufactured in America that represent better values, better materials, fit and workmanship than those which we manufacture and sell under our own name. You will realize the truth of this assertion from the moment you snap a set of these covers over your automobile seats. They are especially designed for the car you drive, and are readily attached by means of instantaneous fasteners.

We know that our proposition is better for the dealer because we manufacture exclusively *for* the trade, and sell exclusively *through* the trade: our list prices are fair, our discounts are liberal, our service is prompt and reliable and we guarantee price protection to September 1st, 1916, to all dealers under contract with us.

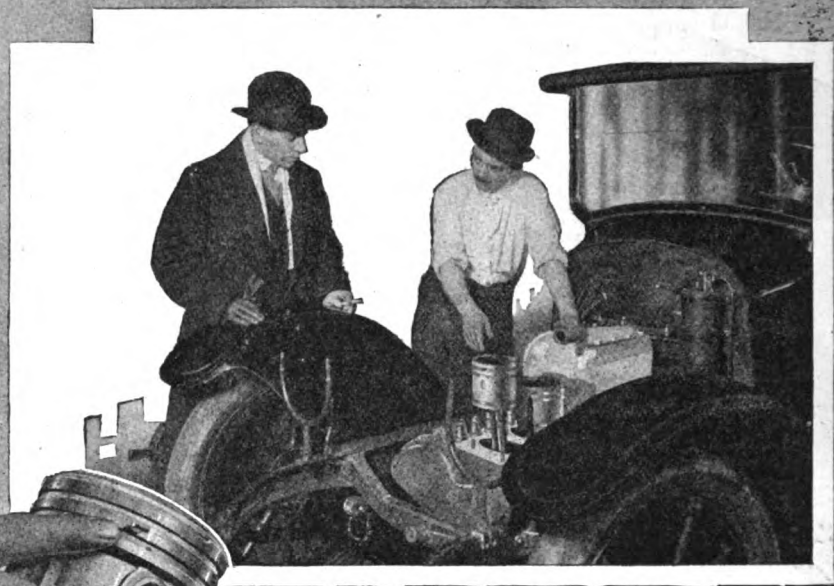
The cost of everything that enters into the manufacture of Warner Auto Upholstery Covers is advancing by leaps and bounds. If you have not already received our catalog, price-list, swatches, display hanger and dealer contract, write today.

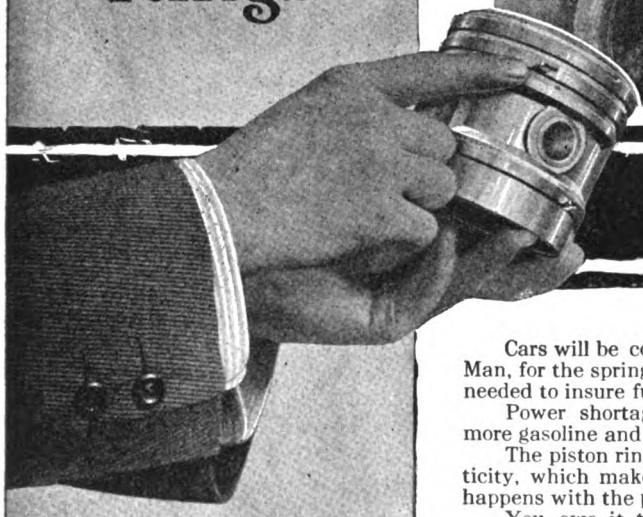
THE WARNER AUTO TOP COMPANY

1632-1636 CENTRAL AVE. *Established Thirty Years* **CINCINNATI, OHIO**

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"What You Need Are McQUAY-NORRIS LEAK-PROOF Piston Rings"





Cars will be coming in to you right along now, Mr. Garage or Repair Man, for the spring overhaul. The owners depend on you to say what's needed to insure full power for the summer ahead.

Power shortage is what they've suffered from chiefly. It's taking more gasoline and they've had a lot of trouble with carbon.

The piston rings are responsible. They have lost proper fit and elasticity, which makes them leaky and generally inefficient. That always happens with the piston rings commonly used by motor manufacturers.

You owe it to your customer and to your own reputation as an authority to talk piston rings. Tell him why they are responsible for leaky compression and carbon troubles. Apply the only permanently satisfactory cure—LEAK-PROOF Piston Rings.

The piston rings that never lose fit or elasticity—that give full power always—that don't lose efficiency in a few months of wear.

NO OTHER ACCESSORY OFFERS YOU SO CERTAIN A MARKET

Every other accessory you handle is part of the equipment of several or all cars—or something like it. They're all renewal parts. Not a manufacturer in America uses LEAK-PROOF Piston Rings as standard equipment. You, and you only, have the exclusive control of this market, as we sell only through dealers and jobbers.

Make it a part of every overhauling job you handle to put in LEAK-PROOF Piston Rings. Your customer will see the benefit at once and appreciate it. You'll improve your standing with him and increase his reliance on your judgment. He'll recommend your services to his friends.

Send for FREE Booklet—"To Have and To Hold Power"—the standard hand-book on gas engine compression. It tells what LEAK-PROOF efficiency means. Write Dept. R.

LYNITE-PISTONS ALUMINUM

For FORDS

4 LYNITE Aluminum Pistons fully equipped with LEAK-PROOF Piston Rings, $30.00. The most attractive proposition ever made to a Ford Owner. It gives the Ford motor the kind of pistons that are used in practically all high-priced cars for 1916. LYNITE and LEAK-PROOF make a combination that out-classes anything for producing snap, speed, power, silence and economy in Fords.



—— Manufactured by ——

McQuay-Norris Mfg. Co., St. Louis, U.S.A.

CANADIAN FACTORY:—W. H. BANFIELD & SONS, 372 PAPE AVE., TORONTO

—— BRANCH OFFICES: ——

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OWNING A WATERHOUSE IS LIKE FINDING A BURIED TREASURE



It's the handiest tool in the world. With it you can weld anything, anywhere, at any time.

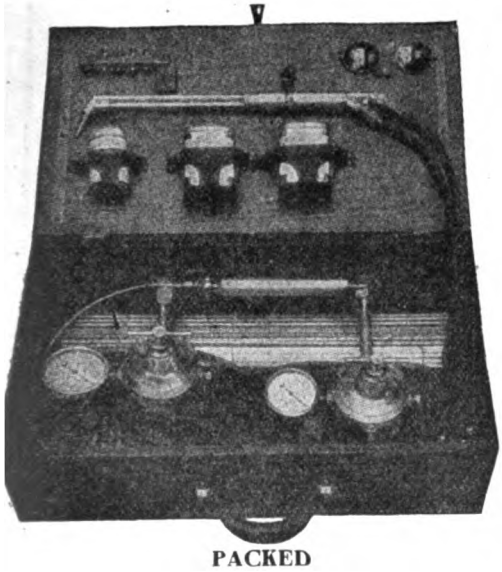
Every repairman in the United States should have a copy of our new catalog and learn all about the wonderful process of welding.

Thousands of Waterhouse Equipments are making and saving for their owners, put one to making and saving for you.

Every jobber in the United States and Canada should know all about our new line.



AT WORK



PACKED

No Garageman, Repairman, Manufacturer or Metal-worker of any description can afford to be without a Waterhouse any longer than the time required to send in his order.

Waterhouse Equipment complete $42.00, 5% discount for cash. If Welding materials are desired add $4.50, less 5% for cash.

Either order through us or your jobber.
Only be sure to specify Waterhouse.

WATERHOUSE WELDING COMPANY

16 Pelham Street, BOSTON, MASS.

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QUALITY COUNTS

Quality counts in Spark Plugs more than in any other part of the Car's equipment. There's a big and growing demand for better Spark Plugs than those usually furnished with the car. Over 90 per cent of all Reflex Plugs are sold by our dealers direct to Car Owners to replace plugs already on the car.

Exclusive Territory Protects Your Profits

This means that when you sell Reflex Plugs you don't have to meet the cut-throat competition of a dozen dealers in your own community. You control the ***Quality Business*** in your territory and make a worth-while profit on every Reflex Sale.

Our Guarantee:

"Reflex Spark Plugs are fully guaranteed against defects in material or workmanship. Any plug that proves defective will be repaired or replaced free of charge. Your money back if not entirely satisfied."

A Reflex Free To Every Dealer

Prove Reflex Superiority from your own experience. Just state on your letterhead size thread required on your car and we will send you a Reflex No. 1 FREE OF CHARGE. Test it yourself.

Free Display Cabinet

Signs, circulars and other sales helps are included in our plan to make the Reflex Store in every community known as the headquarters for quality automobile supplies.



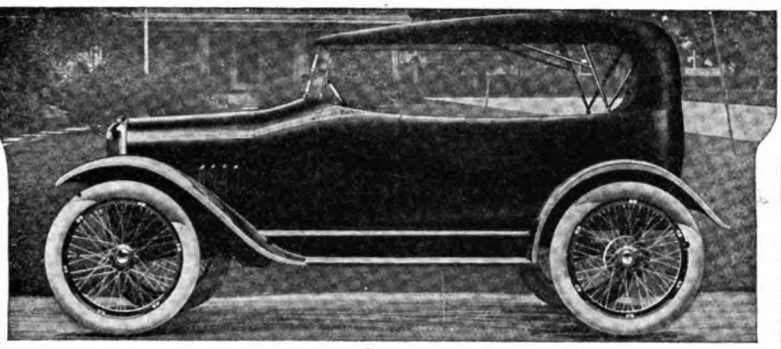
Don't Delay. Open territory is going fast. Write or wire us at once.

THE REFLEX IGNITION CO.

1711 PAYNE AVENUE, CLEVELAND, OHIO

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Tourabout Body $150.00



Top & Windshield $38.00 Extra





UNIVERSAL Specialties that Revolutionize the Appearance of Any FORD Car

UNIVERSAL STREAMLINE RADIATOR AND HOOD

$45.00

Unless you have seen this equipment you have little idea of how much better any model Ford looks with the Universal Streamline Radiator and Hood. Cooling surface greater—volume of water greater—cooling perfect—engine runs better summer or winter. You actually get a true streamline with a more efficient power plant. This radiator gave universal satisfaction during 1915. The hood is made of heavy gauge steel well enameled and finished. Special hood for models previous to 1915—mention this when ordering. Price, nickel or black enamel finish, complete with special starting crank bolts, etc., $45.00.

The Universal Streamline Tourabout Body for Ford Cars is strictly a quality job in every respect. Comfortable deep upholstery, real spring cushions, ample leg room, and wide seats combine to make this the most comfortable body ever put on a Ford Chassis. The top and windshield shown are made special for this body and will not fit the regular Ford. Price $150.00, Mohair or Khaki One-Man Top and Rain Vision Ventilating Windshield $38.00, Radiator and Wire Wheels as listed, Crown Fenders $14.00.

The Universal Streamline Raceabout Body for Ford Cars is built and finished in the same careful way. Genuine spring cushions that actually ride easy and deep well-stuffed upholstery. Standard color red with black trim. Hood and fenders come black—radiator black or nickel. Body with 15 gal. tank and tire supports $100.00. All parts f. o. b. Detroit.

Universal One-Man-Top is properly designed (raises or lowers with utmost ease) and is built of high grade materials throughout. Fits any model Ford. Price complete with Boot, Jiffy or Plain Curtains, Rubber Cloth, Mohair or Khaki $30.00.

These Bodies and Specialties Fit Properly and are Applied with Very Little Effort

SPRANGER DEMOUNTABLE RIM WIRE WHEELS

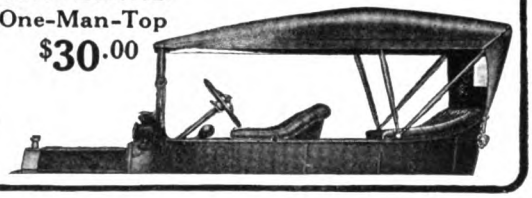
$35.00

Spranger Demountable Rim Wire Wheels are built honestly and carefully by wheel experts and of the best alloys. A substantial hub and general sturdy construction from a thoroughly tested design make each wheel far stronger than actually necessary and allows a liberal factor of safety. There is a substantial saving on tires and increased gasoline mileage; the riding qualities are greatly improved. Easily attached ***without bolts***—front wheels come complete with ball bearings—rear wheels machined to proper taper and Key Seat—go on same as the wheels you take off. Four Wheels—five rims—red, green, black, or yellow—rim wrench—complete $35.00.

Universal Car Equipment Co.

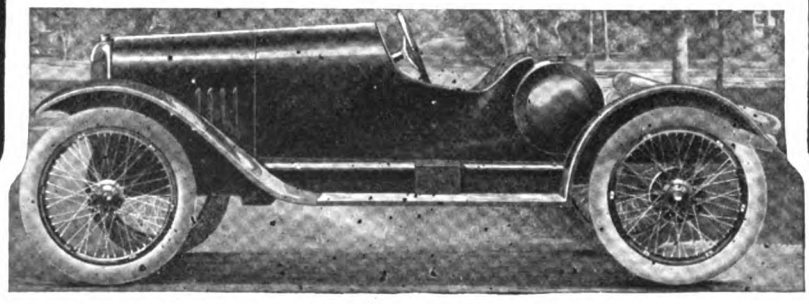
255 East Jefferson Avenue DETROIT, MICHIGAN

UNIVERSAL One-Man-Top $30.00



Every Item Guaranteed

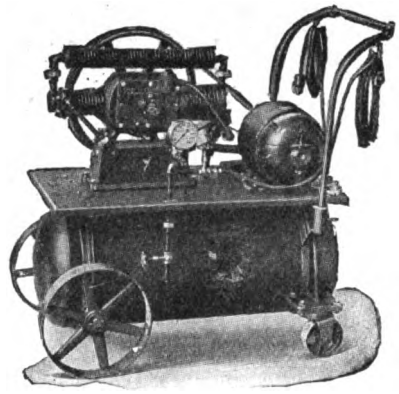
Live Dealers Wanted



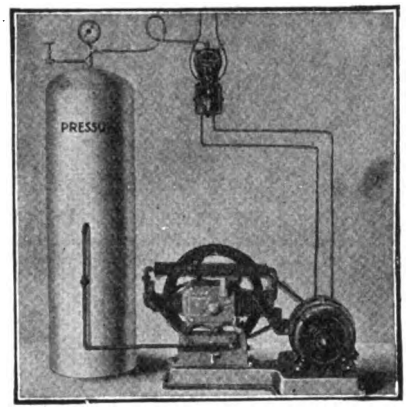
Raceabout Body $100.00

Top & Windshield $35.00 Extra

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TYPE No. 35. Portable with Tank.



TYPE No. 4. Stationary Automatic Air Plant.

GARAGEMEN!

Write and let us prove to your complete satisfaction that you can save 75% in wear, tear, trouble and expense; and 50% in cost of power by using the

U. S. TWO-STAGE AIR COMPRESSOR

Over two-thirds of our sales are to replace other air pressure outfits, because we prove by actual test the superiority of the U. S. Two-Stage principle. A postal will bring this proof to you.

Write and learn about our 30-day Trial and Unlimited Guarantee. Terms to suit your convenience.

THE UNITED STATES AIR COMPRESSOR CO.,

"Everything for the air Line." *Send for Catalog.*

6534 Carnegie Avenue, CLEVELAND, OHIO.

Firestone Accessories



They are built from the standpoint of men who make tires. They cover every possible motoring emergency—are easy to use and certain to work. Their dependability, backed by our energetic campaign in the Saturday Evening Post and other magazines, is creating a big demand among motorists right now.

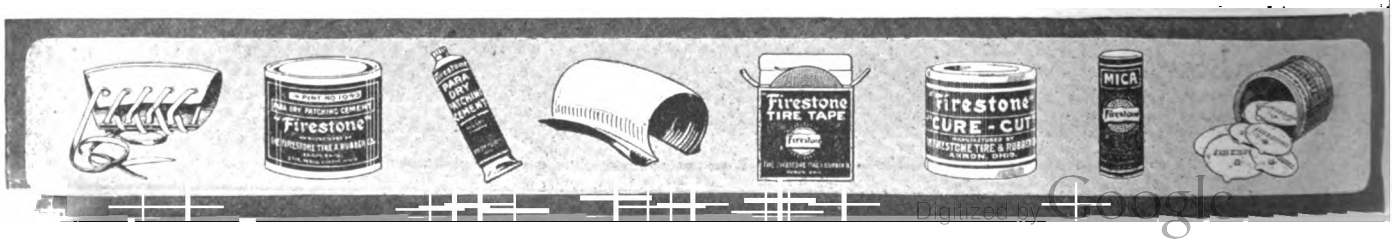
Be ready for the orders. Send for catalog. Here's a partial list

Hook-On Boots for Clincher or Straight Side Tires—Lace-On Boots—Blow-Out Patches—Cementless Tube Patches—"Cure-Cut" Cement—Air Pressure Gauges—Tire Tape—Tire Mica, etc.

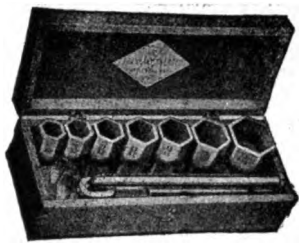
FIRESTONE TIRE AND RUBBER COMPANY

"America's Largest Exclusive Tire and Rim Makers"

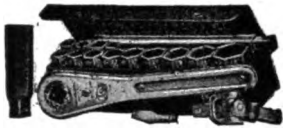
AKRON, OHIO—Branches and Dealers Everywhere



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No. 6 A $2.20



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The "Complete" Set



Pliers that are absolutely guaranteed.

Ask for Wrench Book No. 181B



Mossberg No. 7—The sturdiest 6 in. wrench 36c



Mossberg Auto Wrenches

8 in., 9 in., and 11 in. long



Thin model small adjusting wrenches

An Ideal Realized

For 18 years Mossberg Co. has faithfully tried to manufacture the most desired wrenches and tools in the best possible grade of material and labor and yet sell them

At Lowest Prices Consistent with an **Absolute Guarantee**

Judge for yourself if we have not succeeded in considerable degree.

Just write us your wrench troubles. We will be mighty glad to help you all we can.

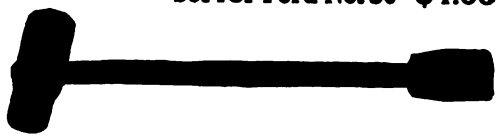
MOSSBERG
Means Wrench Service



Set for Ford No. 17 $2.00



Set for Ford No. 30 $4.00



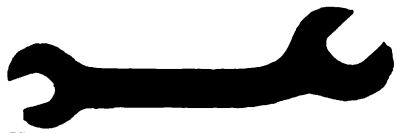
No. 630 for Fords 26c



Hub Cap Wrench for Ford, 10c



Ratchet Transmission Wrench for Fords, 50c

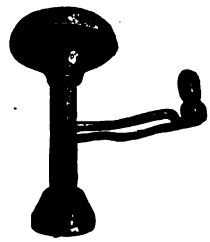


Kit Wrench for Ford 16c



Transmission Wrench for Ford, 12c

Any of these items sent prepaid on receipt of price, if you cannot get them at your dealers.



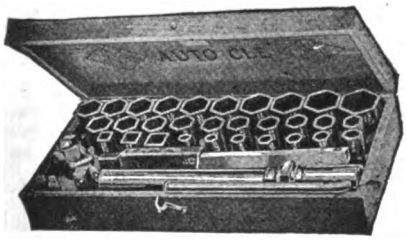
Valve Grinders for Ford, 25c

FRANK MOSSBERG CO.

ATTLEBORO, MASS.

LIST OF BRANCH OFFICES.
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Los Angeles, Cal., 504 Equitable Bldg.
Seattle, Wash., 214 Maritime Bldg.
San Francisco, Cal., 425 Underwood Bldg.
Waynesville, N. C.
Dallas, Texas, Box 927.

The Reliable Auto Cle, $10



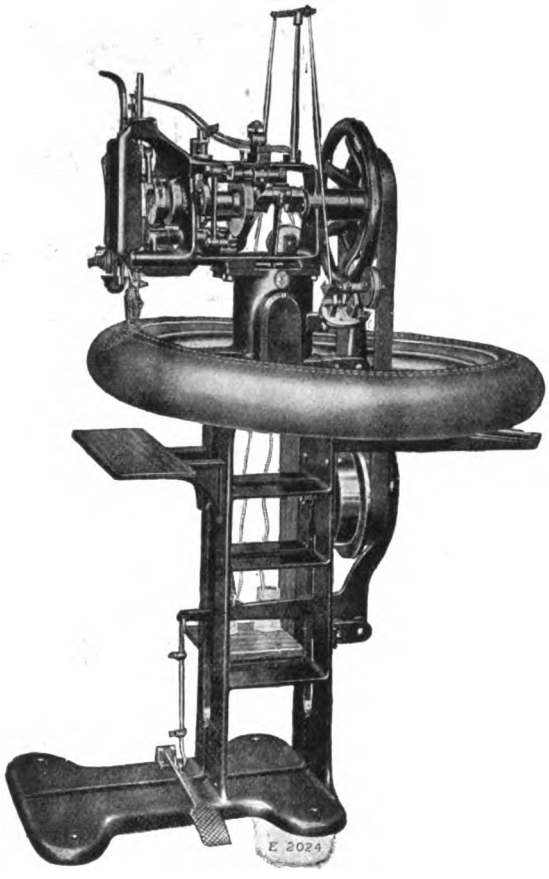


Thin model open end Engineers' Wrenches at really reasonable prices.





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Singer Machine No. 98-2

THE ONLY PRACTICAL

DOUBLE TREAD TIRE STITCHER

IS THE

SINGER SEWING MACHINE

This machine is especially designed for double tread tire stitching by the largest, the best known and most reliable makers of sewing machines in the world.

BUY THE SINGER

and the retreading of old tires will be quickly and efficiently accomplished with the strongest lock stitch that can be produced.

SATISFACTORY EVERYWHERE

WRITE PROMPTLY TO

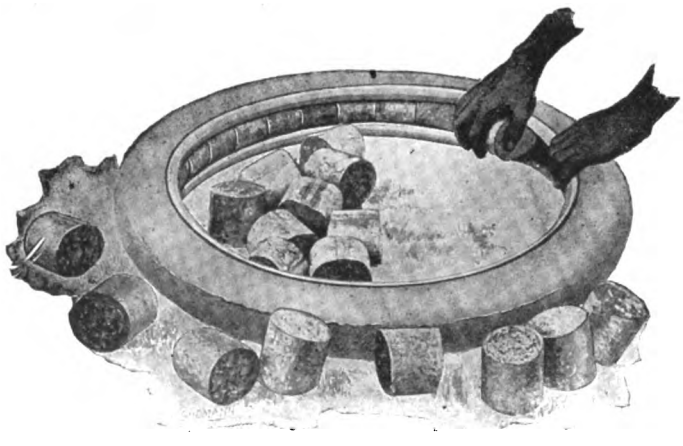
SINGER SEWING MACHINE COMPANY

Room 3508 Singer Building

NEW YORK CITY

NATIONAL RUBBER TIREFILLER

Ends All Tire Trouble—A Perfect Substitute for Air



Made of Pure Rubber, cut in small particles, treated, moulded and vulcanized by our special steam process. Fits all the different size casings. No inner tube and air used, eliminating the cause of all tire trouble. Stops the expense of buying, repairing and replacing inner tubes. Doubles the life of the casings—reducing the cost one-half. Can be transferred and re-transferred as often as is necessary. Has all the easy-riding qualities of the air-filled tire, but none of its faults and uncertainties. No waiting to use your car; it is always ready whenever you need it. Let us send you small sample and tell you more about it.

National Rubber Filler Company

208 College Street - - - Midlothian, Texas

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Atwater Kent

Ignition System



Standard Equipment with following Mfrs.

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ARGO
BELL
CHALMERS
ELCO
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MONARCH
NEW ERA
NORWALK
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PRATT
REGAL
ROSS
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SAXON
SCRIPPS-BOOTH
THOMAS
UNIVERSAL
VAN BLERCK (Marine)
VULCAN (Marine)
and many others

Mr. Dealer:

Suppose you offer your customers an ignition system which has already displaced the magneto on more than thirty representative cars—a system not only moderate in price. simple, absolutely dependable and easy to install, but which establishes a new standard of motor performance —a system which is an investment in safer, easier, and pleasanter car control and in battery insurance.

Can you imagine how quickly they will respond?

A single Atwater Kent installation has been known to produce dozens of sales as a result of its owner's enthusiasm.

If you sell automobile accessories your big opportunity is in the sale of equipment of known reputation. Atwater Kent Ignition needs no introduction for quality or permanence. For years it has ranked as the most efficient and high grade battery ignition system.

Comparatively few car owners, however, realize how much their cars would be improved by the installation of this scientific ignition system. No matter what car your customer drives, he is a good prospect for an Atwater Kent System. Get in touch with him and close the sale—send us his name and we will see that he is supplied with full information direct from the factory. We will help you close the sale.

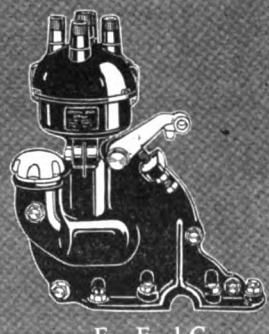
Pick out your fussiest and hardest-to-please customer today. Sell him an Atwater Kent Ignition System on a make-good basis; then decide for yourself whether there is an opportunity for you in Atwater Kent Ignition.

Atwater Kent Mfg. Works

4933 Stenton Avenue **Philadelphia, Pa.**



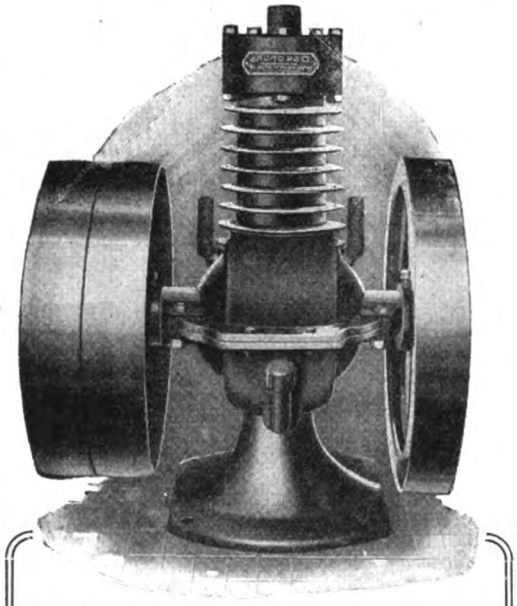
For Magneto Replacement



For Ford Cars

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It Puts the *air* in Rep*air* Shop!



The AU-TO is an absolute necessity in every garage, machine shop and repair plant. Our catalog tells what you want to know. Write for it—the sooner the better.

AIR for every purpose from inflating tires to cleaning the inaccessible parts of an engine,—air at any pressure up to 300 pounds and in quantities as desired,—you have it, at little cost and with no trouble, when you install

The AU-TO Air Compressor

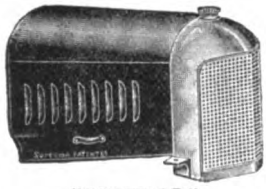
Small in Size and Price—Large in Capacity

It is all metal, air cooled, simple and practically fool-proof. It takes up very little floor space, it is light in weight and is guaranteed to do the work required of it.

THE AU-TO COMPRESSOR CO.

Dept. 62, Wilmington, Ohio, U. S. A.

"SUPERIOR" Radiators and Hoods for Ford Cars



"SUPERIOR" HOOD AND RADIATOR OUTFIT No. 120 $45.00 Complete

1916 "Superior" Products for Ford Cars *Lead Them All!*



"SUPERIOR" Regular Type Radiator Brass, $17.00

RADIATORS, LAMPS, HOODS, CROWN FENDERS, DEMOUNTABLE WHEELS, COWL, ZIG-ZAG AND VENTILATOR WINDSHIELDS, RADIATOR OUTFITS, COMMERCIAL FENDERS, LAMP BRACKETS, Etc.



"SUPERIOR" V-Type Honey-Comb Radiator Brass, $34.70 Nickel, $38.00

Superior Products Are Standard—
Enormous Daily Sales Prove It!

MR. FORD DEALER

SEND FOR NEW ILLUSTRATED SHEET.

We Are Ready To Quote You.—GET OUR PRICES!



"SUPERIOR" Patented Two New "Sure-Fit"

Type "A" fits 1912-13-14 Fords
Type "B" fits 1915-16 Fords
$8.00 Complete

Superior Lamp Mfg. Co. 136 W. 52 d St. N.Y. WRITE TO-DAY.

ALL MAKES OF RADIATORS BUILT AND REPAIRED.

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THE LARGEST AND MOST COMPLETE LINE MADE



We make several different styles, enabling us to fit all standard makes of cars.

They will stand a more severe shock than any other and are made of specially heat treated stock. The bars can be straightened if bent, and are handsomely finished in black japan, polished brass or buffed nickel plate.

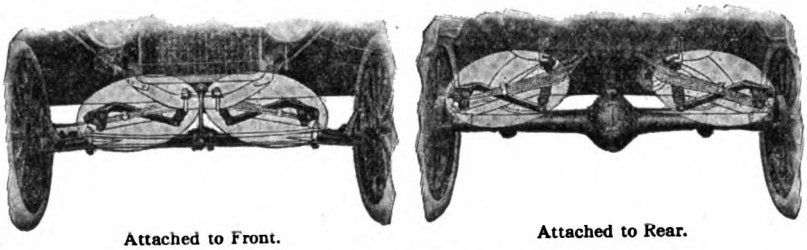
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FLEXLEVERS

FOR FORDS

Sold on 30 days trial—Guaranteed for Life of the Car

Make the easiest riding Ford car possible



Attached to Front. Attached to Rear.

Attached in 30 minutes without removing wheels

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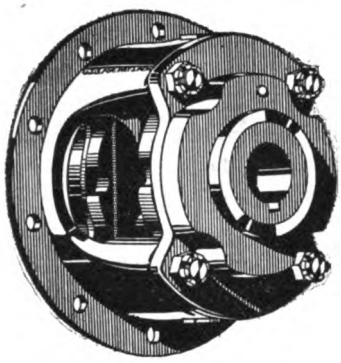
L. P. HALLADAY COMPANY

STREATOR, ILL., U. S. A.

Write for catalog and circulars. Address Dept. D.

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If You Aren't Handling the

BAILEY Gearless Differential

Dozens—yes, hundreds—of people in your territory are ready buyers. We know it from the large number of inquiries we get from all over the country through our national advertising. We know from our sales, doubling and tripling as the months go by.

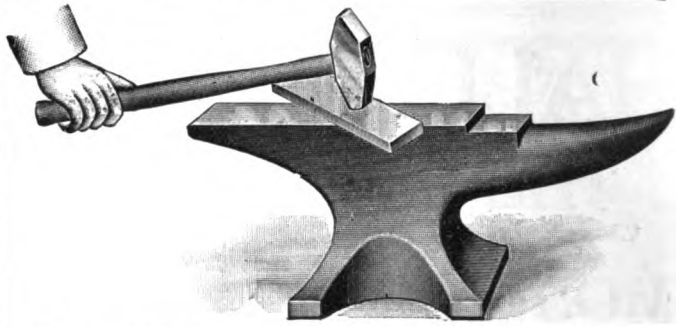
Think of it! Slipping, skidding and sidesway practically eliminated. Power always delivered just where it's needed. Thousands in use.

If you haven't already done so, WRITE US—or your nearest jobber—TODAY.

GEARLESS DIFFERENTIAL CO.,
866 WOODWARD AVE., DETROIT, MICH.

Jobbers Carrying Stock:

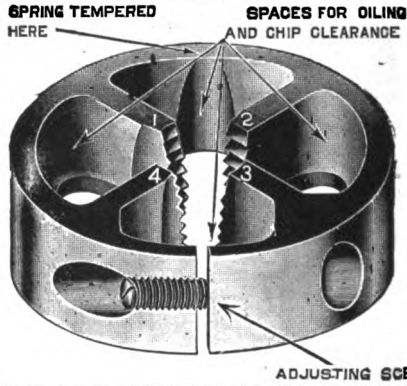
Chanslor & Lyon Co., San Francisco, Cal., and Branches
Weinstock-Nicols Co., San Francisco and Branches
Auto Equipment Co., Denver, Colo., and Branches
Post & Lester Co., Hartford, Conn., and Branches
Henry Horton, New Haven, Conn.
Elyea-Austell Co., Atlanta, Ga.
Motor Car Supply Co., Chicago, Ill.
Marshall Field & Co., Chicago, Ill.
Hippee Motor Supply Co., Des Moines, Iowa
Tri-City Electric Supply Co., Davenport, Iowa
Southwick Auto Supply Co., Topeka, Kansas
C. A. Hagberg Rubber Co., Wichita, Kansas
Tisch Auto Supply Co., Grand Rapids, Mich.
W. S. Nott & Co., Minneapolis, Minn.
Janney, Semple & Hill Co., Minneapolis, Minn.
Reinhard Brothers Co., Minneapolis, Minn.
Minneapolis Iron Store Co., Minneapolis, Minn.
Williams Hardware Co., Minneapolis, Minn.
C. J. Smith & Co., St. Paul, Minn.
Nicols, Dean & Gregg, St. Paul, Minn.
Electric Manufacturing Co., St. Paul, Minn.
Kansas City Automobile Supply Co., Kansas City, Mo.
Motor & Machinists Supply Co., Kansas City, Mo.
Motor Car Equipment Co., New York City, and Branches
James G. Barclay, Inc., Buffalo, N. Y.
Wood Auto Supply Co., Inc., Utica, N. Y.
Omaha Rubber Co., Omaha, Nebr.
Paxton & Gallagher, Omaha, Nebr.
U. S. Automobile Supply Co., Omaha, Nebr.
M. & M. Supply Company, Cleveland, Ohio
Pennsylvania Rubber & Supply Co., Cleveland, Ohio
Burwell Smith Supply Co., Oklahoma City, Oklahoma
Ballou & Wright, Portland, Ore., and Branches
Specialties for Ford Cars Co., Philadelphia, Pa.
Congdon & Carpenter Co., Providence, R. I., and Branches
Chemi Company, Richmond, Va., and Branches
L. & L. Motor Supply Co., Sioux Falls, S. D.
H. F. Brownell & Co., Sioux Falls, S. D.
Ferris-Dunlap Auto Supply Co., Dallas, Texas
Tri-State Motor Company, El Paso, Texas
Capital Electric Co., Salt Lake City, Utah, and Branches
Spokane Cycle & Auto Supply Co., Spokane, Wash.
Kilmer & Sons Co., Spokane, Wash.
Morley-Murphy Hardware Co., Green Bay, Wis.
Julius Andrae & Sons Co., Milwaukee, Wisconsin
Philip Gross Hardware Co., Milwaukee, Wis.
Shadbolt & Boyd Iron Co., Milwaukee, Wis.
Meadows Price Co., Inc., Roanoke, Va.
James S. Remick Co., Sacramento, Cal.
Walkerville Hardware Company, Ltd., Walkerville, Ont.
John Millen & Son, Ltd., Montreal, Que., and Branches
Morris Russell Co., Ltd., 75 Curtain Road, London, E. C.



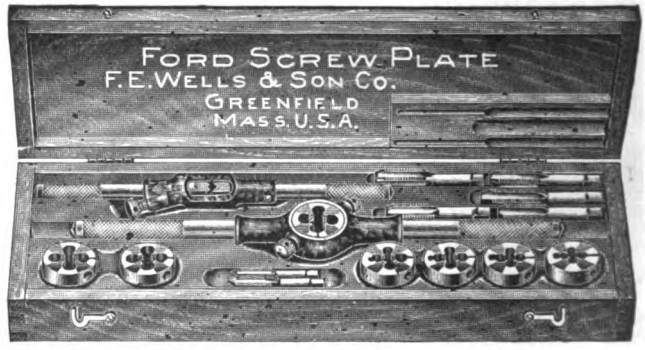
O. K. HAMMERED DIES



FROM FLAT BAR STEEL TO FINISHED BLANK.



THE O. K. PATENT ADJUSTABLE DIE
Patented Dec. 31, 1912



This is One Good O. K. Screw Plate Set.
There are more than 50 others to select from.
Send for Catalog 7-A.

F. E. WELLS & SON CO., GREENFIELD, MASS., U. S. A.

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10% increase

ADVANCE in TIRE PRICES

Owing to the largely increased cost of raw materials, we are compelled to advance our prices 10% on the standard sizes of Goodrich Automobile Tires and Tubes, also on Goodrich Wireless Truck Tires, Goodrich Motorcycle Tires and Tubes and Goodrich Automobile Rubber Accessories effective at once.

Occasional or odd sizes of Goodrich Automobile Tires and Tubes advanced will be shown on our price list.

Despite the many advances made by others we have held to a conservative increase, in line with our policy to maintain "Listed" Prices for

THE B. F. GOODRICH CO.
AKRON, OHIO

Chicago Branch: 1925 Michigan Ave.

PRICES on pneumatic automobile tires, all types of solid and cushion motor truck tires and pneumatic motorcycle tires are advanced 10% on standard sizes. This advance [illegible]

Wise Motorists Will

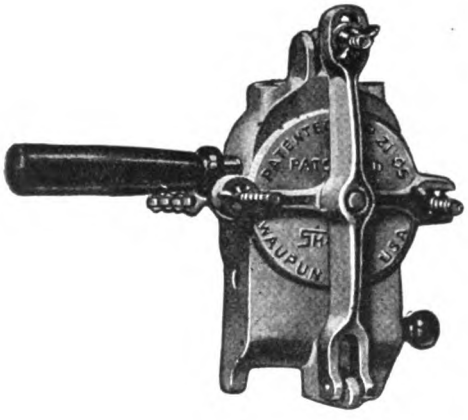
SAVE THEIR TIRES and REDUCE TIRE BILLS in spite of the increased tire prices, by taking care of their tires. They will seal up the small holes with a Shaler Vulcanizer and prevent the exposure of the fabric, keep water from working in and causing blow-outs.

Now, in the face of this increase of tire prices, motorists will save more money than ever with

SHALER Vulcanizer

The Shaler Vulcanizer is simple and easy to use. Any motorist can easily and quickly vulcanize his tires with a Shaler and make the repair permanent and the strongest part of his tire. It requires no watching or regulating. Has no exposed flame. You do not have to fear overcuring or undercuring the rubber. The Shaler has an automatic heat control which provides the exact heat for perfect vulcanization—no more—no less.

WRITE TO-DAY for free copy of Tire Book, "Care and Repair of Tires."



This Is the Shaler Vul-Kit $3.50

It will treble your mileage by keeping your casing cuts and holes sealed up and saves you on tube repairs.

OTHER SHALER MODELS:

ELECTRIC	TUBE KIT	FORD KIT
For Home Garage $12.50	$2.00	$2.75

ASK YOUR DEALER!

Largest Manufacturers of Vulcanizers in the World

C. A. SHALER CO., 801 Fourth Street, Waupun, Wis.

Canadian Distributors:—
JOHN MILLEN & SON, LTD., TORONTO, WINNIPEG, MONTREAL, VANCOUVER

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The Tire Dealer's Problem Is *Not* "Who Makes the Most Tires," But "Who Makes the BEST Tires" —The Tires which give his Customers the Most Mileage

No automobile owner buys a tire for any purpose other than that of utility. It is the tire's performance that counts with *him* and *you*—not its color, nor how many thousands of these particular tires have been built.

You don't care how many tires we make—but we want you to know
WE MAKE THEM GOOD

Miller

"Geared to the Road"

TIRES

are built by the exclusive Miller method, which retains all the life-giving wax and oil in the cotton fabric—the backbone of the tire—and safeguards the natural resiliency and toughness of the rubber. It welds them into one cohesive and road-defying unit.

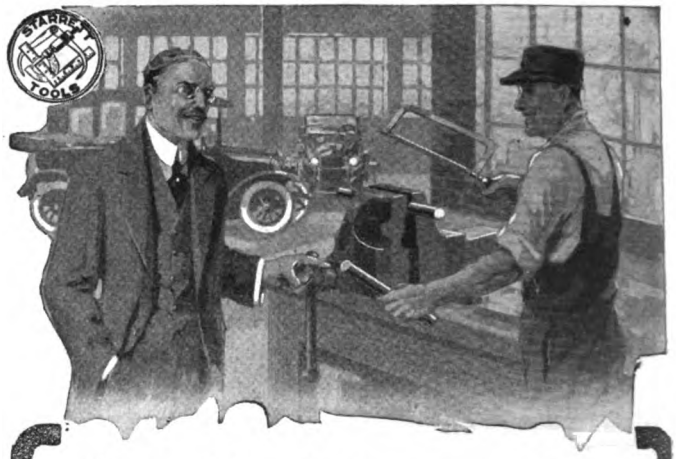
Miller has no quarrel with any manufacturer on the subject of mere volume. Miller does not claim to build more tires than other manufacturers. But we do insist that every Miller tire is the best possible answer to any controversy on excess **mileage,** because every Miller tire gives the motorist the **Greatest Possible Average Mileage.**

And every motorist who uses Miller tires and every dealer who sells them knows this to be true!

Let us tell you more about Miller tires and the Miller tire selling plan. Write at once before some other dealer gets the territory.

It's Because We Don't Make the MOST That We Do Make the BEST

THE MILLER RUBBER CO.
AKRON, OHIO U. S. A.



"Yes, Sir, It Pays to Use a Good Hack Saw"

Look at that clean cut, boss. I put in just the right blade for the job, and the blade's as good as when I started. I save time, get better work and longer service from my hack saws by using

Starrett Hack Saws



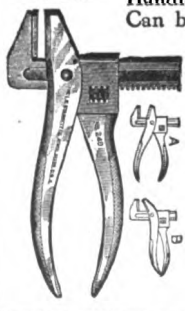
The motorist who makes his own repairs *needs* a good tool. The skilled mechanic does better work—easier work—with a high-grade tool.

Starrett Tools have a world-wide **reputation** which Starrett Hack Saws help to maintain.

There are 21 styles for every shape and kind of metal; 8 styles of frames from which to meet your special requirements.

The STARRETT Expansion Pliers $2.00

Adjustable jaws to fit any shape up to 1¼ inch. Handles always right to get a powerful grip. Can be used as wrench or pliers. The handiest tool for garage, car or home.



Write for 320-page free tool catalog No. 20-DC

Dealers will find it profitable to get our catalogs and terms. We sell direct to dealers.

THE L. S. STARRETT CO.
"The World's Greatest Tool Makers"
ATHOL, MASS.
New York London Chicago

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You positively *need* Micro Piston Rings

To keep the explosive mixture *inside* and surplus oil *outside* the combustion chamber.

To get full power without wasting gas and oil.

To lessen carbon deposit, smoky exhaust, fouling and failure of spark plugs.

To keep cylinders tight and valves clean without frequent regrinding.

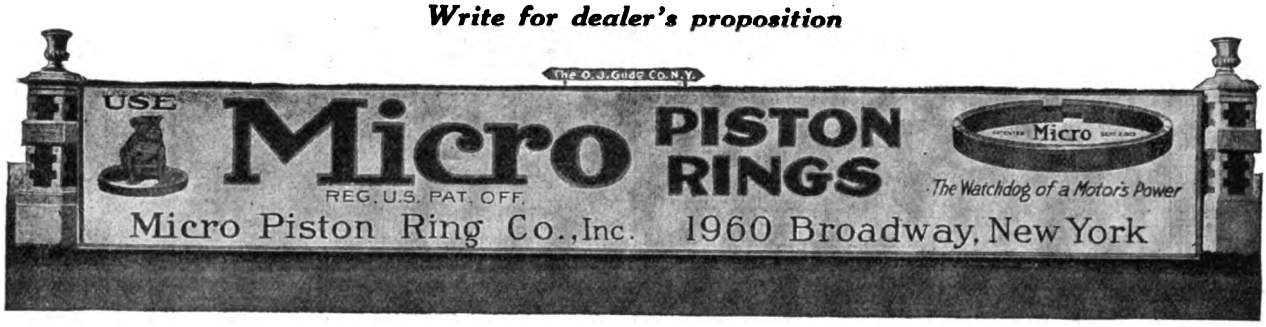
Three distinct bearing surfaces in firm and uniform contact with the cylinder wall in every direction, and our double sealed joint that stays tight when old as well as while new, make Micro Two-part Pressure-tight Rings quickly repay their cost in bettered service and actual savings.



Throwing out leaky plain rings and putting in Micros often brings worn cylinders back to original efficiency without the expense of reboring.

Micro Rings never break in fitting or lose their resilience in service

Write for dealer's proposition



16

Edelmann Specialties of Merit

HIGHEST GRADE — CHICAGO — E. EDELMANN & COMPANY — AUTOMOBILE SPECIALTIES

The Life of the Auto Accessory Trade

LOOK FOR THIS TRADE MARK

MR. LIVE DEALER: Your Jobber carries "Edelmann" Accessories! Ask him and see if he doesn't!!

This is the "JUMBO GREASE GUN"

Needs No Introduction. A "Regular" Grease Gun. Holds 15 oz. grease and is always "On the Job."



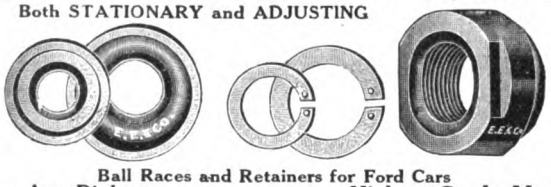
Retail Price $2.25

It's honestly made—all brass and lots of it.

We make and are in position to deliver

FORD BALL RACES, RETAINERS, CONES

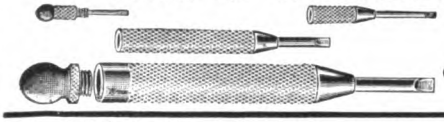
Both STATIONARY and ADJUSTING



Ball Races and Retainers for Ford Cars

Prices Are Right — Highest Grade Material

FOUR IN ONE SCREW DRIVER



The Handiest Ever.

Retail Price, 50c

Own one and realize its good points.



This is that well-known

No. 47 AUTOMATIC AIR CHUCK

Dealer's Net Price, 75c.

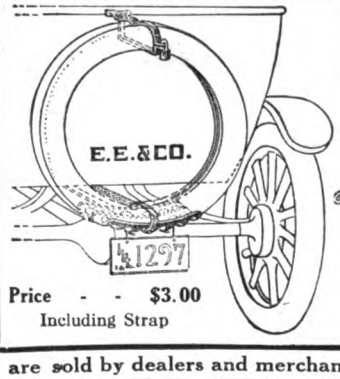
Wanted by all Tire Shops, Garages, Free Air Stations. Supply Automatically! It is Guaranteed.

This is the "BREAK-NOT" Battery Syringe Hydrometer



Users say, "What a big improvement over others! Yet they cost no more."

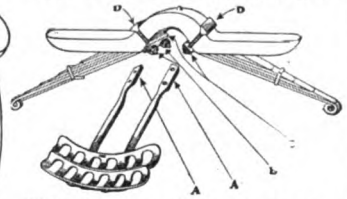
RETAIL PRICE is $1.00, prepaid to any part of United States or Canada.



Price - - $3.00

Including Strap

This is the *Last Word* in TIRE HOLDER Construction.



This shows method of attaching the No. 400 Tire Holder.

Our 1916 Catalog tells about some 200 articles we make. All are sold by dealers and merchants who handle auto accessories.

E. EDELMANN & CO., - - - - 343 E. Ohio Street, Chicago, U. S. A.

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"NORMA"

BALL BEARINGS

(Patented)

Dependable ignition—dependable lighting — dependable starting — these contribute mightily to the pleasure-giving, comfort-giving, service-giving capacity of any car. And remember this—the electrical accessories upon which these things depend are no better than their bearings—they "make good" only so long as their bearings stand up to the work.

Practically all high-grade magnetos, lighting generators and starting motors made in America—those used in the better-class cars—carry "NORMA" Ball Bearings. Which is the best of reasons for believing that any other electrical accessory will perform better if equipped with "NORMA" bearings. Try it.

Want the Catalog?

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust, Combination Bearings





EVERY accessory dealer, every repair shop, should carry these items of the "Chemically Correct" line.

SE-MENT-OL

The original self-acting Radiator Cement

The simple science of it is backed up by the practical experience of the garage man. You pour it in. It "finds the leak and fixes it." No tools, no tinkering, no removal of radiator. A lasting repair in fifteen minutes. **Retail price 75c.**

CARBONOX

The "Chemically Correct" Carbon Remover



Loosens the carbon and it is blown out thru the exhaust. It is fatal to engine efficiency to allow carbon to accumulate in a cylinder until drastic mechanical methods are required to remove it. By using Carbonox every two weeks the cylinders can be kept sweet and clean and the engine will be always running at its best.

Retail price 75c.



PIONEER

Valve-Grinding Compound

This is one of our best items and a top-notcher in quality. Uniform in composition, and grinds the valve quickly down to a smooth firm seat. Contains no ground glass nor powdered emery. Sold in several styles of container, one of the most popular of which is the double end box shown herewith and containing 2 ounces of coarse and 2 ounces of fine. **Retail price 25c.**

Other "Chemically Correct" Items:

Skalex—Radiator Cleaner.
Norwesco Graphite Coating.
Thermite—Anti-Freeze.
Pioneer Rim & Gasket Shellac.
Pioneer Clutch & Brake Compound.
Norwesco Spring Leaf Compound.
Kl-Ens-Ol—Liquid Soap.
Norwesco Hand Soap.
Norwesco Prussian Blue.
Brass-Kote—Air Drying Enamel.
Norwesco Retouching Lacquer.
Never-Burn—Engine Enamel.
Norwesco Leather Top Dressing.
Norwesco Mohair Top Dressing.
Norwesco Upholstering Dressing.
Norwesco Auto Top and Lining Dye.
Norwesco Ford Painting Outfit.
Norwesco Color Varnishes.
Norwesco Aluminum Bronze.
Tire-Lac—Tire Paint.

THE NORTHWESTERN CHEMICAL CO.

MARIETTA, OHIO

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The Garageman's Best Friend

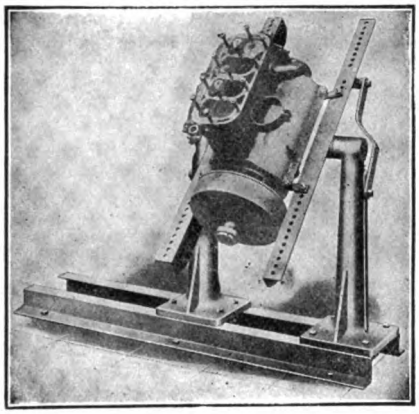
is the Perfectly Get-atable

"EVERYWAY" ENGINE STAND

for working on and mounting all types and sizes of motors.

At every angle you set this stand, the engine is locked rigidly by the two side braces, supporting the engine solidly, without shake or any spring.

The "Everyway" is thoroughly constructed of steel and cast iron, making it safe and



IMPOSSIBLE FOR IT TO BECOME SHAKY

Every garage, large or small, is absolutely in need of one or more "Everyway" Stands.

A cross bar with universal adjustments is part of the equipment for mounting three point suspension motors.

Write at once for catalog and prices.

The United Engine & Mfg. Co.

Hanover, Pennsylvania

Form 1204

CLASS OF SERVICE	SYMBOL
Day Message	
Day Letter	Blue
Night Message	Nite
Night Letter	N L

If none of these three symbols appears after the check (number of words) this is a day message. Otherwise its character is indicated by the symbol appearing after the check.

WESTERN UNION

TELEGRAM

NEWCOMB CARLTON, PRESIDENT

GEORGE W. E. ATKINS, VICE-PRESIDENT BELVIDERE BROOKS, VICE-PRESIDENT

CLASS OF SERVICE	SYMBOL
Day Message	
Day Letter	Blue
Night Message	Nite
Night Letter	N L

If none of these three symbols appears after the check (number of words) this is a day message. Otherwise its character is indicated by the symbol appearing after the check.

EAST ORANGE, N. J.

RECEIVED AT (D. L. & W. STA.)

TEL. ORANGE 842

92 NY DX 105 COLLECT BLUE, COUNT 2 COMMAS, 1 DOT AND ONS 1.

BX ..... LOS ANGELES CALIF. 11:45 A.M. JAN. 14, 1916.

SIMMS MAGNETO COMPANY.

EAST ORANGE, N.J.

STOCK 1916 MAXWELL "25" TOURING CAR RUNNING UNDER A A A SANCTION COMPLETED TOTAL MILEAGE OF 22,022.3 MILES OVER THE ROAD ON THE MORNING OF JANUARY 5TH THE SIMMS MAGNETO AND SIMMS HUFF GENERATOR PERFORMED PERFECTLY THROUGHOUT ENTIRE DISTANCE AND WERE IN PERFECT CONDITION AT COMPLETION OF TEST CAR WAS STOPPED VOLUNTARILY BY US WAS STARTED WITHIN 50 SECONDS AFTER STOPPED AND STARTER WORKED PERFECTLY CAR HAS BEEN RUN 2,000 MILES SINCE THE 5TH WITHOUT TOUCHING MAGNETO GENERATOR STARTER OR ANY OTHER PART OF MACHINE.

LORD MOTOR CAR COMPANY.

10:30 P.M.

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Schrader



FREE

AIR IS FREE—
Rubber Costs Money—
RIDE ON AIR

When the air in your tires falls below a certain pressure you no longer are riding on air, but **on rubber.**
Measure your air with a

Schrader

UNIVERSAL TIRE PRESSURE GAUGE

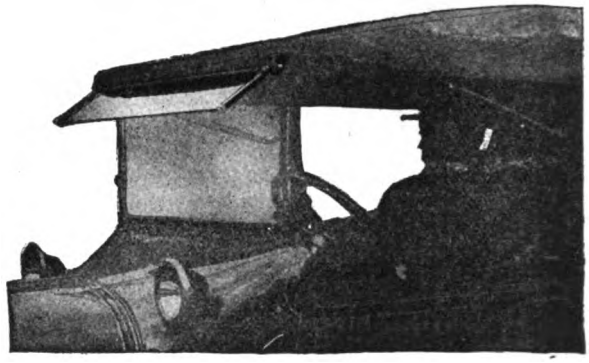
and save your tires.

Price, $1.00

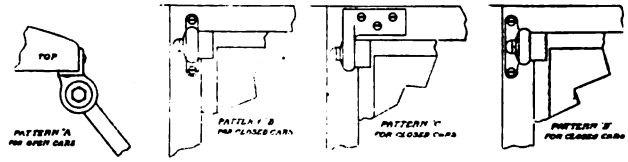
at your dealer's, or

A. SCHRADER'S SON, Inc.
783-793 Atlantic Ave. Brooklyn, N. Y.

THIS STORM SHIELD SELLS BECAUSE IT FILLS A REAL NEED



Licensed under Hanlon Re-issue Patent



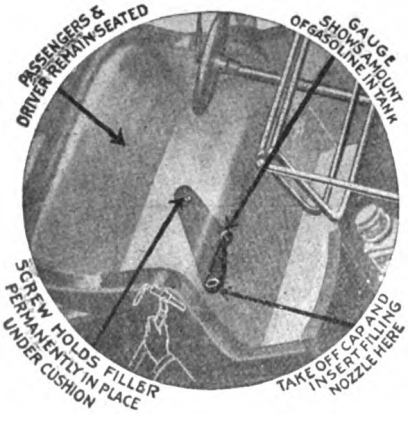
"ROAD-VIEW" SHIELD VISOR

This accessory is a great seller because it makes driving safer and more comfortable by modifying light reflections and keeping rain, snow or sleet from cutting off the view of the road. It is made of excellent plate glass with quality mountings, fastens to the front bow of the top and is adjustable to any desired angle—also made for coupes, limousines, winter tops, etc.

State how wide and how deep over all you want it **$8.00**

Prompt Deliveries Now ***Liberal Discounts***

JOSEPH N. SMITH & COMPANY
DETROIT, MICHIGAN



A FAST WINTER SELLER FOR FORD AGENTS.

THE NEW INVENTION, *"Fillometer."* Every Ford Owner is a Prospect.

The ***"Fillometer"*** is a Combined Gasoline Tank Filler and Gasoline Gauge.
Anyone Can Install it in 2 Minutes with a Screwdriver.

No More Crawling Out and In When Filling with Gasoline.
A Great Comfort Particularly In Stormy Weather.

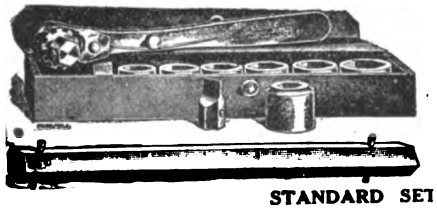
If You Once Install a *"Fillometer"* You'll Never Part With It

THE GAUGE SHOWS CORRECTLY HOW MUCH GASOLINE IS IN THE TANK.

Agents, Write For Particulars.

APEX ELECTRIC MFG. CO.,

1410-12 W. 59th STREET, CHICAGO, U. S. A.



LANE'S "UNIQUE" RATCHET WRENCH

Machine made throughout. Made of the best material obtainable. The sockets in both the Standard and Ford Sets are turned from Bessemer steel and case hardened and are warranted not to break or spread.

Has no equal for close work.

STANDARD SET contains:

1 Handle 7 inches in length,
2 Screwdriver Bits,
7 Sockets to fit semi-finished hexagon nuts as follows:
U. S. Standards from ¼ inch to ½ inch.
A. L. A. M. Standards from 5-16 inch to 11-16 inch.
Cap Screw Heads from 5-16 inch to 5-8 inch.

Price, in leather case, - - - - - $2.50

FORD SET contains:

1 Handle 7 inches in length.
2 Screwdriver Bits,
1 Extension Bar 7 inches in length,
6 Sockets to fit all nuts and bolt heads on Ford car, including the cylinder head.

Price, in leather case, - - - - - $3.00

Sold by dealers everywhere.

WILL. B. LANE, MANUFACTURER **180 N. Dearborn Street, CHICAGO, ILL.**

The Trade Is Cautioned Against Selling Infringements On My Patent.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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What Standardization Means to Automobile Buyers

IT means VALUE—the utmost in efficiency per dollar of cost. Just to the extent that a car is standardized does the buyer's dollar approach the maximum of purchasing power.

Standardization means definite, proved, quality, known manufacturing costs and reduced selling costs.

Of the million autos that will be sold in 1916, 75% will be standardized cars selling for less than $1,000 each. This remarkable American achievement is the result of standardizing motors, starters, carburetors, speedometers, ignition and lighting systems, transmissions, differentials, tires, wheels, axles, rims, bearings, etc.

Finally the upholstery has been standardized by the almost universal adoption of

Rayntite Fabrikoid top material, single or double texture, is guaranteed one year against leaking, but built to last the life of the car.

Craftsman Fabrikoid, the artistic and durable upholstery material for furniture and home decoration, is sold by the yard in leading department stores.



DU PONT FABRIKOID
REG. U. S. PAT. OFF.

MOTOR QUALITY

40% of all the 1915 cars sold were upholstered in this proved, guaranteed material, and in 1916 the total will be nearly 60%.

Fabrikoid is the only standardized automobile upholstery. It wears better than coated splits (commonly sold as "genuine leather") and has the artistic appearance and luxurious comfort of the best leather.

To get the most for your money, buy a standardized car.

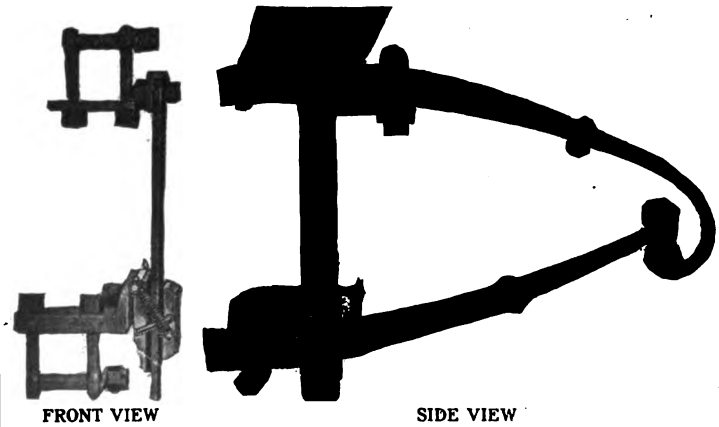
DUPONT FABRIKOID COMPANY, - - **Wilmington, Del.**
Factory, Newburgh, New York **Canadian Factory and Office, Toronto**

PAINT YOUR OWN CAR—Save $25 to $50

Our big, 36-page book, "THE CAR BEAUTIFUL," is the recognized authority on the Home Painting of Motor Cars. After reading it, you yourself, without previous painting experience, can successfully repaint your car or only revarnish it, or enamel the hood and fenders, enamel or silverplate the lamps, etc., redress the top and cushions, paint the wheels a different color—in fact, do anything you otherwise would have to pay a professional painter big money to do.

During the past eight years, thousands of motorists have successfully painted their own cars with our materials. The Arsenal System of repainting Motor Cars (for novices) is one of the big successes of the industry. DON'T SPEND A CENT FOR PAINTING MATERIALS UNTIL YOU HAVE READ THIS BOOK. Send for your copy today. It is FREE.

ARSENAL VARNISH CO., 2501 4th Ave., Rock Island, Illinois



FRONT VIEW SIDE VIEW

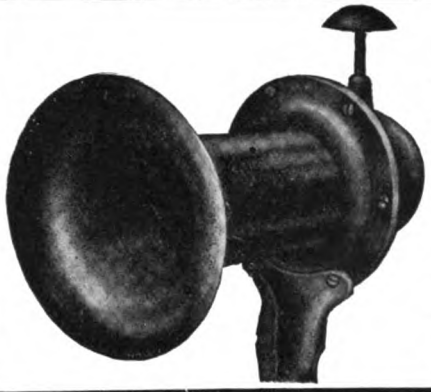
THE car springs with the shock absorber attached are like a compound bow and arrow of great power. When the springs rebound there is a brake on the arrow or rod of the shock absorber, resulting in an easy upward movement. The shock absorber will outlast the car.

Simpler, more reliable than any other, requires no care. Money back guarantee. They are cheaper than car repairs, wear and tear, besides the ease of riding.

Wanted—Business-Getting Agents.

FRICTION SHOCK ABSORBER CO., Kingston, N.Y.

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WONDERTONE WARNING SIGNAL

Truly a wonder signal that gives you the right of way in any traffic. Gives a long, penetrating, powerful, commanding signal, or a sharp, instantaneous crash for ordinary signaling.

DEALERS:

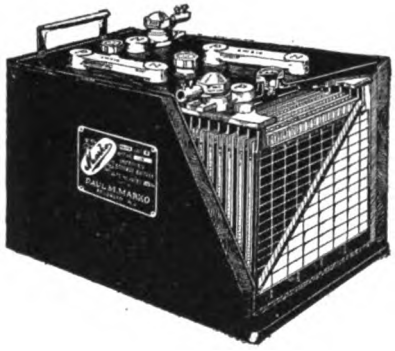
How about the "Wondertone" in your territory? It's a business maker and the sale profits count up fast.

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Write for prices.

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The MARKO Terminal Connector

(PATENT APPLIED FOR)

enables the replacement, without difficulty, of Starting and Lighting Storage Batteries, used on the various makes of gasoline cars.

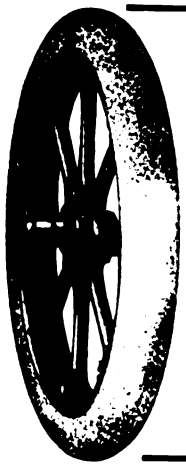
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DESCRIPTIVE CIRCULAR ON REQUEST.

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WHICH IS LIGHTER—STEEL OR WOOD?

Wood in most cases, but when it comes to automobile wheels, *Steel!*

PARKER-HYDRAULIC PRESSED STEEL WHEELS FOR FORDS

are formed from two pieces of steel plate and are unbreakable. Yet they weigh but half as much as wooden wheels with demountable rims. Of course they have demountable rims—the easiest and quickest demountable rims made. Tires can be changed in half the time required for bolt and wedge types, and they cost but $19.75 per set of four, with extra tire carrying rim, hub bolts, brace wrench, etc., complete.

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The Great Road Builder

In every part of this great country the **King Drag** can be used to advantage on country roads for putting them into proper shape at a moderate expense. We have brought out a pamphlet which gives full particulars of the use of the **King Drag** and how to make it.

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We will send **a sample free of charge** to anyone desiring to see it, and will supply the booklet at **a dollar a hundred.**

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MOTOR VEHICLE PUBLISHING COMPANY - 71 Murray St., New York City

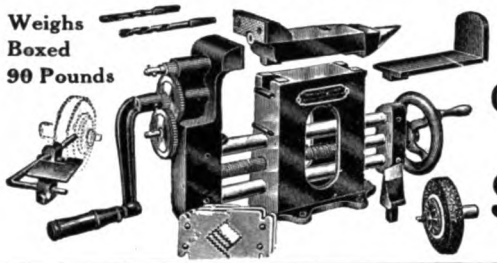
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Try this Repair Outfit

At Our Expense. Every GARAGE, PUBLIC or PRIVATE, needs this BIG, STRONG, COMBINATION OF TOOLS called the

STEWART HANDY WORKER

Weighs Boxed 90 Pounds



Price Complete Only $12.50

If you bought all the tools you get with it, of the same high quality, strength and durability, and the equipment to operate them, they would cost you at least $25 at wholesale price.

A complete, compact workshop that you can attach to a table or bench anywhere about the garage and make it pay you big profits.

NOTE WHAT IT INCLUDES

A strong, practical anvil; powerful vise, up to 4½ inches, width of jaw 4 inches; a sure-grip steel pipe vise, takes up to 1½ inch pipe; a Corundum grinding wheel, 5 inches x 1 inch; a two speed drill press with 2 drills; a metal cutting wedge and driving mechanism of three speeds—direct, 4 to 1 and 16 to 1—easily regulated by changing the handle grip. It operates grinding wheel, buffing wheel and many other similar tools. With the Stewart "Handy Worker" you can do much of your own car repairing, etc., blacksmith work, home repairing, make plumbing repairs, keep knives and other cutting tools sharp and in good working trim.

READ OUR SPECIAL OFFER

Send for one of these great combined outfits today with the understanding that if you don't like it in every way you can ship it back and we will return every cent you paid out. Of all the thousands shipped, not one customer has made a single complaint. It pleases every customer, but our standing offer to return every cent paid out holds good to each purchaser.

SEND ONLY $2.00 WITH YOUR ORDER and pay the balance when it arrives. ORDER TODAY OR WRITE FOR BOOKLET.

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SPITLER PUNCTURE PLUGS

The Spitler Puncture Plug repairs punctures in automobile inner tubes quickly and without the use of cement, assuring a safe, permanent and economical repair.

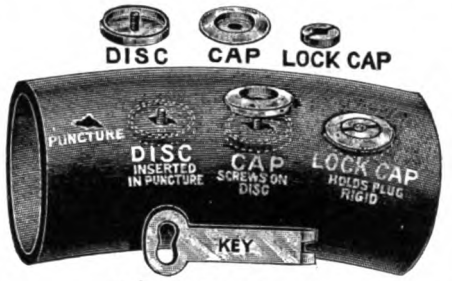
The operation is so simple that a lady can make the repair without soiling her hands.

The plug can easily be taken out and used over again. A permanent repair in one minute.

To insert The Spitler Puncture Plug into the puncture, wet the tube before inserting plug.

Place the base of plug on edge and by stretching the tube at point of puncture, the plug slides in like a button in your coat. Then place cap over discs and screw lock cap firmly.

The Spitler Puncture Plug positively cannot cut the tube nor injure the fabric of the shoe for the principle is the same as the air valve on the tube.



Write for Circular.

Price—Four to a Set, $1.00.

(Patented May 11th, 1915.)

SPITLER PUNCTURE PLUG CO., Inc., United States Rubber Building, 1790 Broadway, NEW YORK CITY

SEBASTIAN LATHES HIGH QUALITY LOW PRICES

If you delight in good tools, you will delight in Sebastian Lathes. For 25 years we have built lathes, and lathes only, employing skilled labor always, and improving equipment and machinery every year. Sebastian Lathes are

STANDARD FOR QUALITY---LOW IN PRICE

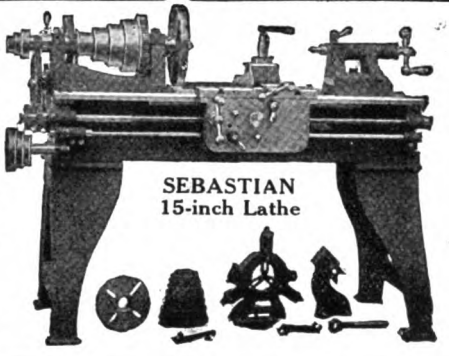
They are accurate, economical, simple and durable. Many re-orders and voluntary letters from users of Sebastian Lathes prove this.

The Sebastian reputation is back of every Sebastian Lathe. You are judge and jury when you buy a lathe. We are not satisfied until you are. Look over the complete line in our new catalog. It shows Lathes for general repair work, garage and automobile work, etc.

When you buy a lathe, say "Sebastian"

Address (for the catalog)

THE SEBASTIAN LATHE COMPANY, 108 Culvert Street, Cincinnati, Ohio



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Add $250.00 A MONTH EXTRA To Your Business

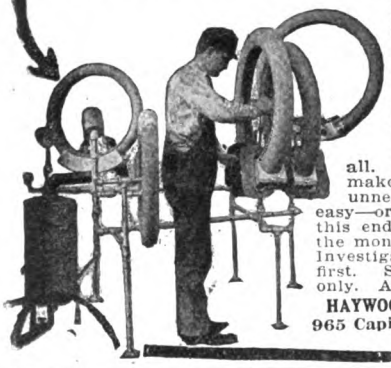
REPAIR AUTOMOBILE TIRES

Sounds like a whole lot of money to clear extra every month. Seems almost impossible, but that is what hundreds of men are doing who have added a Tire Repair Department to their business. **The investment is small, the profit large** and **returns quick and all cash**, besides the demand for tire repairing and retreading is constantly growing. Your garage is by no means complete, your business is not as profitable as it can be until you get in on the Tire Repairing and Vulcanizing end.

THE HAYWOOD TIRE REPAIR EQUIPMENT

Answers all the requirements to successfully handle this end of the business. With it and a little business judgment, success is certain. Every year adds thousands of new auto owners. They are looking more and more to economical tire service. The day of discarded tires is over, the Haywood Equipment makes this possible.

HERE IS YOUR OPPORTUNITY



Either as a side line to your present automobile business or as a business by itself, the Haywood Equipment will make money for you. **Tires go wrong all the time.** You know that. Keep them in tune. Give your customers complete service—repair their tires and all. This builds business and makes your rich. Experience unnecessary. You can learn easy—or teach a boy to handle this end. Be the boss and make the money. Learn the details now. Investigate. Act quick. Be the first. Send name and address only. A postal will do.

HAYWOOD TIRE & EQUIPMENT CO.
965 Capitol Ave., Indianapolis, Ind.

WITHERBEE BATTERIES

are the kind you should stock, Mr. Dealer. We offer not only the largest and most complete line of Starting and Lighting Batteries, but by far

THE BEST VALUE

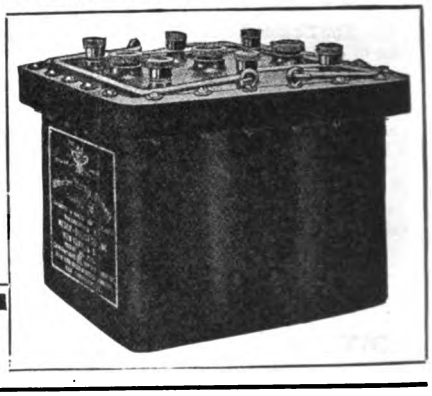
on the market. They are conservatively rated. Comparative test will show that they have nearly double the ampere hour capacity that can be secured from some others of the same rating. This means that

Your Customers get their Money's Worth

when you sell them **WITHERBEE BATTERIES.**

Satisfied customers are your best asset. Our liberal selling terms insure you a substantial margin of profit—write for full details and Dealer Proposition.

MEDER-STAUDT CO., Inc.
Sole Manufacturers
1876 Broadway, New York
Factory:
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Distributors and Service Stations in the principal cities.



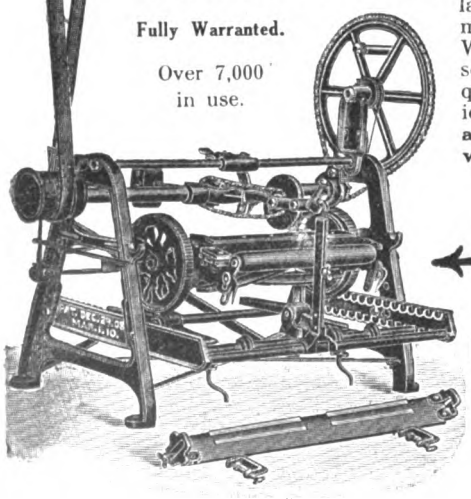
IDEAL Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Will also grind straight knife without removing from mower. Operated by either hand or power. Ball bearing Alundum Grinding Wheel and Main Shaft. The only practical machine for sharpening Lawn Mowers on the market. Has Skate Sharpener Attachment for sharpening skates. **Write today** for full information of this great labor saver and money-maker. Will do the work so much better, quicker and easier, you **cannot afford to do without it.**

Write today. Don't delay.

Fully Warranted.

Over 7,000 in use.



THE ROOT-HEATH MFG. CO., PLYMOUTH, OHIO.

"You Grind It as You Find It"

PERFECTION Multiple PISTON RINGS

A new type of piston ring that saves power and money



PERFECTION rings are made of 1-16" sections of special soft elastic steel. The openings in the various sections come at different points, causing the ring to always present a barrier to the escape of gas from the firing chamber. Also an equal spring tension at all points gives perfect bearing on cylinder walls. Easily applied, cannot be broken in putting on, cause less friction, save power, reduce carbon and keep down gasoline and repair bills.

Dealers Wanted

Write for prices and discounts.

Automobile Construction & Engineering Co.
45 North 7th Street - - Philadelphia, Pa.

N. A. PETRY CO., INC., 1309 Race St., Philadelphia Agents for Penna and Atlantic Coast States, South.

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We carry in stock trunks for every make of car.



AJAX Lunch Outfits

Lunch kits fitted for 2 to 8 persons. Some styles contain ice chests or fireless cookers.

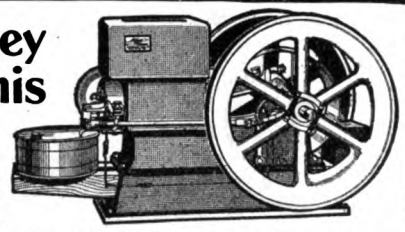


Ajax Trunk & Sample Case Co.
Our new enlarged plant
144-150 West 18th Street
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Write for Complete 1916 Catalogue

Make Money Selling this Engine

Garage Men and Repair Men



Here is your chance to handle a high grade engine at prices that will get the engine business in your locality. One engine sells another. Our liberal discounts from prices here quoted make you a good profit. Complete line as per list below.

Keco ENGINES
Gasoline, Kerosene & Gas

are absolutely high grade, made in an independent factory. Engines are center-firing, valve-in-head type, with automobile ignition. Safety spark shift for easy and safe starting. Best of materials and construction—simple to operate—durable—give even speed and low cost power with low repair cost.

SOLD ON TRIAL

Every engine is fully guaranteed for 5 years. Write for our independent dealers' proposition, and our NO-RISK DEALERS' OFFER. Let us show you the profit you can make with our independent line of engines. Don't wait if you want exclusive sale, but **write today.**

MANUFACTURERS ENGINE COMPANY
1879 Crystal Ave., KANSAS CITY, MO.

RETAIL PRICES	
Stationary Engines	
2 H-P.,	$ 35.10
3 H-P.,	52.65
4 H-P.,	70.20
6 H-P.,	100.00
8 H-P.,	140.40
12 H-P.,	210.90
Portable Engines	
2 H-P.,	$ 40.15
3 H-P.,	60.75
4 H-P.,	83.35
6 H-P.,	130.00
8 H-P.,	176.80
12 H-P.,	248.00
Engine Saw-Rigs	
4 H-P.,	$128.25
6 H-P.,	155.90
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12 H-P.,	272.50

(F. O. B. Factory)
5 YEAR GUARANTY



GOOD BUSINESS IN DULL SEASONS

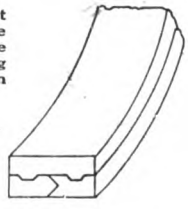
Show the car owner that K-P Rings will protect his motor against winter power losses. Show him how

K-P RINGS

are good insurance against the winter snows and heavy roads, by utilizing the whole force of each fuel charge and stopping the costly leakage of power and compression.

"Piston Ring Service is the Key to Perfect Compression."
—Efficiency Ed.

Show the car owner that K-P Rings will enable him to keep his car in use for the winter driving and you will cash in on your arguments.

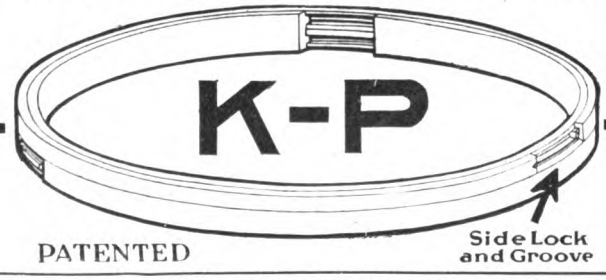


Special Inducements to Dealers and Agents.

Rings in All Sizes.

Write for booklet "Economy and Power"

Keys Piston Ring Company
3037 Olive St. St. Louis, Mo.



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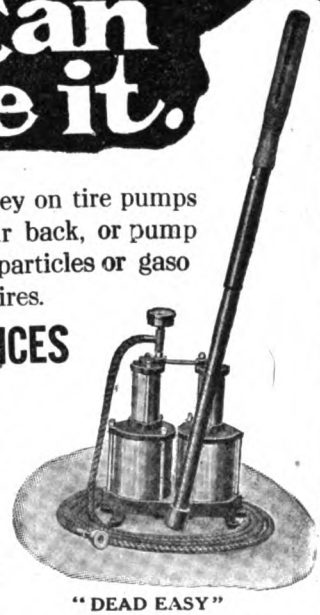
Side Lock and Groove

At Our Risk—You Can Prove it.

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gaso line fumes into your tires.

TAKE NO CHANCES

At our risk you can prove that the **"Dead Easy"** is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



"DEAD EASY"

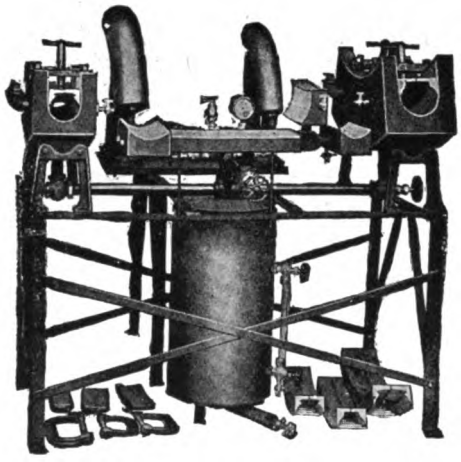
Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's **"Dead Easy."**

FREE TRIAL OFFER

Write *today*, NOW, for fifteen-day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICH., U. S. A.

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Vanderpool Vulcanizers Satisfy

A. W. Childress, Richmond, Va., July 3rd, writes: "The machines that I bought from you have been in use every day, and the more I ***use them, the better I like them.*** I consider your Vulcanizer ***the equal of any on the market*** and ***better than most.***" Mr. Childress bought one Vulcanizer and after using it about four months, he sent us his order and check for a second machine.

Moler & Stewart, Mount Orab, O., July 1st: The Vulcanizer is working fine. We have had no trouble with it since we got it. ***It is doing fine work.***

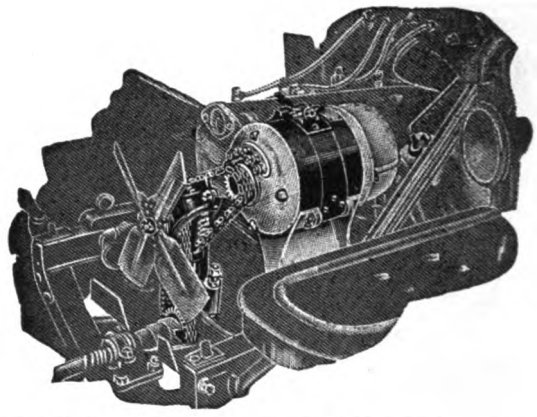
A. M. Johnson, Mechanicsburg, O., June 1st: The machine is doing good work. I am well pleased with it.

REPAIR MATERIALS.

Hi Grade Tread Stocks, 55-65c. per lb. Tube Stock, 80c. Hi Grade Fabric, 75c. Cements, Can, $1.70. Gal. Tube, $1.90. Air Bags, 14 and 16 lg. x 3 in., $2.95; 3½ in., $3.25; 4 in., $3.35; 4¼ in., $3.95. Cash with order, 5% Discount. On 50 lbs. or over, 10 and 5% Discount.

VANDERPOOL CO., Springfield, Ohio.

1044 S. Main St., LOS ANGELES, CALIF.



North East System of Electric Starting and Lighting for the Ford car.

It cranks the motor.
Gives you a brilliant light at all times.
Charges the storage battery.
Any garage man can install it in a few hours —no changing of the Ford car necessary.

Our Bulletin 30-A will give you a complete description.

"Universal" System for Any Make of Car.

Ask for Bulletin 33-A

North East Electric Company

ROCHESTER, N. Y.

One Turn of the Motor

even in zero weather—starts the car when equipped with the

RAJAH PRIMING PLUG

Dealers:— There are few plugs with these excellent features: Absolutely gas-tight, insulation guaranteed against cracking under severe strains. Substantial, non-spreading electrodes—easy to clean. Rajah Priming Plugs are a necessity during the winter—an additional precaution at all times. Rajah Plugs mean for dealers quick turnovers, good profits, and a satisfied trade. Retail, with thumbnut terminal, shown here, $1.50.



"Ignition Absolutely Sure!"

For illustrated catalog, write to

RAJAH AUTO-SUPPLY COMPANY
BLOOMFIELD NEW JERSEY

JOHN MILLEN & SON, Ltd.,
Montreal, Toronto, Winnipeg, Vancouver

DOVER



The Dover Indestructible Head Light Bulb Carrier



SOLVES THE PROBLEM

of having extra bulbs always ready in case of accident or breakage.
It is a round metal container with removable covers at each end—each cover is provided with a spring socket which holds the bulbs more securely than in the lamps.
Keep your spare bulbs in the **DOVER TWO-LITE BULB CASE,** always ready when needed.
Carry it in your tool kit.

Send for New 1916 Catalogue

Dover Stamping & Mfg. Co., Cambridge, Mass

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Supreme Auto Oil

FLOWS FREELY AT ZERO

Starts with the Engine

This permits the use of a medium instead of light oil during the winter months, and affords better lubrication.

Any dealer displaying the Sign of the Orange Disc will supply **Supreme Auto Oil.**

There is More Power in
THAT GOOD GULF GASOLINE
and SUPREME AUTO OIL

We have an attractive proposition for dealers.

GULF REFINING COMPANY
Dept. 1880, Frick Annex PITTSBURGH, PA.
The largest independent refining company in the world



The ALLEN TIRE CASE

gives a perfect protection to spare shoes.
All colors—all sizes. Prices $3.00 and up.
At your dealer's. *Write for booklet.*

THE ALLEN AUTO SPECIALTY CO.,
Manufacturers
1926 Broadway, New York 1627 Michigan Ave., Chicago

The Foundation of this Tire

is just as good as the day it was bought. Any tire with good fabric, whether there is any rubber on the outside or not, is suitable for the

TRIPLE TREAD PROCESS



The Triple Tread is the only tire protector made

that does not depend on inflation, rim pressure or mechanical means to hold it in place, so that the style of bead on your tires cannot affect the success of their treatment.

In Vulcanizing the Triple Tread on your Tire

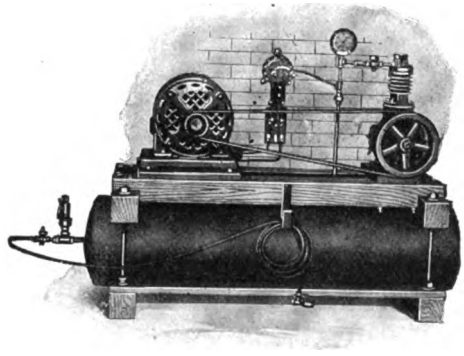
we are able to fill the pores of the leather with rubber, making it waterproof, so that by bringing the leather down the sides and over the bead of the case, covering it completely, we are able to keep dirt and water from getting under the tread to rot the fabric, and also to strengthen the sides and bead of the tire.

Write for our booklet,
"Worn Out Tires Made New."
Please mention the size of your tires.

TRIPLE TREAD MFG. CO.
1542 MICHIGAN AVENUE CHICAGO
Factories: San Francisco, Chicago, Winnipeg

The Standard Oil Company

Bought Several Hundred of these



GARDNER FILLER STATION OUTFITS

FOR TIRE FILLING

These units passed the Standard Oil Company's tests, were adopted and are giving absolute satisfaction. If they can save money and give the best of service to The Standard Oil Company—why can't they do the same for you?

Just drop us a line for complete information today. It will interest you.

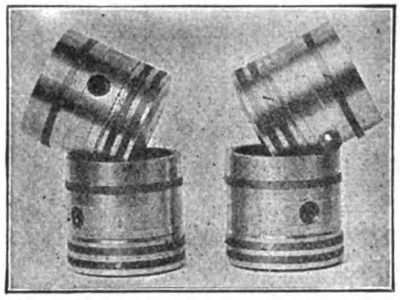
THE GARDNER GOVERNOR COMPANY,
Station R, QUINCY, ILL.

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Is This Not Convincing?

BUTLER'S SPECIAL ALLOY PISTONS

are a *universal success* in over 60 different make motors



Why not make your motor better?

We guarantee workmanship and material.

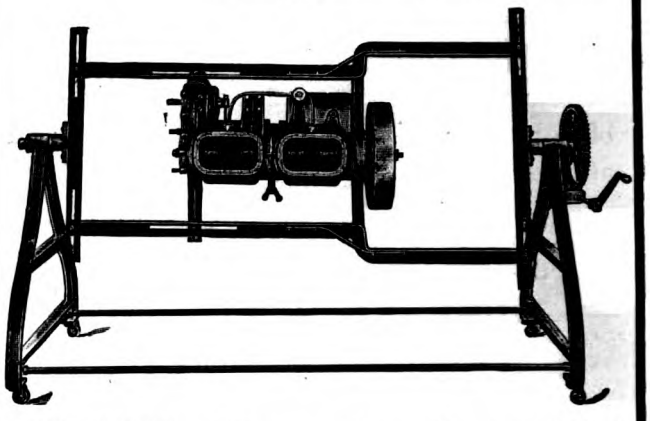
REGRIND THE CYLINDERS,
fit standard cast iron, light semi cast iron, or aluminum alloy pistons.

Twenty years of engineering, the highest class machinery, and the best material assure you, car owner and repairman, of QUALITY SERVICE.

You want the best — Let us hear from you.

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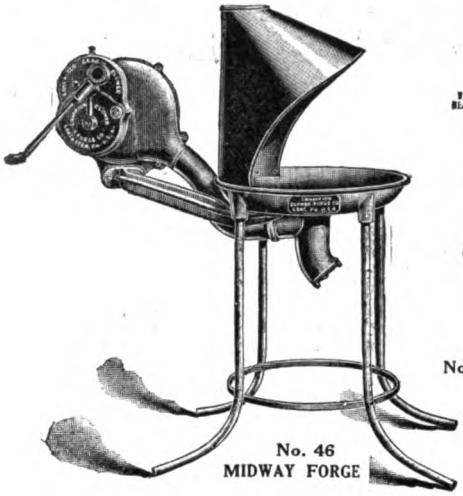
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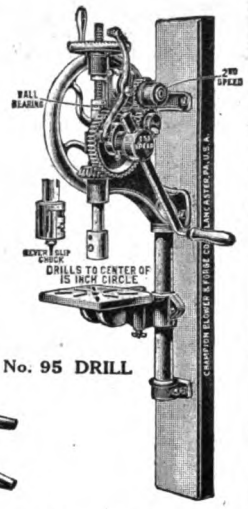
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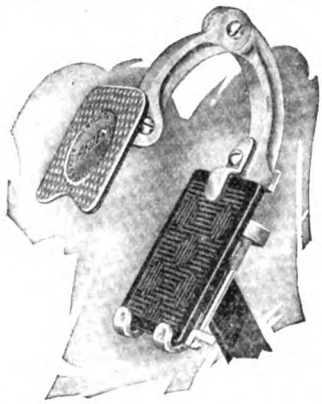


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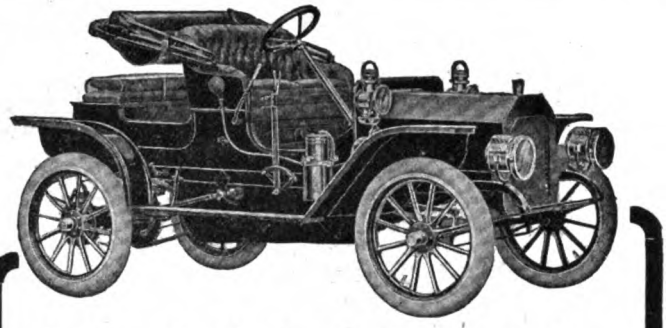
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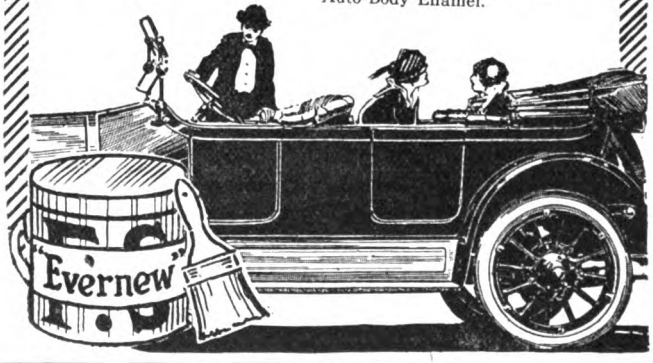
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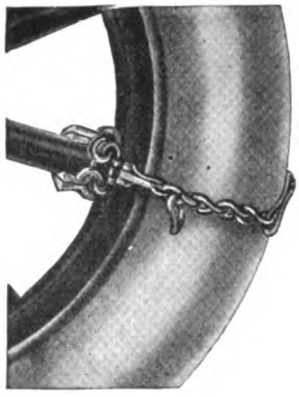
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A JOURNAL OF PRACTICAL MOTORING

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TIMING THE VALVES

For Motors of Varying Speeds and Up to Twelve Cylinders Each.

BY C. P. SHATTUCK, M. E.

NO. 2

In the previous instalment reference was made to the firing order of the engine to be retimed or its valve openings rechecked, and it was stated that a knowledge of the sequence would be of assistance in the work. By this is meant that one will have to rotate the flywheel but half a revolution to check the opening point of each intake valve or two complete revolutions of the flywheel to check the four intakes. This is not absolutely necessary, nor is it imperative that the motorist know the firing order to complete the work. He can check a valve at the time; that is, both the opening and closing points, by continuing to rotate the flywheel until the valve in question opens and closes. This method involves more time and labor but is the more simpler.

Assuming that we are to check the timing of a four-cylinder engine having a firing order of 1-3-4-2. Starting with the No. 1 cylinder (that nearest the radiator) we place the piston at top dead center, then rotate the flywheel in its normal direction until the intake valve starts to lift, which in the case of the timing diagram illustrated at Fig. 5 in the preceding article would be 11 degrees after top dead center. A half revolution of the flywheel or 180 degrees movement will bring the piston of the No. 3 cylinder past top dead center, or in other words, the intake valve of the third cylinder should begin to lift. This completes one revolution of the flywheel. Another half revolution will see the intake stroke of the fourth cylinder in operation, and the fourth half revolution or two complete revolutions of the flywheel will bring the intake valve mechanism of the second cylinder into operation. Similarly, the exhaust valves may be brought into operation. If the firing order be 1-2-4-3, we follow the firing sequence. Four-cylinder motors fire either 1-3-4-2 or 1-2-4-3.

If one does not care to bother with the firing order when checking the timing of the valves the simplest method is to check the openings of each valve in 1, 2, 3, 4 order. With the spark plugs removed rotate the flywheel in its normal direction, which will be anti-clockwise or to the left when looking at it from the rear of the dash, and until the marks I O 1-4 on the periphery of the flywheel register or coincide with the pointer or indicator. Next move the flywheel an inch or so which will cause the valve of either the first or fourth cylinder to lift. Note which valve it is, then move the flywheel back or clockwise until the marks I O 1-4 coincide with the pointer. With the flywheel in this position the valve should begin to lift, and consequently the tappet should be in firm contact with the valve stem. If not, the opening is late and should be corrected.

With the adjustable types of valve tappets it is a simple matter to correct the opening. Loosen the lock nut and rotate the adjusting nut so as to raise the latter which movement will lengthen it. In performing this work it is advisable to use two wrenches, one on the adjusting nut and the other on the lock member, and care must be taken not to exert a bending stress upon the adjusting member. As a rule the locking nut is set up tight and will require some strength to loosen it and because of this fact one must be careful. In adjusting the threaded part of the tappet, turn it up until the valve starts to lift and with the marks on the flywheel registering with the pointer as previously explained. Set up the lock nut so that the threaded member will not move, but not finally as the work should be rechecked. Rotate the flywheel until the No. 4 intake valve starts to open, then with the flywheel marks registering with the pointer, note if this valve opens early or late. If so, correct it by means of the adjusting mechanism. The intake valves of the second and third cylinder can be checked in a similar manner, as can the exhaust valves of each cylinder.

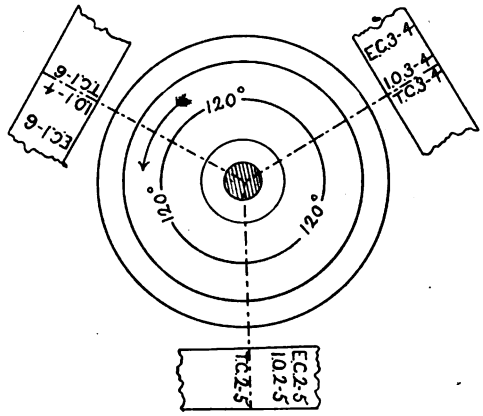


Fig. 6—Illustrating markings of flywheel of six-cylinder engine.

In performing this work one can rock the flywheel back and forth to ascertain the opening point of each valve, and similarly the closing points can be ascertained by utilizing the marks on the flywheel. Generally it will be found that the openings are late. After completing the adjusting of the valves, go over the work once more and note if the openings are correct. If so, set up the locking nut good and tight and be careful that when tightening the locking nut that the threaded member is not moved.

It is surprising the number of owners who readjust the valve mechanism without utilizing the marks on the flywheel and by employing a business card or a sheet of thick paper for determining the proper space between the valve stem and the push-rod. A large number of manufacturers give such directions in their instruction books, but the writer

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holds that such methods are not productive of the results desired for the simple reason that the thickness of the material used will vary considerably. If fairly accurate results are desired the better method is to use the marks on the flywheel.

Every engine is not provided with adjustable tappet or pushrods and the Ford is an example. When such a condition exists the work of retiming

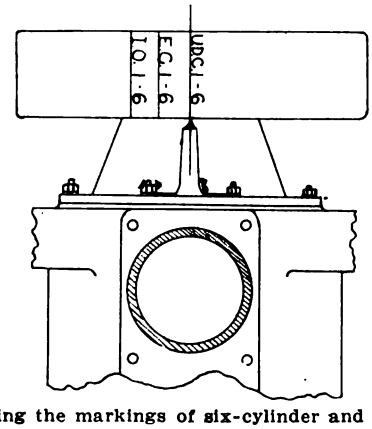


Fig. 7—Showing the markings of six-cylinder and power impulses in degrees.

the valves is more difficult, especially if one undertakes to lengthen the valve stems. The usual procedure is to draw the temper of the valve stem end, then lengthen it by hammering, and file to obtain the desired length and proper lift. After this work, which will take considerable time, the end of the stem should be hardened. The better and more simpler method is to purchase the valve stem adjusters marketed for the Ford. These consist of a cap-like member which fits over the valve stem, and a number of discs of varying thicknesses are provided for compensating for wear of the stem. As the flywheel of the Ford motor is not readily accessible and is not marked as is the conventional type, the clearance between the pushrod and valve stem is determined by measuring. The space should not be greater than 1/32-inch nor less than 1/64. If too large a space exist, the valve will open late and close early. If too small, there is opportunity of

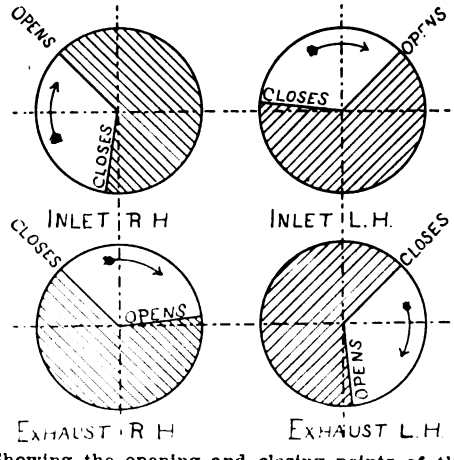


Fig. 8—Showing the opening and closing points of the valves of an eight-cylinder power plant.

the valve not closing when the engine is hot. This brings up a point that the amateur repairman should not overlook and that is the necessity for making allowance for the expansion and contraction of metal when hot and cold. Where an adjustment of the valve mechanism results in a very small space between the tappet and the stem, and with the motor cold, one must allow for expansion. Consequently, the better way in making adjustments of a close nature is to perform the work when the engine is warm.

The flywheel markings of a six-cylinder engine are shown in Figs. 6 and 7, the latter diagram illustrating that the strokes are the same as in a four-cylinder engine and that the impulses occur every 120 degrees instead of 180 as with the four-cylinder power plant. By this it will be seen that the power strokes overlap and this should be taken into consideration when rotating the flywheel and checking up the valve timing. The method of correcting the opening and closing points is the same as with the four-cylinder engine in so far as the mechanical work is concerned.

To decrease or increase the clearance between the valve stem and adjusting screw in the valve mechanism of the eight-cylinder engine one proceeds in the same manner as with the four and the six, but unlike these the power strokes are four in number, of 135 degrees duration during every revolution, as against three in the six and two in the four. In the King eight-cylinder engine, for example, which has a stroke of five inches, the power stroke is not com-

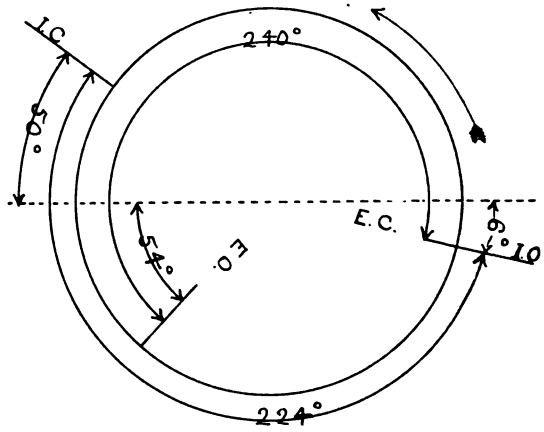


Fig. 9—Timing diagram of twelve-cylinder engine.

pleted within 45 degrees crankshaft travel which is equivalent to 1⅝ inches of piston travel when the next cylinder fires. The piston travel of 1⅝ inches is the overlap of one explosion with the next, and each power stroke is overlapped by that of the next cylinder in the firing sequence by 45 degrees.

In adjusting or retiming of the valves of the Cadillac eight, type 53, it is necessary to have the cams in a certain position which is obtained by rotating the flywheel until the valve in question has just seated. The flywheel is then further moved to a distance of 1⅝ inches of its periphery when the clearance should be between .002 to .003-inch and with the engine cold. The inlet valves of this engine open and the exhausts close on dead center, and the intakes close 46°-40′ after low dead center and the exhausts open 46°-40′ before center. The opening and closing points are diagrammatically illustrated at Fig. 8. The marks of the flywheel can be employed as with the King engine. The retiming of this motor is simple even should the silent chain driving the camshaft be displaced as the sprockets are marked, a tooth of the crankshaft meshing between two teeth of the camshaft sprocket.

Figs. 9 and 10 show the valve timing diagram of the National and Pathfinder twelve engines and are of interest in that they show the duration of the

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power strokes in degrees, also how the strokes overlap.

While it is a simple matter to retime a motor when the flywheel is marked, the work is more difficult without the markings. One can generally obtain the timing diagram from the factory and with it you first proceed to lay off the periphery or rim of the flywheel in degrees. Spaces of two degrees will

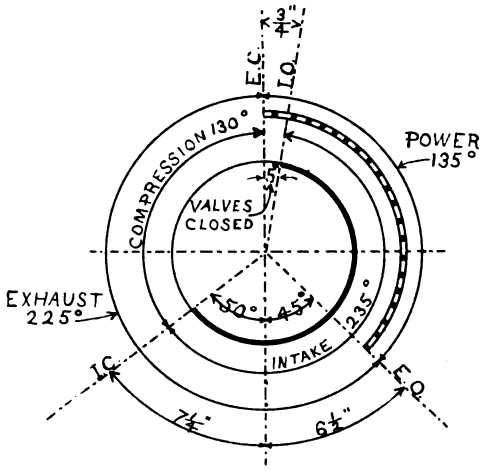


Fig. 10—Showing the power stroke of the twelve-cylinder engine, also opening and closing points of valves.

suffice for large flywheels and four degrees for a small one of 14 inches in diameter for example. The proper spaces between the marks are found as follows: Multiply the diameter of the flywheel in inches by 3.1416 and divide by 180 for two degree spaces and 90 for four degree spaces. There are 360 degrees to the circle.

A simple method is to take a piece of stiff paper of the same width as the rim of the flywheel, and in length equal to the diameter multiplied by 3.1416. Divide and mark the paper into four 90 degree spaces, or two 180 degree, and fasten the paper to the flywheel by means of paste or glue. Next we obtain the top and bottom dead center lines, and by means of a plumb line used as shown at Fig. 10, we obtain these positions with the crankthrows in a vertical position. Where the line touches the top and bottom of the flywheel will be the dead centers for the crankthrows of cylinders 1 and 4, and 2 and 3. This is simple, as two crankthrows will be up and two down with the four-cylinder engine. Mention is not made of the six-cylinder as the flywheels of these are marked. As a rule unmarked flywheels will be found with very old engines.

To lay off the degrees on the flywheel the latter and crankshaft are sometimes mounted in the lathe and a square or spirit level utilized to ascertain the centers. It is possible to lay off the degrees with the lathe. Having ascertained the dead center marks the next step is to prick punch the cylinder or crankcase which marking will serve as an indicator or pointer.

Having obtained the dead centers mark the paper, starting with 360 for the top dead center of the crankthrows 1 and 4, and 180 for the centers of 2 and 3. Next mark or lay off in 30 degree spaces, beginning with 360 and in a direction opposite to that in which the flywheel revolves. If desired the spaces can be laid off in 15 degrees or even finer still, in two degrees by dividing a space of 30 degrees as indicated in the sketch at Fig. 11. This will enable one to time within very close limits. Having laid off the flywheel, it is an easy matter to mark it according to the timing diagram. The directions will be of value should it be necessary to replace a broken timing gear and when the original markings are destroyed.

When the timing is not known, one will have to experiment more or less. For small and high speed engines set the intake to open from 12 to 15 degrees after top dead center and close from 25 to 30 degrees after lower dead center. Set the exhaust to open 40 degrees before lower dead center and to close 5 degrees after top dead center. With large and slow speed engines the intake should open from 5 to 10 degrees after top dead center and close from 15 to 20 degrees after lower dead center. The exhaust should be open from 30 to 40 degrees before lower dead center and close from 0 to 5 degrees after top dead center. Medium speed engines have a setting between these two, and the timing given is general not specific. In experimenting with valve setting it should be borne in mind that advancing or retarding the camshaft gear by a single tooth may make a difference of 10 degrees on the flywheel. This, however, may be determined when laying off the wheel in degrees. It is not practical to alter the manufacturer's setting without introducing new defects, and any change should not be made without the advice of the maker.

The correct functioning of the valves is important in that fuel economy is obtained to say nothing of a sweeter running engine. After restoring the valve mechanism to an efficient condition one should go a step further and overhaul the ignition system for a good spark is essential if the maximum amount of mixture is to be burned. Old wires should be replaced with new to prevent leakage of current, particularly those conveying the intensified electricity, and the breaker mechanism of the primary circuit

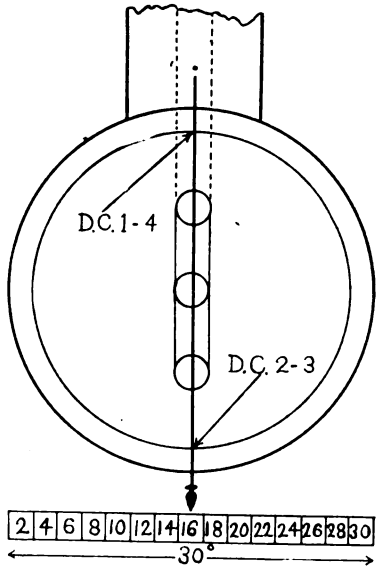


Fig. 11—Illustrating how to obtain dead centres on unmarked flywheel and how to lay it off in spaces of two and four degrees.

be adjusted according to the instructions of the manufacturer. Relative to reducing the cost of operation, one should learn to properly adjust the carburetor. Use as lean a mixture as possible to save fuel, and if it is productive of hard starting, look elsewhere for the cause and remedy it. By observing these precautions the motorist will find that the mileage to a gallon of fuel will be considerably increased.

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FORD SPARK PLUG TROUBLES.

What Causes Some of them and How they May Be Remedied.

From Murray Fahnestock, Pennsylvania.—Trouble with oily spark plugs almost invariably occurs at the first cylinder, because the oil feed pipe delivers all the oil to the front cylinder. If this trouble occurs, it is a sign that the oil level is too high or that the piston and rings are not a good fit in the cylinders.

The oil level should never be higher than the upper petcock in the crankcase, and a good quality of oil should be used. Some owners drill a small hole in the oil feed pipe, opposite the second cylinder. This diverts some of the oil and prevents the flooding of the front cylinder. However, this hole should be rather small, or the timing gears and front cylinder may not receive a sufficient supply of oil.

When the Ford car is standing on a level floor, the rear of the crankcase is intended to be about half an inch lower than the front of the crankcase, so that the oil will flow freely from the front of the crankcase, where it enters, back to the sump below the fly-wheel. If the front spring is sagged, it should be replaced or retempered. A pad or block can be placed between the spring and the cross member of the frame to bring the motor up to the proper level. The fitting of shock absorbers to a car sometimes raises the car more at the rear than at the front, and this point should be carefully noticed. As the Ford runabout has the same rear spring as the touring car, but does not carry nearly as much weight at the rear, the spring of the runabout has a tendency to hold the rear higher than it should. This condition is best remedied by removing one or more leaves from the rear spring, which will also make the car ride easier.

Scored cylinders will sometimes allow oil to work up past the pistons and into the combustion space where it will cause trouble. If the cylinder walls are badly scored, it will be necessary to have the cylinder block rebored. If the cylinder block is sent to the factory, or to one of the branches of the Ford Motor Company, they will rebore the cylinder block for two dollars. A set of oversize pistons, with rings and pins, complete, will cost six dollars.

The new pistons will be one-thirty-second of an inch larger than the old ones, and the increased power will amount to the difference in area of the two circles. Carefully figured, this amounts to somewhat less than half a horsepower, an amount that would not be noticeable in the running of the car. In practice, however, a substantial power increase often results. This is due to the fact that the cylinder block has been subjected to numerous heatings and coolings since it was first placed in service and the iron has aged. The cylinder bores may have warped slightly out of round and, when they are rebored, they are made straight, and remain true, because the iron has already attained its permanent set. When the bore of the cylinders is true, the compression does not escape easily and the motor has much more power. After the motor has been rebored and new piston fitted, plenty of oil should be used and the motor run carefully for the first few hundred miles, until the parts have had a chance to wear to a perfect fit.

Sometimes the pistons become worn, and this can generally be remedied by replacing the pistons with new ones or by installing pistons that are .0025 inch oversize.

The proper clearance between the pistons and the cylinders is between .003 and .006 of an inch. This distance can be measured by the use of a thickness gauge or feeler. Sometimes the lower part of the piston is drilled to let the oil drain back into the crankcase but the method does not seem to do much good in actual practice. If one piston is drilled, the rest should be drilled also, or the motor will be thrown badly out of balance and vibration and loss of power will result. In this connection, it is well to compare the weight of the oversize piston with the other pistons, if only one large piston is fitted, as they should all be of the same weight.

If the top edge of the piston is rounded, it will not have as much tendency to scrape the oil off the sides of the cylinder walls and carry it up into the cylinders. This same idea can be applied to the piston rings, the top edges of which can be slightly rounded to advantage. Well fitted piston rings are one of the most important means of preventing the flooding of the cylinders with oil. The rings should not only fit closely against the cylinder walls but the edges of the rings should be a good fit in the grooves of the pistons. The gap between the ends of the piston rings should not be over three-hundredths of an inch, when the rings are in the cylinders. These gaps should not be in the same straight line for the three rings, but should be spaced equi-distant around the piston, thus giving the escaping gases the longest possible path to travel.

If the carburetor is adjusted to give too rich a mixture, it will cause sooting, and short-circuit the spark plugs. Then, of course, oil will rapidly collect in the cylinders, because it will not be forced downward by the explosions.

Misfiring due to other causes, such as a worn or oily commutator, vibrators out of adjustment, or weak magnets, may cause the spark plug points to become clogged with oil, because the oil will not be burned as it is drawn up into the combustion space.

Some owners make a practice of coasting down hill, with the clutch engaged and the spark shut off. Under these conditions, a partial vacuum is formed in the cylinders, especially if the throttle is kept closed, because the air is pumped out through the exhaust. This tends to draw the oil into the cylinders and foul the spark plugs.

It is important to have the points of the spark plugs the proper distance apart, which is about 1-32 inch, or about the thickness of a worn dime. It is also well to bend the side electrode upward, so that the oil will drain off to one side and not collect between the points of the spark plugs and cause trouble.

Bosch Plugs For Battery Ignition.

In the December issue it was stated in the Trouble Department that "Bosch spark plugs are designed for magneto ignition." This of course is true, but they are designed also for battery ignition, and it is claimed that they will last even longer on cars using battery ignition systems, inasmuch as they are made primarily to withstand the intense heat of the magneto spark.

No part of the car is more responsible for your safety than the steering gear and steering connections.

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ADJUSTABLE SPRINGS

So That They Will Always Be Correct in Proportion to the Load.

From Henry Sturmley in The Motor, London.—I have on more than one occasion suggested the desirability of some better system of springing cars than we have at present, pointing out that, to obtain perfect springing, the springs should be exactly proportionate to the load, and that, as the load varies, the spring system on any particular car can only be just right for one specific load, so that, when either more heavily or more lightly loaded than the exact weight for which the springs are designed, the springing will be inaccurate and the riding consequently less smooth and satisfactory than it should be.

Some designers, in working out the proportions of their springs, aim at hitting a happy medium as a rule; but others spring the chassis for the heaviest

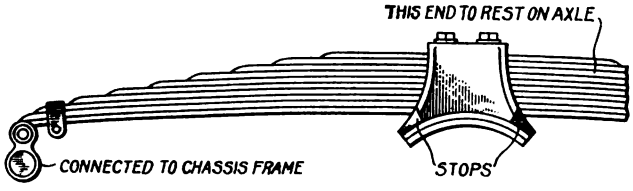


Fig. 1—Spring and Quadrant.

load the car is constructed to carry, so that, for example, if a car is fitted with a five-seated body, the chassis will be sprung on the assumption that it will be loaded when is use with the particular body for which the springing is designed, plus five people of average weight, so that, when less than the full seating capacity of the car is occupied, the riding will be more or less harsh. This, of course, will be accentuated where the possible range of load is greater, as, for example, in a seven-seated car, or in an ambulance arranged to carry six, but which, on the other hand, is made only at times to carry two, and, of course, in this latter connection it is of the highest importance that the springing should be as easy as possible for however many or few cases there may be on board.

Where commercial vehicles are concerned, the need for adjustable or adaptable springing becomes greater still, as the difference between the load upon the springs in, say, a three-ton chassis when fully loaded and when travelling empty is very great. But we need not trouble ourselves at the moment with commercial vehicles. The highest efficiency of springing is desired for the comfort of the passengers, and not only the load, but the nature of road and average travelling speed, will also be points which will more or less affect the result attained by our springing, so that all these factors have to be considered before we can hope to get perfection.

It will be seen, therefore, that perfection cannot be obtained from any non-adaptable system, and that the best we can do with such is to arrive at a compromise. Hence it was with a considerable amount of interest that I heard some little time ago of a new idea in the direction of an adjusting spring system, and I am pleased to be able to give details of this device, which is now being applied with considerable success in practice.

The system is really extremely simple. The efficiency of a spring depends very largely upon its length between unsupported points, and the method of securing adjustability is to vary the length between the supports, thus giving a greater or less length for free play as the occasion may require. For this purpose, the inventor adopts the cantilever form of springing, which consists of a long but slightly arched spring resting on the axle at one end and supported on the frame both at its center and at the forward end, which, being shackled, can accommodate itself to the variations in length caused by spring flection under load. Whilst, therefore, the center and forward end of the spring are both attached to the chassis, the tail extremity rests only upon the axle, and this end partakes of the fullest movement under the undulatory action of the wheels in travel. The new plan varies the length of this free rear end, or, rather, he varies the position of the point of central support, as will be seen by the annexed illustrations. As shown, the central attachment of the spring to the frame consists of a box containing the center of the spring plates, which, instead of being bolted direct to the side of the chassis frame as usual, rests upon a support carried free of the frame, but resting upon a bearing rotatably mounted upon the end of a tube running across the chassis below the frame and supported by brackets depending from it. The under portion of the spring box is arched to correspond with the arc described by the supporting bracket around its center of movement on the supporting tube end, the base being so shaped as to engage with suitably shaped guides in the side blocks, which serve to connect it with the rotatable bracket in such a way that the movement of these sides is limited by stops and so prevented from leaving the spring box altogether.

Now it will be seen that if this movable bracket, which may be set at any point between its limits of movements, is set in a central or vertical position, the effect upon the spring will be the same as with

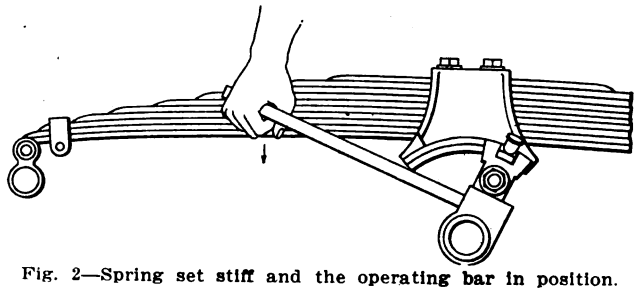


Fig. 2—Spring set stiff and the operating bar in position.

an ordinary cantilever spring supported to the frame sides at its central point, and, so set, the springing may be termed normal. For heavier or lighter loads, the rotatable supporting bracket is moved around its support either towards the front or rear end of the spring box as may be required, this movement being effected, after the loosening of a nut, by a lever inserted in a socket in the bracket, as shown in the illustration. With the leverage for this purpose, this is not a difficult matter, and the adjusting lever is arranged to be carried by spring clips on the inside of the chassis frame, so that it is always handy. It will thus be seen that, when the bracket is moved to a rearward position, the length of the free end of the spring is shortened, which results in making the spring stiffer; whilst, when moved in the other direction, the center of support being further forward, the free length of the spring end is increased, giving

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greater play and more flexibility. Mr. North, in his spring, dispenses with the usual shackle at the front end of the spring, and anchors this end firmly there, if it is intended to take the driving and braking stresses through the springs; but where a separate torque system is provided, a shackle is used for the attachment of the spring to the rear axle.

As the springs are designed, the ratios of maximum to minimum stiffness is 1.55 to 1, so that, roughly speaking, with the point of support shifted

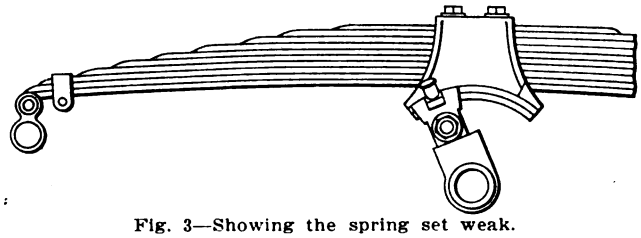


Fig. 3—Showing the spring set weak.

to its rearmost position, the spring is half as stiff again as when the foremost point of support is employed. This certainly appears, as I have already said, to carry out the idea of adjustability in an extremely simple as well as a most efficient manner, and it will be interesting to note how this new advantage provided for the user for the increase of his comfort is accepted by trade and public. To me, the idea appears to be an excellent one and worth the careful consideration of designers generally.

REPAIR ACCOUNTS.

A Simple System That Will Answer For Small Garages or Shops.

That a repair shop and garage accounting system is of value in that it enables the owner to practically eliminate leaks, is acknowledged by those familiar with the work of caring for motor vehicles. There are many systems exploited but the majority as a rule, are not adaptable to the small shop owing to the numerous details involved. And it has been truly said that one can easily overdo the systematizing of his business, and in the endeavor to see that each detail is carried out, one may neglect the customer. Comprehensive systems are not suited to the small garage because their maintenance necessarily entails expense and time. The practical system for the small garage is one that will afford a record of all work done as well as one of supplies, material, stock, etc.

For a shop of small proportions the system described herein will prove of value. It can be altered to meet individual requirements and added to for larger shops. The cost of the tags, slips and books is not unreasonable, and some of the forms may be purchased ready made and a serial number printed. As previously stated, a simple system should be one that does not require a large number of slips and the tags utilized should be made of sturdy material for the average workman is not qualified to handle ordinary paper. For this reason manila shipping tags with serviceable string are recommended.

If the garage be so located that it caters to transient trade the manila tag, shown at Fig. 1, which is about six by three inches, will be of value for a number of reasons. As may be noted the tag is perforated, is made in three sections, and that both the upper and lower parts bear the name of the company. Assuming that the car enters the garage and its owner states he may leave it for a few hours or more. The attendant takes a tag from the rack, enters the time of arrival, name of owner, address, make of car, license number, supplies desired, etc. The lower section of the tag is torn off and given to the owner. His attention is directed to the notice that the company is not responsible for articles left in the machine, and if he desires to avail himself of the free checking privilege, the articles in the car are checked up and taken to the check room. The owner is given the lower half of the tag shown at Fig. 2. He must present the check to obtain the goods. The upper half of the tag is placed with the articles in the check room.

Referring to the tag at Fig. 1 once more. After the floor attendant has filled in the tag, the upper section is tied to the steering wheel and the middle section turned in at the office. This gives the office a record of the storage, car, etc., and prevents any attendant from pocketing the charges as is possible when a car is left late at night and taken out before the arrival of the proprietor of the garage. It also provides the garageman with a record of the revenue derived from transient trade, and the address of the transient, if local, is also of value.

When the transient calls for his car, the time stored is easily figured as are the charges. Should the customer desire his machine sent to the hotel, for example, it is not surrendered until the owner's tag is given up. This prevents use of the machine by others than those intended. After the car has left the garage the top section of the tag is turned

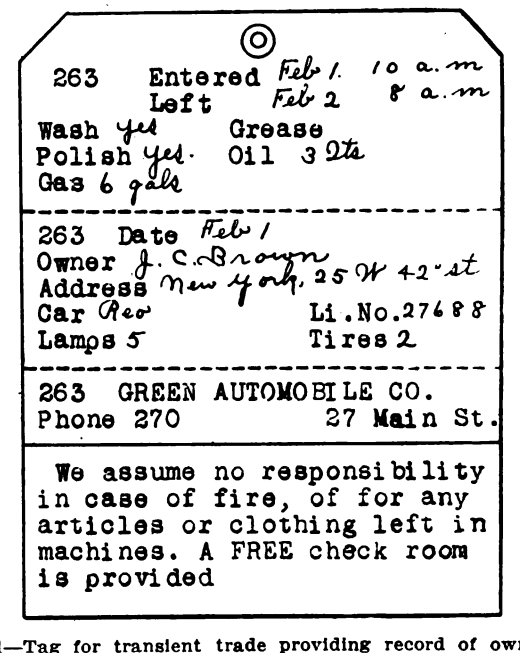


Fig. 1—Tag for transient trade providing record of owner, car and equipment, also section presented by motorist when receiving machine.

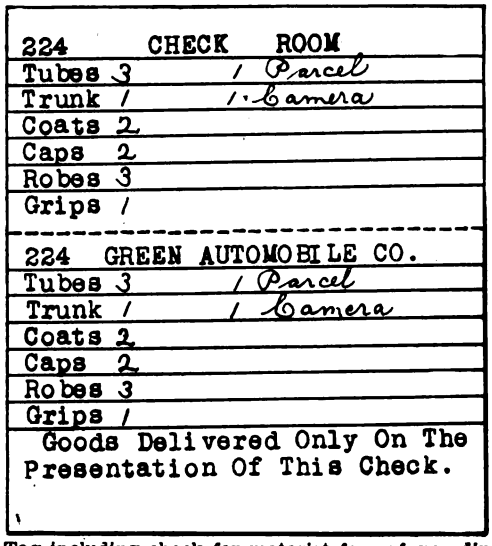
in at the office. If a chauffeur brings in the car and desires a receipted bill, one can be quickly made out. The tag also affords means for keeping track of the oil and gasoline sold.

Coming next to repairs which are often disputed by the customer. The records for repair work should be accurate and so kept that the customer won't have a leg to stand on should he attempt to dispute any item of the work. On the other hand, the proprietor of the shop should know whether his repair shop is being operated efficiently and if there

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is a loss or a profit on the work, and if the profits are proportionate to the capital invested. If two or three workmen are employed one wants to know who the shirkers are, and if the men who have been with the shop but a few months, which one is best adapted to a certain line of work, etc. A record is not possible unless some method is employed to keep track of each man during each day and on varying jobs.

We will assume that Mr. Smith drives in, calls for the proprietor and explains that certain work


224 CHECK ROOM
Tubes 3 / Parcel
Trunk / / Camera
Coats 2
Caps 2
Robes 3
Grips /

224 GREEN AUTOMOBILE CO.
Tubes 3 / Parcel
Trunk / / Camera
Coats 2
Caps 2
Robes 3
Grips /

Goods Delivered Only On The Presentation Of This Check.

Fig. 2—Tag including check for motorist for safeguarding articles left in the machine. The articles are removed and placed in the check room.

is wanted. The order form shown at Fig. 3 is utilized, it consisting of a perforated manila card about six by four inches or any standard size. Each card bears a serial number, and both upper and lower parts are filled in as shown. This gives a complete record of the car, work to be done, when promised, etc. The upper section of the card is turned in at the office but not before the lower part, which also bears a serial number, is attached to the car. The check tag, shown at Fig. 2 can be utilized to check up the articles in the car and its equipment. The motorist is given the lower half of the tag. This prevents any claim being made for articles or equipment not in the car and avoids the possibility of error as the articles are checked when the car is delivered to the customer.

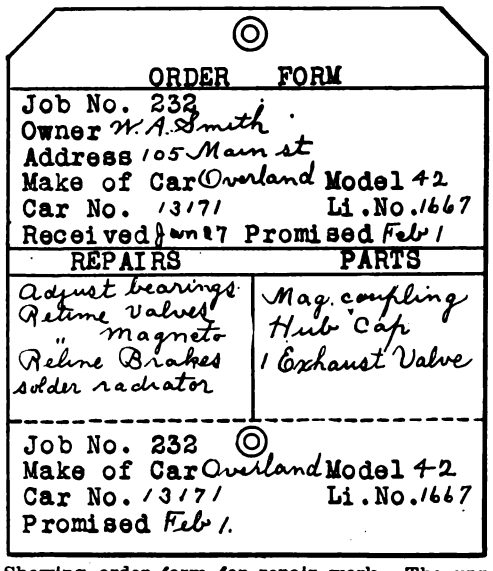
We will assume that the shop be not equipped with a foreman and that the owner supervises the repair shop. A list of the jobs with their serial numbers is kept in the office and the date they are promised. In connection with this should be mentioned that one should be careful in promising work. However, one should be able to give an approximate time if familiar with the repair end.

The lower half of the tag shown at Fig. 3 with a memoranda of the work to be done, is kept in the office, and when a workman is to start on the job, or the work can be assigned by the proprietor, the tag bearing the job number and slip is handed the workman. The latter proceeds to take an employee's card from the box in the shop and as may be noted these cards are daily affairs and are filled out as shown at Fig. 4, the data including the employee's name, time he started to take out the card, time of start and finish of the work and its nature. If the workman be called off to make an adjustment on another car, he marks the time he left the first job, and takes out a new daily card. The proprietor must, of course, fill out the card shown at Fig. 3 else he would not have a record of the work. This i imperative if the owner of the shop would keep a record of all work done, and the tags should be used for cash as well as charge jobs. When the workman finishes the adjustment, he marks the time on the card and turns it in at the office, then goes back to the original job, marking the time he starts and finishes. At night the cards are turned in at the office enabling the proprietor or bookkeeper to enter the jobs on the ledger.

Fig. 5 represents the reverse side of the card at Fig. 4 and on the former is entered the material, supplies, stock, machine work, etc., used each day. These items are also entered on the ledger. Upon the completion of the work the bill can be made out. If one desires to utilize a loose leaf system, the accounts can be made out in duplicate and the copies sent to the motorist. When the account is paid entry is made on the day book and the copy receipted. After the account is closed the leaves are removed from the binder and filed in alphabetical order.

If the customer pays cash, an entry is made in the cash book shown at Fig. 7, and the entry includes the dates, customer's name and amounts received, each in the debit column, or under the designation of debits. The expenditures are entered in the credit column, or under the designation of credits. From this book the debits and credits are made to each account. The difference between the columns of the cash book, added to or deducted from the bank balance, will give the amount of cash on hand.

There are various systems for keeping track of the gasoline. One of the simplest is to charge under


ORDER FORM
Job No. 232
Owner W. A. Smith
Address 105 Main st
Make of Car Overland Model 42
Car No. 13171 Li. No. 1667
Received Jan 17 Promised Feb 1

REPAIRS	PARTS
Adjust bearings Reline valves " magneto Reline Brakes solder radiator	Mag. coupling Hub Cap 1 Exhaust Valve

Job No. 232
Make of Car Overland Model 42
Car No. 13171 Li. No. 1667
Promised Feb 1.

Fig. 3—Showing order form for repair work. The upper tag is turned in to the office and lower section placed on car.

the head of fuel the amount placed in the tank, and to insist that a record be made for any quantity taken from the tank each day. As the pumps are equipped with indicators, the proprietor can take a reading twice a day, or every 12 hours, and if the amount sold does not tally with the records, make an investigation. The record slip should provide for cash and charge sales and show the amount of fuel drawn and the total of sale. The success of this

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system depends upon the proprietor insisting that a slip be made for each use of fuel, and when gasoline is to be used in the repair shop, it be charged to the job. Lubricants can be taken care of in a similar manner. With any system it is most important that a record be made of cash sales for a

REPAIRMAN'S DAILY CARD
Job No. 232
Employee H. K. Williams
Date Jan 28

	START	FINISH
Retime Valves	10 00 a.m	12 noon
" Mag.	1.00 P.M	1.30 P.M
Reline Brakes	1.30 "	5.30 " "

Fig. 4

SUPPLIES, STOCK, PARTS, Etc.
Job. No. 232

1 Mag Coupling
10 ft 2 x 3/16 Brake lining
1 Hub Cap
1 Ex valve
1 Gal Cyl oil
1/4 lb #14 Copper rivets
1 hr. machine work (Smith)

Fig. 5

Figs. 4-5—Employee's daily time card and reverse side for entering material, parts, etc.

busy attendant may forget to make a record and turn in the proceeds.

No mention has been made for listing the stock, equipment, accessories, etc., as these are not always carried by the small garage. Material in the repair shop such as cotter pins, shims, rivets, should be looked after and the supply renewed from time to

LEDGER
NAME
ADDRESS
CAR Li. No.

Job. 232 Items

Fig 6

CASH BOOK

Date		Debit		Credit		Bal	

Fig. 7

Figs. 6-7—Ledger and cash book slips of loose leaf system.

time. By utilizing a memoranda card on which the workman may enter his requirements, material can be kept stocked. In the small garage the proprietor usually supervises the stock but it can be left to one of the older and more experienced workmen if desired.

A good temporary repair of a gasoline leak may be made by covering the opening with a bunch of hard soap and wrapping with tire tape.

OVERHAULING THE CAR

When and How It May Best Be Done for Both Owner and Repair Man.

From J. N. Bagley, Nebraska.—The time of year the run-down car should be repaired and put in good condition is during the winter months when business is slack, but this fact is often overlooked by the user as well as the repairman. When the weather and roads are in bad condition, the repairman should look up these jobs and keep busy during the winter months instead of waiting for it all to come in a bunch. The overhauling usually begins in earnest about the first of April, consequently the repairman is overrun with work and every one wants his job first. Yet, when the repairman's business is slow he can do a better job for less money than he can when there is a hustle and bustle of business and he ought to impress this fact on his customers.

A car should be overhauled at least once a year, and minor things should be looked over at more frequent intervals. Occasionally the motor should be tested for compression, the plugs should be cleaned, the wiring should be examined, the gas tank should be drained, the brakes should be tightened and inspected, the magneto should be readjusted and cleaned, springs oiled, etc. This does not come under the head of overhauling, but such attention is frequently demanded.

In case it is deemed necessary to completely overhaul a car, every part should be removed and examined and all worn or broken parts replaced with new. When this is done in a workmanlike manner, the old car will go out and do eighty per cent. or more of the work it would when new.

Before dismantling a car it should be taken to the wash racks and all dirt and grease removed, as no workman can otherwise do a good job upon it. After a bath it should be taken to the work shop and the body removed, so that the chassis and accessories are easily accessible. Before proceeding further it is a good plan to get a number of good, strong boxes to place the various parts in, so that each part may easily be found in reassembling. Place all the engine parts in a box by themselves. The transmission bolts likewise may be thus disposed of, as they belong to the rear assembly. After all the bolts and other parts are free, give them a bath in gasoline, leaving them clean and bright and free from grease.

Now begin by inspecting the different parts of the engine to note if any need to be replaced with new and if so make a list of them. Pass to the transmission and do likewise, finishing up with the axle. The crank case can then be cleaned up and the main bearings adjusted. To do this remove everything from the shaft and place it into the case and adjust one bearing until it is working a fit; that is, a fit that will allow free and easy turning with the hands, being careful to note if the shafts bear evenly on all parts of the box. Now that the first is fitted, take the second bearing and proceed in the same manner and so on until all have been taken up. Now tighten all of them down and note the manner which the shaft turns in the bearings. It should now turn stiff as all of the main bearings are tight. Then fit each of the connecting rods to the bearing at the crank shaft until the weight of the piston will just slowly drag them down with the bearing on the shaft, all points. After all of the rods have been fitted and

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the crosshead pins made good, secure all rods to the shaft and key bolts as well as main bearing bolts.

Next examine the rings and note their condition. Many times they look good when as a matter of fact they are in poor condition. If they fit the grooves in the head perfectly, remove one of the rings, place it inside the cylinder and note the gap between the ends of the rings. If they fit close together when the ring is compressed in the cylinder walls they are all right, but in case the space between the ends is unusually large the ring should be removed and replaced by a new one. The valves in the cylinders should next be examined and in case the seats are pitted or irregular they should be ground in and all the carbon deposit scraped from them. Also note if the stems fit snugly in the guides, for if they are loose enough to allow a quantity of air to be drawn in around the intake valve when the charge of gas is drawn from the carburetor, it will be impossible to adjust the carburetor so the engine will work well at a low throttle. In case the stems are worn so they do not fit the guides, they should be replaced with new ones that do.

We are now ready to replace the cylinders and bolt them fast to the case, but before doing this note if the gaskets on which they rest are in good condition, and if not, cut new ones of heavy hard paper and use plenty of shellac. Next cut the gasket for the oil pan and place it in position and bolt it tight, as a leak of cylinder oil should not come at the joints. Examine the gears in the front of the case and note if they are worn sufficiently to allow of a slap, as the cam shaft is revolved against the spring pressure from the valve springs. In case the gears are worn sufficient to make a noise, nothing can be done, except to replace with new, as a repair is not possible.

Go over the magneto and replace such parts as are worn and thoroughly clean it with gasoline. In case the points are worn or pitted, they should be replaced or dressed until they fit square and firm. See that the little roller in the breaker bar does not have quite a little play on the shaft, as some missing comes from this particular trouble. Have the points adjusted as recommended by the makers of the magneto, as all do not require the same adjustment. Examine the coupling between the magneto and the gear and note if there is a slack, so that the armature can be moved back and forth a little distance, as this should not be. Be absolutely sure that the magneto lines up so the drive is straight through, or the bearings will be ruined or damaged in a short time. Most magnetos are fitted to a bracket in such manner that they cannot get out of adjustment, while a few have shims which permit of them being shifted about and in the case of the latter it should be looked to carefully.

Examine the pump, especially the stuffing nuts at the ends, and note the condition of the packing. If hard and dry it should be replaced with new and oil or graphite used. Do not screw it unnecessarily tight for holding the water. The hose connection should be replaced with new in case the old is not good. In replacing hose, especially if a trifle tight, it is a very good plan to cover the inner surface with hard oil, as it will thus slip to place without any unnecessary forcing.

The radiator should be washed out thoroughly and if possible use water from a hose, allowing it to flow through for some little time. A sediment will collect in a radiator that affects the circulation and during cold weather will cause some of the tubes to freeze and break open.

All bolts holding the motor in the frame should be replaced with new in case they are worn enough to allow the motor to move about during use. The cross member at the front of the frame should be examined and the condition of the rivets noted. If the rivets are found loose, cut them out and replace with new ones put in hot, as it is impossible to use old rivets to any advantage. When the motor has reached the stage where it is ready to set into the frame, it is a good plan to apply a good engine paint to the cylinders, as well as a coat of aluminum paint to the case and minor parts, such as manifolds, etc. This does not add to the efficiency of the motor but improves its appearance wonderfully and the customer will be more than pleased with the little time and paint taken to do the work. The motor can be left until the balance of the car is ready to assemble or it can be placed in the frame.

Next in order will be the clutch, which should be examined closely. In case of a leather faced clutch the leather if found hard should be replaced with a new one. In replacing the new leather, it should be soaked in warm water until it is pliable. When it dries it will be tight and smooth. The rivets used should be soft copper and the heads peened down below the surface sufficiently to not bear on the metal as the clutch is let in. In case the clutch is of the multiple disc type the disc should be taken out and each one examined and those found rough or cut should be discarded and new ones placed in their stead. The multiple disc should only be adjusted tight enough to prevent slipping, as nothing is gained by having the tension spring over tight. The releasing yoke should be examined and in case of wear it should be replaced, as a partly released clutch makes gear changing very difficult as well as dangerous to the gears.

The differential gears should be examined as well as the spider which supports them. In case they have play on the spider a new spider should be used as a little slack in the rear assembly only adds to danger of some other part of the car. The key and key seat in the bulb, as well as in the axle, should be examined and if any plays found, a new key should be made that fits tight. The mesh of the gears should be examined and in case they do not fit perfectly, the proper adjustment should be made before assembling. In case there are metal thrust washers, they should be replaced with new washers, thus giving the gears the proper mesh.

The brake shoes should be removed and the condition of the lining noted and whether or not the copper rivets holding it to the metal are bearing on the brake drums and cutting or roughing it sufficiently to damage the lining. The rivet heads should be sunk below the surface to prevent bearing on the metal drum as the lining is worn down. In case the break lining is hard and full of grease and dirt, it is not advisable to try cleaning, as new lining is the only safe repair when the responsibility of a good brake is considered.

The springs should be taken apart and all rust removed and flake graphite placed between the leaves. Oil will answer the purpose in a way but it has a tendency to collect dust. The spring shackles should be taken apart and the oil channels opened up and in case they do not fit the loop ends of the springs, they should be replaced with new, or the

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bushings in the springs should be replaced to effect a fit on the bolt. The springs should not allow the frame to swing sidewise if they are held secure at the ends by the shackle and shackle bolts. These bolts should have a small hard oiler in each of them and these should be the kind that the lubricant will be forced into the bearing, as oil will not always flow as it should, especially in cold weather.

All wiring about the car should be examined to see that it is not worn through and resting on the metal. Many times a skinned wire gives all sorts of trouble and while free access to all parts can be had, is a very good time to replace defective wiring.

Jack up the car and note the condition of the wheels and bearings. Clean the bearings with gasoline and supply a fresh lubricant. Revolve the wheels and note if they run true. Grip the wheel firmly and try it for side play in the bearings, as a front wheel loose on bearings is only a trouble added to the steering. The steering gear should now be gone over carefully, as well as those joints and rods which connect it to the wheels. In case the gear has slack within itself, the worm or sector is very likely worn and if it is not supplied with the necessary adjustment, new parts should be placed until it moves free but firm.

In assembling the parts of the car never neglect so little things as a cotter key, for when the customer inspects the job he will notice these little things a great deal quicker than he would if the radiator had been left off, and in mentioning the job to his neighbor, he will never forget to tell him the best place to take his car. Never overlook the painting of the engine, as nearly every man will notice that the instant he raises the hood, and these little things go a great way toward having a large list of satisfied customers. The writer knew of a man who went to the city to buy a car. They told him they had a car that had been driven by a doctor, and he passed to the better world and could not ship the car there, so his widow wanted to sell it at a great sacrifice. He bought the car at the figures asked, because it had been repainted and looked well, but as a matter of fact he had nothing when he got home but a worn out car. Appearance goes a great way, and the time spent in giving the car the appearance after the overhauling is done, is time well spent, even though you do not charge the customer a cent.

Taking next the transmission, it should be gone over carefully and all gears which are jammed at the teeth should be replaced with new. The bearings should be tight so that the gears will not ride each other. The shift bars should be adjusted so that when the lever stands in position the gears will mesh full and square. The end slack of the transmission shafts should be removed, so that when the gears are shifted, they will not have a tendency to crawl past each other, thus allowing only a part of the gear to take the load. The holes in the supports of the transmission case should be examined to see whether or not the case has been working on the frame during service, and in case the holes are worn oblong they should be drilled out as well as the holes in the frame, and new bolts made to take the place of the old ones. The universal joint at the back end of the transmission should be examined and all the old oil or grease removed. Worn parts must be replaced with new after which a sufficient quantity of good, hard oil should be used.

The back axle assembly should be taken down and all bearings examined as well as those parts working in the bearings. Note if the bevel ring is working on the differential case, and in case it is the rivets or bolts must be removed and new ones used.

THROWING BOUQUETS.

Likewise Information About Vibration, Balancing, Second-Hand Cars and Straining Gasoline.

BY JAMES F. HOBART, M. E.

The writer recently received a letter from a gentleman in the Middle West—Mr. Fred Schuman, Iowa—who passed over a very pretty bouquet relating to the writer's stories in the Automobile Dealer and Repairer. Then he proceeded to get even by asking some of the toughest questions that could be thought out in a "week of Sundays."

In his letter, Mr. Schuman says the trouble he now has to contest with is in connection with a Cadillac, 1910, which he purchased new and has been driving ever since, doing his own repairs as required and overhauling the machine as necessary. But he is now having trouble from vibration of the motor. He has recently had the car down, the motor completely overhauled and replaced in an A-1 manner, but it still vibrates badly. He has also written to the factory and they tell him to "tighten the bearings," but that did no good. The factory also told him to put in lighter pistons and that would help. He has weighed the pistons now in use and finds them to weigh 5½ pounds, without connecting rod or wrist pin, and he asks if lighter pistons would do away with the vibration which troubles him and would he get more power with the lighter pistons.

He does not care to have aluminum alloy pistons but would rather have a set of light cast pistons and wishes to be advised if this would cure the vibration and also give more power from the motor. He also wishes advice concerning any other way out of the difficulty.

Motor Vibration.

This trouble is one which has been with the reciprocating engine ever since James Watt jumped the lid off the tea kettle and started into the engine business. With the slow moving old engines there was little vibration and what there was became absorbed in the heavy parts, but when we come to run engines from 500 to 2,500 revolutions per minute, there is bound to be more vibration, and we will never get fully rid of it until the rotary gas engine displaces the unmechanical reciprocating device which every engineer has trouble with. But while we cannot get rid altogether of vibratory engines, we can get rid of a good deal of the disagreeable vibration by adequate design and careful balancing of the reciprocating parts as fully as possible. As stated, this is one of the worst things to be handled in engine design and the vibration though it may be greatly reduced by proper counterbalancing, can never be eliminated entirely.

In locomotive engines they attempt to compensate for the vibration induced by the piston and crosshead mass moving at high speed by adding compensating weight to the crank. The counterweight is usually added to the wheels and is placed directly opposite the crank pin. There have been formulated rules for counterbalancing engines, also more rules, and then rules on top of rules, but these rules, one and all, fail to give perfect balance to the reciprocat-

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ing parts. The vibration may be, and has been, greatly lessened, but it cannot be avoided or compensated altogether.

Rule for Counterbalancing.

The most generally accepted rule is to find the weight of the piston, cross-head (if any), cross-head pin and add to the weight thereof, one-half the weight of the connecting rod. Multiply this amount by the length of crank. If it is possible to affix a weight opposite to the crank, then determine the greatest convenient distance from center of shaft to the center of gravity of the proposed counterweight. Divide the result previously found by the radius of the counterweight, and the result will give the number of pounds weight which should be used as a counterweight. But in practice this weight is reduced according to the speed at which the engine runs, from three-fourths to two-thirds. Perhaps three-fourths is the most usually accepted figure.

But when the proper weight of a counterbalance is obtained, where are you going to attach it to an automobile engine? You can't attach weight to the crank discs, for there aren't any, or any room for

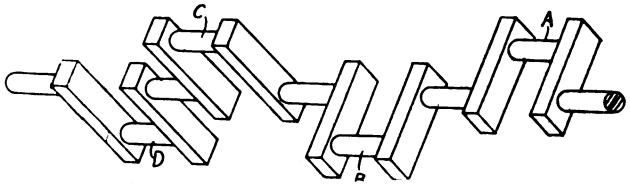


Fig. 1—Four Cylinders Opposed.

them. You can't attach the counterweight to the wheels as in a locomotive engine, because there is no direct connection between engine and wheel. In fact, there is no place in an automobile engine for balancing counterweights, therefore we can't well use them.

Light Reciprocating Parts Best.

But the above calculations do show us that the vibration of an engine depends principally upon the weight of the reciprocating parts. Therefore, it is evident that the lighter we make piston, rod and pins, their strength being adequate, the less will be the vibration of the engine. And furthermore, it will usually be found that the speed at which the engine is run has a good deal to do with the vibration of the engine, but it does not always hold that the faster the engine is run the greater the vibration, for there will usually be found some speed at which the engine will run more quietly than at any other speed. Sometimes there will be found two or more speeds, many revolutions per minute apart, at which the engine runs better and smoother than at any other speeds. This is true with other machines as well as with engines and it is due to the little known and less understood vibratory laws which govern and control many things of which the best of us at present know but little.

The calculations in the foregoing paragraph have one suggestive point, that the greater the weight of the reciprocating parts, the greater must be the mass of the counterweight which affixed opposite the crank, will make the engine run quietly, without vibration. This being true, it stands to reason that the lighter we can make the pistons and other reciprocating parts the less counterweight will be necessary and of course the less vibration without any counterweight. It is up to us to make and use as light a piston and connecting rod as possible. And aluminum pistons and rods, if we can make them stand up under the stress they will be subject to must materially reduce the vibration of the engine.

One point which was not stated in regard to this engine was whether or not the engine gave trouble by vibrating when first purchased in 1910. If the engine vibrated then as badly as now the cause of the excessive vibration must be looked for in the design of the engine. If, however, the vibrating developed later, particularly after being overhauled, wholly or in part, then the cause may be sought for in something which has been done—or undone—during overhauling.

It is quite possible that the excessive vibration—if it did not exist when the engine was new—may be caused, wholly or in part, by too great an advance in the spark. Explosion of compressed gas charges before the crank is fairly over or past the center surely puts nasty strains upon an engine.

In view of the many factors entering this question, I am not able to give as explicit an answer to the question of what causes the engine vibration as the gentleman asks for. The best I can do is, Yankee-like, to answer his question by asking those stated above. But one thing is certain: making the pistons and rods lighter will help matters a good deal.

There is another thing which affects the vibration of multi-cylinder engines, and that is, the manner in which their several cranks are arranged and the angle each crank makes with the other cranks. It is possible to construct an engine of the reciprocating type which will run practically without vibration. To do this, the cylinders must be double and opposed to each other in pairs if there be more than two cylinders. And the movement of the pistons must be such that in the opposed cylinders, both pistons are moving out, or in, at the same time. In the ordinary opposed engine one cylinder is moving in, the other out, at the same instant, thereby adding to instead of neutralizing the vibrations from each other.

Side by Side Balancing.

When two cylinders are placed side by side then the reciprocating parts in one cylinder almost perfectly balance those of the other cylinder, but the equalizing stress must all be transmitted from one cylinder to the other through the crankshaft. This being the case it may be possible to reduce the vibration of this particular engine by making a new crankshaft and rearranging the timing of the four cylinders. The four cranks should be arranged something as shown by Fig. 1, with each pair disposed at 180 degrees from each other as the reciprocating parts in cylinders A and B balance each other through the short length of shaft which connects them.

There is an opposite stress upon each crank which is exactly equalized through the short piece of shaft between A and B. In like manner, the cylinders C and D equalize each other's vibratory stress through the short length of shaft connecting cranks C and D.

In Fig. 2, which shows an arrangement of cranks frequently met with, the stress in cylinder A, due to its reciprocating parts, is equalized by similar opposing stresses in cylinder C. In this case the two stresses must be transmitted through two pieces of shaft, also through the crank, B. This gives a long route for the equalizing stress to follow and very much of the equalizing effect is evidently lost in

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torsion along the shaft and crank, B, and absorbed by the several bearings which the shaft passes through.

The Non-Vibrating Engine.

An engine could be made almost absolutely non-vibrating by using two opposed cylinders, placed in line with each other and with cranks fitted in discs which should be formed into cut gears and meshed with each other. The cylinders should be so connected that they are carried by a rigid housing and when the cranks are assembled they should be exactly opposite each other so as to be both "in" or both "out" at the same instant.

This arrangement would give an engine about as free from vibration as it is possible in the reciprocating type, but this form would be of little use for automobile purposes. The arrangement shown by Fig. 1 seems worthy of consideration.

Selling Second-Hand Automobiles.

"What becomes of all the pins?" is a question which was old when the writer was a boy, and the answer is the same now as it was then, viz.: "I don't know!" The same question may well be asked regarding automobiles and the reply would be still more of a puzzle for autos don't slip out of sight quite as easily as pins.

There's another story about pins which might be well applied to automobiles. The boy who was required to write a composition on "Pins," started his effusion by the statements: "Pins are real life-savers. Many lives have been saved by pins by not swallowing them!" And accordingly, many lives must have been saved and accidents prevented by automobiles—"by not riding in them!"

But where do all the old autos go to? A census recently taken in Indiana shows that there is one automobile owned in the State by each thirty inhabitants, and they're "some smoke wagons" for the Hoosier State. According to calculations made by the assistant Secretary of State, 96,915 licenses have been issued, an increase of over 30,000 from 1914, and no one can even guess what number of cars will be owned in the State before 1916 is past.

This immense number of cars must mean the discarding of many thousand used cars for new and better machines and here the question as to what becomes of the old cars becomes very interesting indeed.

A great many used cars are altered into light delivery trucks and grocers, butchers, bakers and marketmen take to the converted vehicles like ducks to the water. Somebody has a chance to make good commissions in placing these used cars where they are wanted, and a chap in Cleveland, Ohio, seems to have the right idea regarding the sale and handling of used cars. Their method is certainly an innovation in the selling of second-hand cars and they say in their announcement—which may be of interest to some enterprising dealer—

> "We announce the opening of a new department to be devoted exclusively to the selling of second-hand automobiles strictly ON A COMMISSION BASIS. We believe that this is the only method which insures a fair deal to both parties concerned. We will have no personal interest in any car offered for sale other than a nominal commission to be paid to us ONLY in case of a sale. There will be no other charge. There are other advantages in doing business through us which will be made known by inquiry by letter, 'phone or by personal call."

Don't Do It This Way!

It may be regarded as pretty poor practice nowadays to make connection between any wire and binding screw by twisting the wire around the threaded stem and then screwing the head or nut down upon the wire. Get away from this very crude form of connection and let the screw clamp against a flat bit of metal which has been solidly attached to the wire.

But if you ever are forced to use the wire twisted-around method, then by all that is good, twist the wire around the screw in the direction that the watch hands move—never in the opposite direction. There's a reason for this, and a good one. When the wire is twisted around the screw "clock-wise" the nut, when it comes down upon the wire, will pull the wire tighter against the screw and make as good a connection as is possible in that manner. But when the wire is twisted around "contra-clockwise" the screwing down of nut or head forces the wire out and away, and it is almost impossible to make a good, tight and lasting connection with the wire twisted around "against the sun" or against the direction taken by the clock-hands.

Vibrator Springs Too Stiff.

I recently saw a man get "stuck" on the road from having too stiff a spring upon the spark coil vibrator. While the dry cells were fresh there was

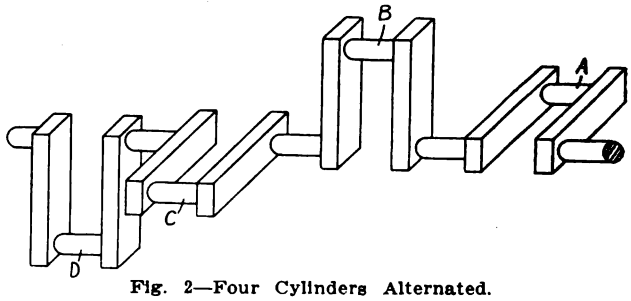


Fig. 2—Four Cylinders Alternated.

current to work the heavy vibrator spring in good shape but when the cells became weakened a bit from long use, there was not enough current to start the spring into making the first vibration, though once in motion it would work fairly well. The vibrator spring was weakened a bit by grinding it on an emery wheel (it could be done by filing and draw filing as well) and after the treatment the vibrator worked well on as weak a battery as would ignite the cylinder charges. You might look after this point with considerable advantage when there is trouble with the ignition missing at times, especially at starting.

Look Out for the Chamois Strainer.

It's a mighty good thing to strain the gasoline through a piece of chamois skin, but it's of little use to do so and throw the strainer down upon a dirty floor bench after using it. Then, next time you use the strainer there is a fine collection of dirt to be washed into the gasoline tank by the first liquid which passes through the strainer.

I saw another fool trick recently in connection with a chamois filter. It had been in use for some time and gasoline was very slow in passing through the chamois skin, so what did the user do but turn the chamois the other side up instead of cleansing it by washing with gasoline. But the gasoline went through all right, and that was what was wanted. But, oh, the dirt!

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TROUBLE-DEPARTMENT



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1760 His Brush Car.

From Herman H. Sunvald, Minnesota.—I have a Brush car that gives me some trouble in knocking and overheating. I have gone over the car but find everything O. K. The only thing I suspect is the carburetor, that is an old Kingston. Just as soon as I open the trottle the engine starts to pound, and I can turn off the switch and the engine will run along and pound (there is no short circuit), but as soon as I nearly close the throttle, the pounding stops. It does not matter how I keep the spark. This is when I run the car in high, it never pounds in low gear how fast the engine is running. It don't seem to pound or overheat so much when I have the gas tank full as when it is nearly empty. I have tried to adjust the carburetor in all manners but it don't help. I use high grade gas. Kindly let me know if you think a new carburetor would help matters. Would you prefer the air friction or Schebler's, and what model Schebler would be best suited for a Model E Brush car?

Reply.—Your motor is an old model with probably worn cylinders, pistons and rings. Undoubtedly your trouble results from carbon deposits in the cylinders, on the tops of the pistons, in the valve passageways and on the valve heads. Such being the case you could never prevent carbon deposits by changing carburetors. The carbon collects because with the throttle partly closed the partial vacuum within the cylinders draws the lubricating oil past the poorly fitting pistons and rings, and this oil does not entirely burn with the gasoline vapor and air, the unconsumed carbon remaining in the cylinders. Of course, if the gas itself is too rich it will aggravate the trouble. Both air friction and Schebler carburetors are recognized as good. The model Schebler carburetor recommended at the factory for Brush cars is either the D, 1 inch, or the H, 1 inch.

1761 A Bad Knock.

From W. J. Hemphill, Iowa.—I have a model 79 Overland car that has been run about 3,200 miles and seems to be in good condition at present with this exception: it has a very bad knock when it is forced to pull very hard. This knock seems to be caused by the carbon, in fact, I have had it cleaned about every 500 miles, and this relieves it very well but not altogether. I use Polarine altogether, but it does not call for much oil. The compression is O. K.. In fact, this is the only complaint I have to make at this time. Can you tell me why this should dirty up so quickly? And can you tell me how to fix it so that it will not? Can you tell me of any special rings that would help to overcome this trouble?

Reply.—Preignition as a result of carbon deposits is caused usually by too much oil in the cylinders. It is possible that your rings may not fit as they should; you may have run the engine some time without water in the radiator, or you may be using a light Polarine oil when a heavier grade would give you better results. To discover the exact cause it would be necessary to disassemble the motor and note the condition of the cylinders, pistons and rings. If the cylinders are scored there are no rings made that will remedy the trouble. There are several makes of piston rings advertised in every issue of this publication, but to equip your motor with new piston rings is an operation to be entrusted to some one who really knows how they should be fitted, not to an amateur. Before prescribing a cure in your case we would have to know for sure just what causes the excess carbon deposit. See our reply to Hermen E. Lunvelt, Minnesota, in the next issue.

1762 Chipped Differential Cogs.

From O. F. Berg, Minneapolis.—I have a Buick, model 29, which has run about eight thousand miles. Why does it chip the outside corners of the cogs in the differential ring gear from ¼ to ½ inch in length? I have heard of several others with the same model complain of the same. Now the gear is not worn that one can see, nor is the pinion. These pieces get in between the cogs and make a pounding noise.

Reply.—Chipping of the outer ends of the teeth of the driven differential gear can only result from one or two primary causes—either imperfect gear teeth or faulty alignment. These gears are hardened and may lose their perfect shape during this operation, but the most probable theory is that the bushing or bearing directly ahead of the bevel driving pinion is somewhat worn, throwing the axis of this shaft slightly out of line with the differential shafts. The bearings of the differential shafts must be looked to as well as the other above referred to, although their normal wear is not so great.

1763 Intermittent Missing.

From James Thomas, Oregon.—On my Buick 1913, model 40, I have a Stromburg carburetor, and I find that in climbing a hill it will give an intermittent missing. But if I adjust it down and give it more air through the carburetor, it will stop missing, but this seems to make it difficult to crank. Then I have to set it back about 8 notches and give it less air and then it will crank much easier, but as soon as I get it started I will have to give it more air through the carburetor. Please tell me how to prevent this inconvenience.

Reply.—Your trouble is by no means an unusual one. Its cause is too poor a mixture at low speed and too rich at high. You can probably remedy this by using new inlet valve stem bushings which fit the inlet valve stems more closely, preventing air leaks to impoverish the mixture. You should be able to remedy the trouble in a measure by increasing the gasoline supply and slightly reducing the tension of the automatic air valve spring.

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1764 Clutch Trouble.

From E. W. Kruse, Missouri.—We have an Overland car, model 25, 1910, touring car. This car has given good service. Lately, in running along even on a good road, when a wheel strikes an obstruction, a clod or stone, the clutch, which is a multiple disc, slips and the engine races, and when the clutch pedal is jerked up by putting the foot under it, the clutch will catch again and run until the next small bump it strikes. We have strengthened the clutch spring on the outside, and this makes it strong enough to hold the clutch in place. May it not be possible that the rings, or clutch collar, or both, are worn so that they need repairing, and can this be done without getting new parts, which are rather expensive for this car? The car has made approximately 10,000 miles. We are certain of having made 7,800 miles. All valves have been reground once. Otherwise the car is in good shape.

Reply.—The symptoms described point out the fact that new friction plates are needed. Just why they are worn out may be as a result of normal wear or may be due to imperfect alignment of the crank shaft with the transmission shaft, imperfect adjustment, or some defect. For a car now in its seventh year a total mileage of but 10,000 is unusual, even if somewhat improbable. Automobile engineers have for many years been aiming to cheapen the first cost, as well as the upkeep, of multiple disc clutches.

1765 Long and Short Stroke.

From J. E. Scott, Indiana.—Which is the more powerful style of motor, that which is termed the long stroke motor or the one with the shorter stroke? If, in your judgment there is any difference, what is the difference and what advantage has one over the other?

Reply.—The power of a motor is governed by the area of a piston, the length of stroke and the number of impulses per minute, taken in connection with the mean effective pressure within the cylinder. The M. E. P., as it is usually called, is the average pressure, expressed in pounds per square inch, exerted against the piston during the power stroke. A motor of 6-in. stroke should be 50 per cent. more powerful than another of the same bore and stroke at the same number of revolutions per minute. the number of cylinders in both cases being the same. Experiments made by engineers indicate that long stroke motors are more economical than short stroke, the theory being that a greater expansion of the gases is possible and the exhaust can be opened when the pressure in the cylinder is materially lower than is possible in a short stroke, higher speed motor. Long stroke motors are very popular with automobile engine designers, manufacturers, owners and operators. Early stationary gas engine manufacturers years ago discovered that a stroke approximately 50 per cent. greater than the bore gave highest efficiency. Carburetion is much more easy in long than in short stroke motors.

1766 Battery Information.

From Fred Mank, Pennsylvania.—I am anxious to have a few questions explained. We have a small motor which requires two and three dry cells of 75 to 25 amperes connected in series to run for a boy's "Meccano" outfit. Now I would like to make them a wet battery, which I suppose is longer lived and cheaper. How many ½ or 1-gallon jars must be connected in series, or how, to obtain from 2 to 4 volts, or, in short, the necessary power.

Reply.—Sal ammoniac wet cells have to use carbon and zinc elements, the carbon element containing black oxide of manganese as a depolarizer. If you are to use copper and zinc elements the electrolyte must be sulphate of copper or blue vitriol, dissolved in water, the copper being at the bottom of the jar and the zinc at the top. This type of battery was and still is used largely for closed circuit work, such as for telegraphy, and is usually known as "crow foot," from the shape of the zinc element. It is in reality the gravity type. You can buy these cells much more cheaply than you can manufacture them. They must remain quiescent, not moved about, for if the electrolyte becomes at all disturbed, the entire battery solution soon becomes ruined. Each cell will give you something less than one volt. You will find that dry cells in the end are more economical than wet sal ammoniac, a dry or wet cell giving the same voltage, no matter what its size. The only object of using large cells is longer life. Just what a "boy's meccano outfit" is we do not know.

1767 A 1909 Cadillac.

From H. L. Dessar, New York.—I am overhauling my Cadillac, 1909 car, and would appreciate your opinion as to the utility of several contemplated changes. Since the cold weather set in the car has not run satisfactorily as the motor missed badly when idling or running on a level road, but would fire regularly when pulling on a grade. The car is equipped with a Stromberg carburetor, type 4B, bought new about a year ago, with a hot air attachment from the exhaust manifold. The ignition is from two independent systems, there being two spark plugs in each cylinder. A battery with a four-unit coil supplies the starting spark and a Bosch high tension magneto, type DU4, gives the current for running. On inspection, after the motor was down, all parts looked good, bearings tight and piston rings all bright, but in the third cylinder the opening of the three rings were in a straight vertical line. There was also considerable soft carbon in the combustion chambers and on the piston heads.

1.—Do you think that this condition would account for the misfiring? 2.—If the pistons were fitted with some type of non-leaking rings would the motor be more efficient? 3.—Would one non-leaking ring per piston be enough? 4.—Would coiling a piece of ⅜" O. D. copper pipe around the vertical part of the intake manifold, for about six inches, and connecting same with the water circulation, give sufficient heat to avoid condensation of the gasoline as supplied to-day? 5.—In your opinion would the benefits derived warrant the expense?

Reply—1.—If by "condition" you refer to the piston ring partings being in line vertically, probably not. More likely the rings are so badly worn that the piston ring partings are too wide. The piston and cylinders probably are also worn and are possibly scored. If you will examine your inlet valve stems and bushings you quite likely will find either one or both badly worn, an additional possible and probable cause of missed explosions. 2.—They probably would if properly fitted, but such rings could not be expected to remedy trouble caused by

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worn or scored cylinders or pistons fitting too loosely. 3.—One is better than none, two to a piston better than one and in many cases three to a piston have proven better but then not entirely satisfactory. The better the cylinder surface is the less work there is for the rings to perform. 4.—It should not do any harm. If a 6-in. coil of ⅜" O. D. tubing helps, the longer it is the better the results, provided of course you can get a circulation of hot water through it. We have no means of knowing whether the short or long coil would do the trick. 5.—If the work were properly done it might. It would be an experiment, however, and experience such as you desire is rather high priced as a rule.

1768 **Temper Drawing.**

From Walter L. Miller, New Mexico.—Through your Trouble Department I would like to find out how I could draw the temper on the Armstrong Self Hardening Steel, that is used for lathe tools.

Reply.—Self hardening steel can be forged and ground, but cannot be filed or machined. High speed steel can be annealed by burying in lime while very hot, but after such annealing, a property not possessed by the former, it has to be re-tempered.

1769 **Undue Gasoline Consumption.**

From Henry Ryg, Frost, Minnesota.—1—We own a Maxwell, 1915, 5 passenger car. Bought it last May. We have been bothered with gasoline consumption, as it uses as much as one gallon of gasoline to every 10 miles. We have had it repaired at two different garages several times, but without receiving any help. They have looked over the carburetor and said that it needed cleaning and they cleaned it but it did not help any. The carburetor is a K.D. They have closed the needle valve as much as it is possible to do. If they should close it more it wouldn't run. It leaked before but I have not discovered any leaking now. I shut the gasoline off when I stop the motor. If you know anything that would help so that it would not burn so much, please let me know. 2—Will a Maxwell car run as many miles on low gravity gasoline to the gallon, as on higher gravity gasoline? 3—Will the storage batteries freeze if allowed to stand in the car in an unheated house in winter, if the motor is started once a week? 4—Do you believe it hurts the storage batteries to take them out and let them stand in a hot house over winter, without any care?

Reply—1—If impossible to decrease your consumption of gasoline by adjusting the carburetor it indicates that the carburetor itself is at fault or that the trouble is somewhere else. This you should be able to determine by temporarily connecting some other make of carburetor, for instance one which was sent out with the car when new. Almost anyone selling carburetors would be glad of an opportunity to change carburetors on trial. 2—This depends entirely upon the condition of the motor, the type, make and size of the carburetor and its adjustment. A gallon of heavy gasoline contains more heat units than does a gallon of lighter and more easily vaporized fuel. 3—Yes, if the weather is cold enough and the battery is nearly exhausted. They should be kept fully charged and put under charge every week or two. 4—We not only believe but we know it will seriously injure them.

1770 **Lighting and Starting Trouble.**

From O. W. Martenoon, Colorado.—I have an Overland car, Model 81. I am having considerable trouble with the starter and lighting system. The storage battery seemed to leak a little about a month ago so I took it to what was supposed to be a battery expert, and about three weeks after I went out one morning to start the engine and the battery seemed to be dead. I started it with the crank and run it to town about twelve miles. The lights have worked ever since, except when I try to use the starter. The instant the starter is engaged the lights will go out, but the starter will not turn the motor. The lights will not burn again until about two or three minutes after the starting pedal has been released and the motor not running. Then they will burn as bright as ever, but the minute the starter is engaged the lights go out. It is a 6V. U.S.L. battery. If the motor is run above twenty miles an hour when the lights are turned on it will burn the bulbs out.

Reply.—The combined starting and lighting system used with this car utilizes a direct current generator with a governor to prevent the voltage from reaching such a point that the lamps burn out. Your governor therefore, does not release as it should, hence the burned out bulbs. Your battery is probably pretty well discharged, is possibly sulphated, and suffers like lots of others from unintentional abuse. You should write to the manufacturers of your storage battery, or for that matter of any make of storage battery, for their explicit directions for the care of batteries, and you should carefully follow the instructions so plainly given in the instruction book sent out by the Willys-Overland Co., with every car. Your battery is probably practically ruined, and it may cost a considerable amount for repair and renewals of plates, etc. If you send it to the manufacturer you should empty out and thoroughly wash out the electrolyte before shipping. The U.S.L. battery is made by the U. S. Heating and Lighting Co., Niagara Falls, N. Y. The nearest agency of the Willys-Overland Co., should be able to give you some assistance.

1771 **Misfires, Pops and Jerks.**

From S. R. Fulcher, North Carolina.—I have a 1913 Ford car that has not been run over 10,000 miles. Will you explain to me through the Automobile Dealer and Repairer why it misfires and pops and jerks running around on the streets, but when taken out in the country where the roads are soft and it takes more gas, it pulls as good as when new.

Reply—It probably needs the attention of some good repairman to locate the trouble, which may be in the ignition, carburetion, or physical condition of the engine's cylinders, valves, pistons, rings, or valve springs. Your query is so indefinite that to answer it any ways clearly would necessitate at least a score or two of Yankee guesses. Probably proper carburetor adjustment, or a later model should help.

1772 **Ford Magneto Trouble.**

From Oscar O. Romundstad, Wisconsin.—Please tell me in your next issue what could possibly have been wrong with a model 1916 Ford, which has only been used a little. The lights became very feeble and glowed very little. The bulbs, wires and switches were all changed all to no purpose, evidently, as

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there was no improvement. They say there was a good ground connection and the motor runs good, and ignition is perfect. Neither high nor low speed would improve the lights.

Reply—If you will remove the small brush attached to the terminal at the top of the flywheel megneto housing, you will probably find some carbonized fibre hair like particles attached to it which should be removed carefully. You may have an imperfectly grounded connection in your lamp circuit, even if you are told that it is perfectly grounded.

1773 **Fuel Qualities.**

From R. Blondel, Massachusetts.—Will you kindly tell me which is the best explosive mixture, dry hot air with gasoline, or hot damp air and gasoline, or a little hot steam added to the air and gasoline vapor?

Reply.—We are going to let you decide this query after telling you something of the physical characteristics of the three mixtures mentioned, presupposing that each one has the perfect proportion of air to gasoline vapor. It is a law of physics that nearly all metals and practically all gases and fluids expand with the application of heat. Air also expands under heat hence a cubic foot of air at atmospheric pressure would contain more oxygen at 60 degrees Fahrenheit than would a similar cubic foot of air at atmospheric pressure if heated to 90 degrees. This is equally true of the vapor of naphtha. If the charge of air and gasoline or naphtha vapor is hot it will contain less heat and power than if cool—but it must be hot enough to thoroughly vaporize and hold the gasoline vapor in suspension, unless the gasoline has been thoroughly pulverized by the air passing the vaporizing nozzle at high velocity. If the air is saturated with moisture, as on a damp day, unless it is preheated this moisture will collect in the throttle structure and inlet manifold in the form of small particles of ice, but if heated sufficiently to prevent such a deposit, at certain motor speeds there is an appreciable increase of power noted. In some types of stationary internal combustion engines operating at low piston speed, water is taken into the combustion chamber, as well as gasoline vapor and air, for a two-fold object—primarily to lengthen the actual time of combustion, and thus increase the power, and secondarily to prevent carbon deposit. On a heavy atmosphere most motorcar motors "pick up" much better than when the atmosphere is dry and light, but as the engine speed is raised, increase of power becomes less and less noticeable until at high speed there seems to be little if any difference. If superheated steam were introduced to a very cold mixture, or saturated steam were introduced to a warmer mixture of air and gasoline vapor, it might increase the power, if under automatic control, at no time being in excess of the proper amount, at low engine speed, but it is extremely doubtful if any improvement would be noted at the high engine speed at which most automobile engines are to-day operated.

1774 **Two-Cycle Automobile Engines.**

From Fred E. Snyder, Illinois.—A friend and myself have been having quite an argument as to the number of cycles an ordinary automobile engine is supposed to have. I am positive that a very large majority of the automobile engines of today are four-cycle engines. Am I right? What is the meaning of cycle in relation to a gasoline engine? What are the names of some of the two-cycle automobiles sold to-day, if any?

Reply—An automobile gasoline engine has one and only one cycle. If this cycle or completion of operation is completed in four separate strokes of the piston in any one cylinder, it becomes a four-stroke-cycle, usually and improperly called a four-cycle engine. Practically all motorcar engines are today, even in spite of our worthy disciple and expounder of two-stroke-cycle possibilities, Mr. Charles E. Duryea, of the four-stroke-cycle type, and we confidently believe they will continue to be of this construction for many decades. We do not know of a single two-stroke-cycle automobile on the market, with the possible exception of the Chase, manufactured in Syracuse, N. Y. This is a commercial car.

1775 **Trouble With the Starter.**

From P. Presson, Minnesota.—1—I have an Overland model 79, 1914, car, with Gray & Davis starter and generator. Would it hurt the generator to run the machine with storage battery off, or have all generators safety devices for such occasions? 2—With battery removed could I change the wiring so as to get current for the lights direct from the generator? If so, how? Or, would I thereby burn out the bulbs? 3—On the 1915 Studebaker the storage furnishes current for ignition. Now, could you give me a diagram for changing the wires so as to get ignition direct from the generator, in case you must remove your battery. I know it has been done, but have forgotten how.

Reply—1—Motor car manufacturers warn owners against running the car with the battery removed. We understand that Gray & Davis and similar direct current systems do not have such safety devices. 2—No. You would burn out both bulbs and generator. 3—The 1915 Studebaker system is an improvement over that used on the 1914 Overland. We advise you to write to the Gray & Davis Co., Boston, Mass., who will advise you just what additional equipment is necessary, also of the wiring, in case you desire to combine ignition with starting and lighting. If you must remove your battery you must also remove the magneto, or at least the magneto brushes, if you run the car.

1776 **Lubricant Qualities.**

From William H. Corbett, New York.—1—Will you kindly tell me whether there is a benefit in using castor oil as a lubricant in an engine, in preference to other oils? 2—Why do racing cars use it? 3—Does it carbonize as much as other oils? 4—What benefits, if any, has is over other oils? 5—Has it any harmful effects?

Reply—1—In certain cases—yes. Revolving cylinder aeronautical engines have to use castor oil, no other kind answering the purpose. It is never used alone in any other types of internal combustion engines. 2—Racing motor drivers use it with their usual mineral oil lubricant on account of its high viscosity and the fearfully hot cylinders of their motors, and although its use causes heavy carbon deposits they do not need to run their engines slowly enough to be troubled from preignition. 3—Much more so. 4—Answered in reply to query No. 2. 5—No.

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1777 **Gasoline Efficiency.**

From Guy G. Ebert, Pennsylvania.—1—Gasoline generally used runs from 60 to 62 degrees. Would a gasoline 72 to 76 degrees be less liable to carbonize? 2—Would a gallon of 60 to 62 degree gasoline run as many miles (all other conditions being equal) as a gallon of 72 to 76 degrees, or wouldn't you deem it advisable to use such a high grade of gasoline.

Reply—1—Possibly. 2—To use the heavier gasoline efficiently would necessitate having a more modern carburetor than if using the much more volatile 74 degree product. It will cost considerably more per mile to use 74 degree than the usual motor gasoline procurable, and be much harder to procure.

1778 **Size of Tires.**

From X. Y. Z., Ohio.—1—Please answer in your next issue whether you consider a 3½ inch tire sufficient to carry a car weighing 2200 lbs., without passengers. 2—Can I use a 4 inch tire on the same rims as the 3½ inch tire?

Reply.—1—A 2,200 pound car, unless you are to pile in six or eight heavy people, should run satisfactorily on 3½" tires. If you will write to the manufacturer of the tires you are using or contemplate using, he will gladly furnish you some valuable tire information gratis, sizes for various weights, inflation pressures, care, etc. 2—Yes.

1779 **Valve Reseating.**

From Otlus Wheat, Texas.—Kindly answer through your columns if the valves of a model T Ford engine could be replaced with larger ones. What I wish to do is to make the valve opening larger, and drill out the valve guide. Through some careless workman the valves have been reseated so that the head of the valve when seated is down in a recess of about 1/16 of an inch. In your opinion, if this is possible, which I am sure it is, what size valve could I use? Also where could I get a reseating tool for the valve?

Reply—Yes, you can do what you suggest. Use an adjustable valve reseater. You can purchase this tool by addressing Suite 701, 30 North Michigan Avenue, Chicago, Ill. Care should be taken not to cut away too much material. You will need valves with larger heads, the size to be determined by the seat cut in the cylinder.

1780 **Fuel System Trouble.**

From John E. Wood, New York.—Will you kindly diagnose the trouble with my fuel system? On my Pullman, 4-cylinder car, I am using an old type of Stromberg carburetor, without a hot-air intake. Every time I stop my engine about a quarter of a pint of galosine drips from the air intake at the bottom of the carburetor. There is no leak of gasoline at any other time, and this trouble is not manifest when the engine is very hot.

Reply.—There are two mediums utilized in the vaporization of gasoline in an internal combustion motor, air velocity pulverizing it and heat to not only vaporize, but to keep the pulverized and vaporized gasoline from condensing back to liquid form after it leaves the mixing chamber. Gasoline today is much heavier and less volatile than when your motor was new. Later and more modern carburetors are designed with smaller fixed air openings to give the air higher velocity and in addition to hot water jacketing the throttle valve structure, provision is made to use heated air. In your case the gasoline is not properly pulverized and vaporized, a quantity remaining in the inlet manifold at all times in liquid state while the engine is running, the partial vacuum in the cylinders drawing air and gasoline vapor past it, preventing it from running back through the carburetor until the engine is stopped. Your only remedy is a carburetor of later model designed and constructed to prevent "loading up" of the inlet manifold with condensed and improperly vaporized gasoline. Although you do not so state, there is probably an extraordinary waste of fuel.

1781 **Magneto Trouble.**

From Harry H. Shawl, Kansas.—Could a low tension Remy magneto be fixed so it would not absorb the strength of dry cell batteries, in running the current through it to run the motor? We have a Buick car with plain coil and the magneto is not working satisfactorily. It probably should be sent to the works for repairs. I have heard that batteries are used up six times faster through the magneto than where not used through one. The magneto has the breaker box and distributor on it, which, of course, has to be used for proper ignition.

Reply.—The low tension Remy magneto has a long contact at the circuit breaker in the breaker box and uses up battery rapidly as a result. Your only remedy is to get the magneto repaired or equip the motor with a single-spark battery ignition system, one that uses battery current economically.

1782 **A Lubrication Inquiry.**

From W. J. Hill, New York.—What would be the advantage of using the same oil in a Ford car that is used in the Franklin? And what are the objections, if any?

Reply.—The Franklin is an air-cooled motor and the cylinders get very much hotter than do those of a water-cooled engine. Again the cylinders of a Ford, cooled by thermo syphon rather than by a mechanically circulated system, get nearly as hot as in a Franklin. As a result cylinder oil adapted for use in a Franklin would be better suited for a Ford than some other makes. About the only objection we could raise would be that it might have a slightly higher fire test than would give best results and cause excessive carbon deposits. The manufacturers of a motor car should be best able to judge of the oil best adapted for use with their individual product, although some manufacturers of motor oils have expended large sums of money in making tests of all the principal makes, models and types, while unfortunately for some car owners there are oil dealers who advise brands manifestly unsuited for use in certain makes and types of cars.

1783 **Removing Battery Connections.**

From W. H. D., New York.—Kindly tell me how to remove the heavy load connections which join my storage battery plates. The battery is a "Pumpelly" 1915. Connections are seemingly driven on. I need to replace one cell, which is leaking.

Reply.—These connections are probably "burned" on by the process known as "lead burning," a hydro-

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gen flame melting and fusing the connector to the plates. You will probably have to take the battery to some one who is equipped to do lead burning in order to replace the defective cell. A year or so ago the Pumpelly storage battery was manufactured by the Pumpelly Battery Co., Indianapolis, Ind.

1784 **Ignition Inquiries.**

From J. E. Hess, Massachusetts.—Since its infancy I have been a subscriber and reader of the Automobile Dealer and Repairer with much interest, as well as instruction, and now for the first time may I ask you two or three questions in relation to the model 79 Overland, 1914, car, equipped with Splitdorf low-tension magneto and coil for ignition? 1—Is it practical to use two ordinary spark plugs in each cylinder for ignition, one in place of the priming cup in addition to the regular plug? 2—Do you personally know whether the results obtained by installation of the Su-Dig series plug would warrant my installing same in my car? This plug is advertised in your publication. Any information would be thankfully received.

Reply.—1—Not unless you have two separate ignition systems or a two-spark independent type of magneto. 2—The Su-Dig plugs are highly recommended, and quite likely the manufacturers would be willing to send you a set on trial to be retained only if they give the results claimed for them.

1785 **Platinum Points Ruined.**

From N. Scholl, New Jersey.—As I am experiencing some difficulty with my car, I herewith take advantage of your offer to furnish information concerning car troubles. My car is a 1914 Ford, equipped with master vibrator, Briggs & Stratton make. The platinum points on the vibrator springs wear very rapidly, lasting only about 300 miles. I have tried all manner of adjustments, but to no avail. While the motor is running there is a continuous flame at the platinums, which of course causes this rapid deterioration. My car gets its light, as is the usual way, from the magneto, and I find that when the lights are switched on this flame at the platinums immediately disappears.

Reply.—There is little doubt that the condenser of the master vibrator has broken down, as one mission of the condenser is to prevent arcing at the contact points. With the lights switched on, the amperage of the current used for ignition is very much reduced, correspondingly lessening the arcing at the contact points.

1786 **Sparks, Coils and Wheels.**

From Wm. J. Temple, Nebraska.—1—Could 110 volt A. C. be used to spark a stationary engine by means of one of these commercial bell-ringing transformers? The engine is equipped with a jump spark coil, which is operated by four batteries at present. 2—Would there be any danger of injuring the coil if operated in this manner? 3—About how much current would be used from the 110 volt line? 4—Is it detrimental to the car in any way to run one plain tread and one non-skid on the rear wheels at the same time?

Reply.—1—It possibly could be done. 2—If your coil is designed to operate on but four dry cells—yes. 3—Four dry cells give approximately 6 volts. You would have to use some sort of a transformer, or a bank of. say, 17 or 18 6-volt lamps in series with the coil. It would take a considerable current and would be more expensive than dry cells. A small belt-driven magneto would be much simpler and more economical. It should not cost more than $10 to $15. 4—It might cause extra work for the differential, one wheel slipping and the other doing most of the work.

1787 **Battery Information.**

From W. W. Mowland, Maine.—1—I would like to know how to disconnect the storage battery of a 1915 model 80-T Overland car. 2—I should also be pleased to have you advise me as to what is the best and strongest storage battery. The present one is a U. S. L. battery and will not start a car in cold weather. 3—I should also like to know the name of the storage battery used on new 1915 4-cylinder Buick cars.

Reply.—1—Disconnect the wires from the battery. Do not attempt to run the engine with the battery removed unless you also remove the generator, or at least the generator commutator brushes, for it means that, unless you do, you will utterly ruin it. 2—The U. S. L. is a good battery, but will not stand abuse, nor for that matter will any other make. If you do not keep it properly charged, replace the water which is decomposed, and charge it every week or two by running the motor and noting that the generator is generating electricity as it should, you will always encounter trouble. 3—The 4-cylinder 1915 Buick uses the Exide, manufactured by the Electric Storage Battery Co., Philadelphia, Pa.

1788 **Removal of Pins.**

From E. P., Iowa.—Will you please answer the following question through your Trouble Department, as I read the same with interest? It will be noted that there are different thrust plates on each side of the differential gears. It sometimes happens that these plates wear considerably, and this also wears the two pins that hold these plates up, so that the plates drop down on the axle shaft roller bearing. Will you tell me how these pins are removed and new ones put in?

Reply.—Owing to the fact that you omitted the very necessary information—the make of your car or of the rear axle and differential, we fear that our reply will be rather unsatisfactory, as it will have to be in general rather than specific. If, as we understand it, the pins are used to prevent the thrust plates from rotating, they may be driven in or screwed into place. If the former, it probably will be necessary to drill them out, using a drill of slightly less diameter than the pins. If taper pins are used they may be upset or riveted over at the small end, in which case it usually is necessary to drill a little distance into the small end before they can be "backed" or driven out.

1789 **Wiring for Lighting and Ignition.**

From Louis L. Hills, Maine.—1—Kindly inform me how to connect a tail light and dome light to a 1915 Ford magneto? 2—Also how to connect dry batteries for ignition. I spent some time and much energy trying to remove the glass from the Ford headlight. I found it very simple by placing a flat file against the rivet beneath the rim and striking

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the file with a hammer, making the rim turn to the left or counter-clock-wise.

Reply.—1—Use two 6-volt lamps in series, one lamp grounded to the chassis frame, a wire connecting the other lamp terminal of the grounded lamp with the second lamp, and with the remaining terminal connected to one pole of a single throw lighting switch, connect the other pole of the switch with the wire which leads from the brush contact terminal on top the magneto or flywheel housing. 2—Connect one pole of a battery of four dry cells, wired in series, with the metal chassis frame, and the other with the battery connecting pole of the ignition switch.

1790 **Lighting from the Magneto.**

From Dr. R. B. Scofield, New York.—I have a Ford, model T, car with the new type magneto. I would like to have four electric lights run from this magneto, two for side lights, one for tail light and one for a dash light. Can I run these all in one circuit, and if so what lamp—that is, what bulb should I use? Is there a more satisfactory way of wiring? Of course I do not want to injure my magneto. Thank you for the information.

Reply.—You can use four 3-4-volt lamps in a single circuit or you can use two 6-8-volt lamps in each of two circuits. The side lamps could be any candlepower desired, but higher of course than the rear and dash lights. If the lights interfere with ignition you could use lower candlepower bulbs, but you should not reduce their voltage, else you will burn them out. Remember, if two are wired in series the voltage should be 6-8, and if four in series, 3-4.

1791 **A Transmission Click.**

From A. E. Brown, Massachusetts.—I have a 16-20 horsepower Hupmobile runabout. All at once I noticed a click in what seemed to be the transmission, and it was only noticeable in the reverse gear. I have drawn out all of the oil and examined the gears and every tooth is all right. The click comes at every revolution of either the drive shaft or one of the gears. When I take off the cover of the transmission it sounds so plain that it seems as though I could see where it is, yet I can discover nothing, as every gear is perfect. The more power I use in reversing the louder it sounds. It sounds like a set screw dragging, as near as I can describe it.

Reply.—It will be necessary to remove the reverse gear and reverse gear shaft, in all probability, in order to discover where and what the trouble is. We regret that we are unable to advise you any more definitely but we can gather but little information from your inquiry from which to formulate a diagnosis of the probable trouble.

1792 **Kerosene and Gasoline.**

From Ralph A. Guth, Pennsylvania.—Is it possible to use, with satisfactory results, a kerosene-gasoline mixture in a model 83 Overland car? If not, why not? I am using a mixture of one part kerosene to four parts gasoline in a stationary 1¾ horsepower gasoline engine, make-and-break jump spark ignition. It runs just as well as with a pure gasoline; no trouble to start on mixture.

Reply.—The mixing of kerosene and gasoline in a variable speed engine is not desirable, though it is true that some engines can be run on such a mixture, with possibly a slight gain in fuel economy. Kerosene is much harder to vaporize than gasoline and the two fuels do not mix readily. The consequence is that there is always a strong tendency for free kerosene to enter the cylinder and cause corbonization and overheating. Moreover, such a mixture is not easy to start on and cannot be satisfactory for winter work.

1793 **A Persistent Knock.**

From C. W. N., New York.—I have a car, in use four years, which troubles with a knock in the engine. I took it to a repair man and was informed that the connecting-rod ends required adjustment. This was done, but since trying the car the knock is still in evidence; if anything, it is worse than before. It is most noticeable when the ignition is advanced, and on a hill I have to retard the spark as much as possible to prevent excessive knock; in any case I cannot stop it entirely. Can you offer any suggestions?

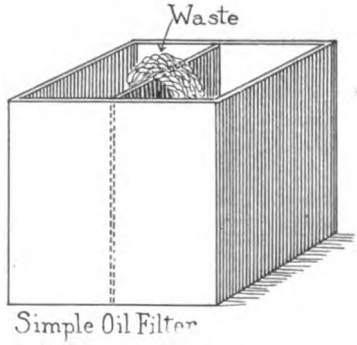
Reply.—It may be due to faulty timing of the spark. It was probably set correctly originally, but the magneto drive may have slipped a little and it requires resetting. Of course, if the cylinders have not been cleaned free from all carbon a knock may occur with correct timing. The cylinders should have been decarbonized when the engine was taken down, otherwise it will be impossible to drive without the knock occurring except possibly by retarding the spark to such a degree that a great loss of efficiency is caused.

A Simple Dimming Device.

From W. H. Hooner, New York.—For anti-glare for my car lamps I had our glazer cut two pieces of Florentine glass for me, and I put one piece in the door of my Presto headlights in place of the clear glass, smooth side out, making it easier to wash off the street mud. The headlights are all any one needs for night driving and there is absolutely no glare, just a strong white light. I hope this will help plenty of others as it has me. It surely will cover the law and still give plenty of light. I firmly believe the glaring headlight is the most dangerous thing on any road (to the other fellow) that there is, outside of ice. Any glazer should cut 2 pieces of Florentine glass, 8 or 9 inches in diameter, for not more than 25 cents for the two pieces.

A Simple Oil Filter.

From F. E. Poister, Kansas.—Take an old five-gallon oil can, solder a partition in the center, making it oil tight. Pour your dirty oil in one side and



Simple Oil Filter

saturate a piece of waste with oil and hang it over the partition so one end is immersed in the dirty oil. By the action of capillarity the oil will flow from one side to the other, leaving the dirt behind.

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Setting Automobile Wheels.

From Massa & Boggs, California.—We note the article by Mr. Blue in your December issue, regarding setting of automobile wheels, and while he has the right idea, we must say we would consider the method of wrapping narrow strips of iron around the felloe very crude. We set numerous automobile wheels in this locality, and our method is as follows: Remove the channel, either by heating slightly, or if loose enough drive off. If the spokes are loose, remove the hub and wedge the spokes at the hub with thin pieces of band steel. Take the measure of the felloe and channel the same as you would a wagon tire and then build up to size with the proper thickness of band iron, put around the face of the felloe in half sections, and secured with a small nail countersunk at each spoke. When the tire or channel is heated and put on over this, it makes a perfect job and the band iron does not show, as Mr. Blue's does, thus making also a very neat job. The stem hole and bolt holes are drilled through the band iron after the channel is on.

We have set as many as twenty wheels in one day without a come back on account of getting loose.

Driving Wheels Pull Best.

From N. G. Near, New York.—I have been asked: "Why can an automobile often back out of mud holes, where it can't get out frontwards?" My explanation is this: For the same reason that a man can pull a greater load on a wheelbarrow than he can push. Where the power pulls, as where a horse is hitched to an automobile that is "stuck," the advantage is greater than where the power acts as a push, as in the automobile going frontwards. In some cases truck builders are now building trucks with the power driving the front wheels instead of the hind wheels. Greater loads can thus be pulled. Rubber tires are used on the front wheels, whereas steel is used on the hind wheels. Since most of the load rests on the hind wheels, it is evident that there will be a good year-in-year-out saving in rubber bills, with the engine resting on the soft front rubber tires; it is protected against severe jarring. The front wheels also do the steering, which they can best do, of course; and the front wheels can pull more than the rear wheels could push. We, therefore, have an ideal combination in such an arrangement.

Next time you are stuck, then, it will be well to remember the above. Make the driving wheels pull.

Electric Lighting.

Owners of cars lighting by acetylene gas or oil can equip their machines with the straight battery system of electric lighting at a moderate cost. Such a system will prove decidedly convenient for it eliminates the trouble of lighting lamps and smoking. One does not require a technical knowledge of electricity to instal such a system, and the wiring is simple as indicated by the drawing. The plan is adaptable for the side and tail lights, or tail and headlights if preferred. Generally the former is employed as the use of bulbs obtaining efficient lighting in the headlights consumes considerable current.

The changing over of the oil lamps into electrical units is a simple matter as there is a large variety of converters and adapters marketed. These units can be clamped over the oil burner or inserted in the side of the lamp, an installation permitting of the use of the oil members when desired. Three converters will be required, two for the side lamps and one for the tail light. Double connectors permitting of breaking the circuit as when displacing the lamp is displaced for cleaning, etc., are preferred, but they can be dispensed with. A switch, preferably of the push and pull type, although an ordinary member will do, some No. 14 or 12 B. & S. gauge insulated wire, cleats and tape completes the equipment aside from the battery. While dry cells wired in series or series multiple may be used, owing to their high price it is cheaper to utilize a storage battery as the latter can be recharged at a slight cost, and if properly cared for will last a long time. In the wiring plan shown there will have to be made three splices which are made by stripping the insulation and binding and soldering the bare wires at the points marked splices in the sketch.

If a six volt battery be employed, six volt lamps will be required, and by using two candlepower tungsten bulbs, economy of current will be effected. The amount of lighting or service from the battery will depend upon its capacity. It is easily figured. Three

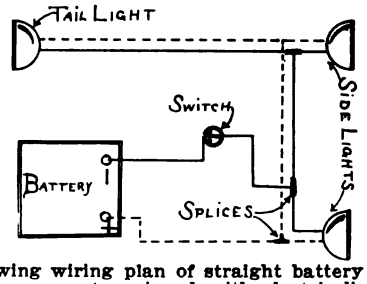


Diagram showing wiring plan of straight battery system of electric lighting for cars not equipped with electric lighting system.

two candlepower bulbs will consume slightly over seven watts. To simplify matters let it be assumed that one ampere is equivalent to six watts, inasmuch as an electromotive force of one volt with a current strength of one ampere is capable of developing an energy called a watt.

If the battery be of 60 ampere-hour capacity, multiply 60 by 6 which obtains 360 watts. As three two candlepower lamps will consume say 7½ watts, dividing 360 by 7½ obtains 48, the total number of consecutive hours of lighting that should be obtained. If six dry cells be used, and estimating the amperage at 20, they will supply lighting for 16 consecutive hours. If dry cells are to be employed, it is best to wire 12 in series multiple as greater efficiency and longer life will be obtained.

Care of the Varnish.

From J. Elton Greenleaf, New Jersey.—When the new owner receives his first car with its beautiful luster, he resolves to keep it in this perfect condition as long as possible. Such a resolve, if conscientiously followed out, will more than repay him for the additional labor which it involves. Automobile bodies are usually finished with at least 18 coats of paint and varnish. All this fine finish is put there by the manufacturer not only for beauty's sake but also to protect the surface underneath from the disastrous effects of the elements. It is most certainly worthy of the greatest care. It would raise the hair on the head of an ordinary coachman if he saw a man go over a car with hot water and a scrubbing brush as has been done in some instances. Such a procedure mars and dulls the varnish beyond any

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hope of repair without refinishing. In the first place one should possess two chamois skins and two flannel cloths, one of each for the body and chassis, also a plentiful supply of cold clean water. Rain water is preferred, but should none be at hand the ordinary city supply will do nearly as well. Using a hose without a nozzle, direct a gentle stream of water against the body, taking care to have it hit the body at an angle. The more gentle the stream and the longer time any mud accumulation are allowed to soak the better, as a heavy flow will tend to drive the grit over the surface so rapidly as to cause scratches. If a hose is not available, a garden watering pot, such as used to water flowers with, will serve, although not as convenient.

Taking one of the flannel cloths remove the accumulations of dust and mud as the water flows upon the body. Try to float the dirt accumulations off as much as possible without rubbing the surface.

Keep separate chamois and cloth for the body and chassis, and always wash the car in the shade. In drying the body wipe it gently with the chamois and let a fine mist remain as this will notably increase the luster. While there are undoubtedly good soaps on the market for use in washing cars, the writer does not recommend their continued use, except on the chassis. Kerosene should never be used. Plain cold water is the best thing for the varnish, and plenty of it, especially on a new car as it hardens the finish.

First wash the hood, then the body, fenders, chassis and wheels last. In washing the chassis, first remove with gasoline all accumulations of grease or oil. Between the spokes a brush can be used to good advantage. The varnish used on the chassis will stand a much stronger stream of water, without injury, than that used on the body. Care should be taken in lubricating the car, not to spill any lubricant on the varnish as it is very detrimental to it.

Tar deposits may be removed with a small piece of rag moistened in turpentine. Do not allow mud spattered on the car to dry on it, as it will spot the finish by extracting the oil, and wash off dust as soon as possible. If these directions are carefully followed, the car will retain its original luster for a long period.

It Was a Defective Coil.

From F. H. Tuthill, New York.—I note an inquiry in your Trouble Department, No. 1755, January number, 1916, from C. E. Caswell, N. H. I have one of the same model AA Maxwells, and have had just the same trouble described, and did just what Mr. Caswell did, but no good. I concluded it must be in the coil and sent it to the Splitdorf people. They repaired the coil at a cost of less than four dollars. Now my Maxwell AA of 1910 is running fine. This car has been run a little more than 45,000 miles. By bushing the inlet valve stems, no doubt, there would be an improvement in the motor.

Expects to Make 100,000 Miles.

From E. E. T., Iowa.—I have a Warren Detroit, 1910 model car, and it is as good as most cars two years old. I have never run it over 35 miles an hour. I only figure on making 20 miles an hour. I have never had the speed craze. I do my own repairing. My car has only 70 miles to run to make 50,000 miles, and I expect to drive it 100,000 miles. A car needs a careful looking over at least twice a year and cleaned, and if you hear a queer sound look till you find the trouble and fix it.

Hood Support and Pipe Cutter.

From C. S. Perry, Rhode Island.—The streamline or taper hood of the present type of auto is not as easy to handle as the old style which had a support

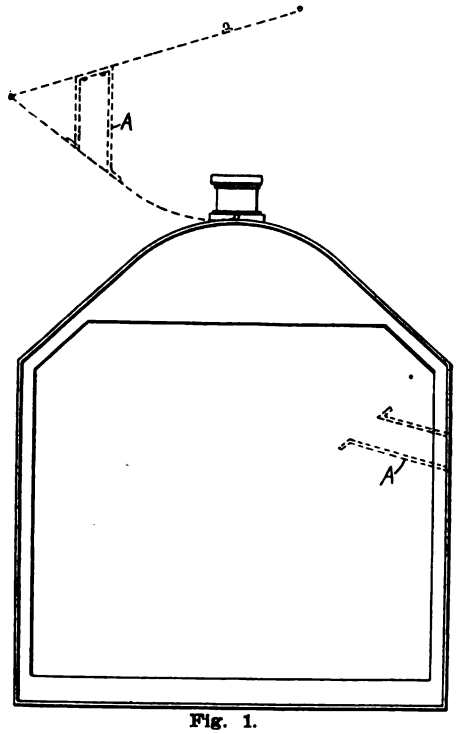


Fig. 1.

attached to the engine side of the dash. With the old type it was an easy matter to raise and fold back the flap of the hood when one was inspecting the engine or adjusting the carburetor, etc. With the new designs one must be careful in raising and folding back the hood else it will scratch the varnish and paint on the body part of the hood. As it is not an easy matter to fold the hood back when looking over the engine, the bracket or support shown at A in

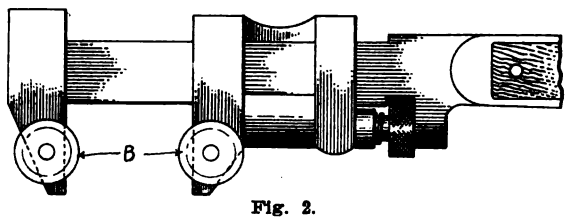


Fig. 2.

Fig. 1, will be found to be useful. It consists of a strip of light steel about half an inch wide and one-eighth thick and is bent to the shape shown in the drawing. The strip is rivetted to the hood and if one be careful the heads of the rivets will not show or the finish be injured to any great extent. The rivet heads can be touched with a little color varnish after the job is completed. In fitting the hood support, care must be taken to so install it that it will clear the motor when the hood is down. This kink will not only save scratching the paint but the hood can be raised and lowered easily.

The kink shown at Fig 2, illustrates how a pipe

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cutter can be made by any one interested in manufacturing his own tools. Take any old wrench the jaws of which open wide enough to handle piping, up to 2 or 2½ inches or less, it depending on the work to be done. Purchase the steel cutting discs, B, which can be bought at any hardware store for a few cents. Use two stove bolts with diameters similar to the openings in the discs, and drill two holes in the jaws of the wrench as shown in the drawing. Slip the bolts through the openings in the discs and those in the wrench jaws, and tighten the nuts on the bolts. It is important that the discs rotate fairly free on the bolts. As the jaws of the wrench are adjustable it is a simple matter to cut piping of different diameter up to and including the maximum opening of the cutters.

How a Knock Was Cured.

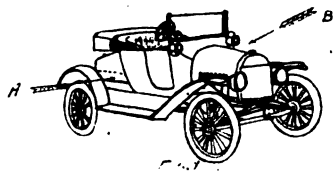
From Leroy C. Smith, New York.—I have just signed for your paper but have read it for some time. I want to tell the readers of an experience I had with a Ford motor.

I repair cars of all kinds but this one was a sticker. The trouble was a slight knock when the spark was advanced. At all other times the motor ran smoothly. The trouble was to find the knock. I took it to be a bearing knock, of course, and I tightened all the bearings but the knock got worse. I had the motor all down and it seemed to be in fine shape (a 1913 car). I was desperate, so I wrote the Ford Company, but they did not help me any, so I set out to find what the trouble was or bust. I didn't think it could be a piston slap, as the pistons were in such good shape, and seemed to fit the cylinders fine. Every time I started the thing it seemed to knock a little harder, and as a last resort I began to lift out the coils, one at a time, and as I lifted out No. 2 coil—behold! it quit knocking. I at once took out the second piston and fitted a new one .003 inch oversize, and when I started it the knock was gone for sure. I hope this will help some one who has the same trouble, and I would advise every Ford owner to keep watch of his pistons and have new ones fitted when they have been run some time. Let us hear from others through these columns.

Stream-Line and Improved Steering Wheel.

From I. O. Ernest, Mt. Vernon, Ohio.—I own a 1915 Ford runabout. Following a suggestion in the October Automobile Dealer and Repairer, under the heading of "A Compartment for Tire Shoes," by E. G. B., New York, I conceived the idea of giving to my car the up-to-date stream lines. To my surprise this was a very simple matter, and gives to the Ford roadster such a neat classy appearance that it cannot be recognized as a Ford unless scrutinized closely. With the Ford runabout it is a very simple matter to remove the rear boot. I then made a tire compartment 6 inches high as suggested by E. G. B., with the exception that this was made of wood, and in the manner indicated at A, Fig. 1. This consists of a wood frame with the side to the rear of the machine left loose to which a wooden tray is fastened so that it can be slipped in and out like a bureau drawer; then on top of this frame the old boot can be easily fitted. The frame was then given a coat of shellac and two or three coats of black enamel. As will be noted this raises the old boot 6 inches which adds greatly to the appearance as well as giving a great deal more room for carrying baggage, etc., when the tray is not used for a spare tire. I also made the bottom of the old boot removable which adds to the convenience when no spare tire is being carried. I then secured a stream line hood from the Specialty Auto Parts Company, of New York, and the transformation was as surprising as it was complete and pleasing, as will be noted by the cut.

After driving my car just the past summer and fall I found that the paint had worn off the steering wheel rim so much that it made it rather unsightly; also when driving with gloves, especially woollen ones, I had to moisten the palms frequently with saliva to prevent the wheel from slipping in my hands. I overcame these objections in the following manner, which is very simple and costs practically



nothing: Get a yard of heavy unbleached muslin and cut it "on the bias" into strips 1⅛ inches wide, and fold one edge over ⅜ inch, as shown at A in Fig. 2. Remove the rim from the steering wheel spider and tack one end of the strip to same with a small tack. (Drive the tack through the single thickness of the strip as at B so that on the next round it will be covered and not leave a rough place on the rim.) Then wrap around the rim overlapping the single thickness with the ⅜ inch edge that is turned over as at C. This will bind each previous round solid and make the wrappings three thicknesses as well as cover the tacks at the beginning

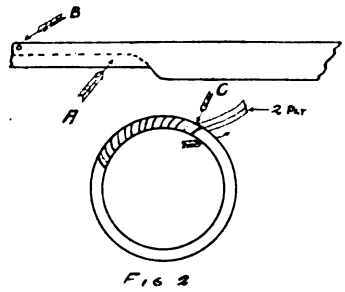


Fig. 2

and end of each strip. After the rim has been covered with the muslin strips give three or four coats of hard floor varnish, or dark shellac and you have a steering wheel improved in appearance, as well as one which will not slip in your hands, which is a factor of safety.

Beware of the Flames.

From W. H. D., Connecticut.—A gentleman in Marble Dale, Conn., thought to warm up his Overland so that his daughter could use the car to drive to her school, a mile distant, she being a teacher. He accordingly set an ordinary kerosene oil heater in front of the radiator and put robes and blankets over it and the radiator, and went to his breakfast. Upon returning, dense smoke was issuing from the garage. With the help of a neighbor, the garage doors were forced and the machine pulled out and the fire put out. The fire in the building which adjoined his store was also extinguished. The fire

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was confined inside and it caught inside under the hood. Everything under the hood was irretrievably ruined, wires were fused, or rather burned off from everything, and the hood was of course ruined. The oil stove was very little injured. Probable expense of repairs, $250.

An Unusual Record.

From W. E. H., South Dakota.—For the benefit of automobile owners and those thinking of owning one, I wish to tell some of my experiences.

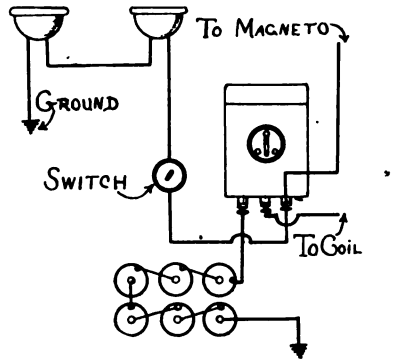
I bought a Rambler, No. 63, in 1910, and still have it. A repair book came with the car, and I made a study of every piece and part, so I knew what I had. When it does not sound right, I find out myself what the matter is and fix it myself, if possible. This may sound big, but it is the truth. I have driven this car over 80,000 miles and in all kinds of weather, as I ran an automobile livery for 18 months with it and did nothing else. It still has the same spark plugs in it that came with it, and the same carburetor, except I put on a hot air pipe from my exhaust manifold, since the gasoline has gotten so poor. I have only been hauled in once, and then I stripped my gears on a bad road. I always use steam engine cylinder oil in the transmission and differential. I prefer Polarine to any oil I have ever used in the engine. I see that my oil pump drops 4 drops to each cylinder at a time, or all it will stand, without making it smoke at the muffler. I always set the hand feed so that the engine will run smooth when idling, and then govern it with the foot throttle. I always coast down hill, around corners, over crossings and rough places when possible. I never apply the brakes hard enough to slide the wheels, and never drive over 25 miles per hour, unless necessity demands it. I always use rain water in the radiator, if it is to be had. In cold weather I fill it with hot water, then it starts easy. As far as the engine is concerned, I would just as soon start for New York or California, as with any engine I know of, if I only had a starter. The compression is so strong, my wife can not crank it. It is a 34 horsepower. If you should get a short circuit, and do not know where it is, look at your electric horn, if you have one. I had one and it came against the brass rim of my dash by wear. It took me a day and a half to find it and one minute to fix it when found. I get from 10,000 to 15,000 miles out of a set of tires. I put in an inner liner after I have run them 1,000 to 1,200 miles. I can yet drive my car as low as 4 miles per hour on high. If I was to buy a new car to-day I would first get a book of parts and study them.

Starting the Ford Car.

From M. E., New Jersey.—Much has been said and written about starting the Ford car on the magneto in cold weather. While the flywheel magneto will give enough juice when everything is all right, it is not an easy task to crank sharply after the motor has stood for some time in the cold as the average owner of a Ford will agree. Having picked up a six volt storage battery very cheaply I decided to install it and wire it up with my master vibrator. And as I had the current decided to connect up my headlights so that I could use them when the car was running very slow or when I left it for a few minutes. This saved lighting the side lights. The accompanying drawing shows how the wiring was accomplished, and for the benefit of those desiring to use dry cells, I have shown the method of wiring them.

One of the leads from the lamps is grounded or attached to some metal part of the chassis. One side of the battery is also grounded. The remaining wire from the battery is attached to the left hand terminal of the vibrator, and a wire having a switch in the circuit is led from the right hand terminal of the vibrator to the switch, thence to the headlight.

When the vibrator switch be thrown to the right, the current for ignition and lighting is supplied by the magneto. Placing the switch lever at the left, cuts out the magneto and cuts in the current from the battery as when starting. The lighting switch controls the lamps. By throwing the vibrator switch



Wiring plan for Ford car including dry cells for starting and supplying current to the lamps.

to the battery side one can use the current from the battery for lighting the headlights. While the exact method of wiring may vary with some vibrators, the principles are the same, but in the plan shown the units of the old coil were fixed by what is known as shunting, and the coil switch was placed at the side to which the wire from the vibrators is attached.

Car Thefts in Chicago.

The wholesale theft of automobiles, which has been going on in Chicago, Ill., is shown by the fact that 2,185 cars were stolen during last year. Of these 1,775 have been recovered, and 410 are still missing. The growth in the number of cars stolen each year in Chicago is shown by the following table:

Year	Stolen	Recovered	Balance
1911	617	613	4
1912	678	670	8
1913	557	524	33
1914	1,415	1,284	131
1915	2,185	1,775	410

As a result of skillful detective work, the Chicago police recently captured a number of men who had stolen many cars, and it is hoped that the 1916 figures will show a decrease in automobile thefts.

Anything that tends to push a valve to one side or lift it by applying force in any way except centrally is liable to cause unequal and abnormal wear of both stem and seating. For this reason the end of the stem and the top of the lifter tappet should be true and square and make perfectly even contact.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, FEBRUARY, 1916.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

AUTOMOBILE PRICES.

The fact that one manufacturer of high grade cars has announced an increase of $100 in the price of their six cylinder model beginning with March 1, need not be considered as positive proof that the tendency will be general. The reason given for the advance in the case referred to is the rise in price of raw material, although it must be admitted that the sum referred to would represent quite a stiff "rise" of such raw material as has really advanced in price.

Yet a movement of this sort is better business policy than a superficial glance would indicate, whether or not the rise in price of raw material compels it. An intending purchaser of a high grade car will be likely to assume that if the rise in price is a necessity it indicates that the present price is low for the value given, and likewise that the present demand for the car must be good or the manufacturers would hardly care to take a step that might reduce that demand. Then the announcement was made long enough ahead to give prospective purchasers ample opportunity to get a car that will sell at an advanced price soon after their purchase, it being rather disappointing to purchase a car or anything else only to find that a substantial reduction in price has been made immediately after. It makes one feel that his purchase is not worth what he paid for it.

As to the rise in the cost of the raw material of an automobile, it is both substantial and general, although not enough to add to the cost of the finished product when the constantly improving methods of production are taken into consideration. The tendency to reduce prices during the past year is proof of this. It might be claimed that the abnormal profits of some of the more prominent manufacturers is still further proof, but if profitable war orders be eliminated, automobile manufacturing will not average greater profits than any other business.

As to the general subject of rising prices, it is the surest guarantee of prosperity that can be had. It indicates that the people want things and that they have the means to satisfy their wants. On the other hand, falling prices are a sure indication of falling prosperity.

Nor should there be any apprehension even though the rising prices are due to a lessened supply. No matter whether there be a greater or less supply the price will be low if no one wants to buy or is able to buy. On the other hand, if the people are able to buy and want to buy, the supply will be forthcoming sooner or later, for the price will make it profitable to produce the thing needed.

In this day and generation of marvellous productive capacity there will not be a long period when a supply of anything cannot be had that the public want and have the money to pay for.

Meantime, despite the rise in price of raw materials, we do not look for a general rise in the price of automobiles. Owing to greater efficiency the cost of production falls faster than the cost of raw materials rises.

MISSING COPIES.

In spite of the care with which we mail copies of the Automobile Dealer and Repairer each month to all subscribers, we get a great many complaints. After we have deposited a subscriber's paper in the post office, of course, our responsibility with respect to it ceases, but nevertheless the subscriber holds us responsible and of course makes his complaint direct to us, if he doesn't get his copy regularly. Readers are assured that it gives pleasure, any time a copy is missed, to resend it. All that is necessary is to drop us a line by letter or postal card, stating the month that has been missed, and, unless it is out of print, it will be promptly forwarded without charge.

We want our readers to bear in mind another point, and that is that our paper is not published the first of the month, but the middle of the month, and sometimes it is late two or three days, owing to our big edition. Thus Western subscribers are not likely to get their copies any month much before the 25th, and possibly sometimes a day or two later. Far Western and Pacific Coast subscribers will be still later in getting their copies each month.

This explanation is made because so many readers, in spite of efforts to inform them, are mistaken as to the date of publication.

INDUSTRIAL REGENERATION.

Both England and Germany are considering how to regenerate their industries after the war is over, and each is naturally anxious to wrest from the United States that which this country has gained. France is also giving some thought to the subject. The national feeling in each of these countries is strongly against imports and the popular slogans are: "Sell as much as we can; buy as little as we can; do without as much as we can." According to external evidence or reports, each side feels confident

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of winning, and this leads to the conclusion that it will be some time before the war is over. If so, there will surely be an imperative necessity for the most rigid economy.

The means suggested for securing this trade regeneration seem to be mainly better organization of industry, the highest efficiency, and the use of more automatic and high speeded machinery. These are well enough, but alone they will not draw away business from the United States.

When that wicked and altogether uncalled for carnage is over, labor in those countries will be more expensive than it has been for many years. One reason for this will be the appalling destruction of their strongest and best workers, both skilled and unskilled. This will amount to at least one-fourth of the whole. Then the demand for labor to rehabilitate industries and replace destroyed property will be heavy. With this increased demand and decreased supply the price of labor is likely to rise at least 50 per cent. This being the probable situation, this country need not for some years fear serious inroads into the trade it has already secured from other countries than those engaged in the war. Of course, our direct trade with the war countries will fall away to a remarkable degree.

DEATH OF JOHN A HILL.

A great light in trade paper journalism went out with the passing away of John A. Hill of this city, president of the Hill Publishing Company, which publishes five technical journals—American Machinist, Power, Engineering News, Engineering and Mining Journal, and Coal Age. Mr. Hill expired in his automobile while on his way to his office, and at the age of 58. Some would say he "died before his time," being in the full flush of physical manhood. But he lived long enough to secure the respect of his acquaintances and the affection of his associates and employes. He also left a business which is a monument to his memory, and quite likely a sufficient fortune to satisfy reasonable ambition. His ideals were high and he spared no effort or expense to reach them; his impulses were generous and many in his employ have felt them; his purposes were plain and there was no guile in him.

John A. Hill was born in Vermont, but went west with his parents in his boyhood. He learned the printer's trade and afterwards became a locomotive engineer. He came to New York and began his career here as an advertising solicitor for a feeble trade paper, but by the force of his tremendous energy soon made it prosper. In less than 30 years he thus rose from obscurity to become the head of one of the largest trade publication enterprises in the world.

The race was nobly won. Why should it have been prolonged? Peace to his ashes!

GRADE CROSSINGS AND DARKNESS.

According to investigation made by the Bureau of Census at Washington, the automobile to-day is being driven with more care and more regard for public safety than it was a few years ago. Thus a five-year increase of 775 per cent.—accepting as reliable the figures compiled by the National Automobile Chamber of Commerce—in number of machines, has been accompanied by an increase of 315 per cent. in automobile fatalities; and a one-year increase of 38 per cent. in number of machines has been accompanied by an increase of 12 per cent. in fatalities.

Judging by our reports, grade railway crossings are now supplying a large per cent. of the fatalities, and of course every such accident is due to pure carelessness. Sometimes the steering gear of a car may get out of order, or the brakes may give way, or the car may skid, and for such defects human foresight cannot be held invariably and wholly responsible. But there is not the slightest reason whatever for any one to drive an automobile upon a grade railway crossing unless he knows positively that no train is near.

Again, far more accidents happen at night than during the day. Few seem to realize the absolute necessity for the great restriction of speed after nightfall. All drivers should make it a rule to see for themselves by the light of their own lamps whether the way is clear or not. No one should ever drive at a speed so that he is unable to pull up to a standstill in less distance than is illuminated ahead by his lamps.

FIXED AND RESALE PRICES.

It is singular that in all the discussion of the bill to allow manufacturers of patented and trade-marked articles to control the resale prices, the matter has been almost altogether considered from the standpoint of the interest to the reseller and the producer only.

Of course it is to the advantage of the producer to control such prices, else why should he want to do so? The fact that low prices often stimulate increased sales weighs very little against the many advantages of maintained prices. If the price of the Ingersoll dollar watch, for illustration, were reduced to 80 cents its sales would without doubt be increased, but once price-cutting is begun, no one can tell where it will end, and lower prices are always a temptation to lower quality on the part of the producer, even though they may not always compel it.

Thus as far as both the producer and the retailer are concerned fixed prices are desirable. In these times when distribution lags so far behind production, price-cutting invariably means disaster if not positive ruin.

As stated, these are the views expressed by the trade magazines and business men. But when they offer these arguments as a reason why a law should be enacted forbidding retailers to cut prices of such articles, fresh evidence is adduced as to how laws often get upon our statute books.

Except as it concerns the public welfare the interests of the retailer and the manufacturer are no concern of our lawmakers. It is simply a case of a few desiring to sell their products at as high prices as possible and of many desiring to purchase at as low prices as possible. If the public had its way manufacturers and retailers would not be allowed to make a fair profit, and if manufacturers and retailers had their way the public would be paying exorbitant profits upon their purchases.

We are inclined to think that the public interests would be best conserved by allowing producers—except in the case of monopolies—to fix resale prices. But let us not sail under false colors. Let us not enact laws to benefit individuals or classes, or special interests. There has been too much of that.

In the case of watches, or cameras, or breakfast

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foods, or automobiles, if the price of a certain kind is too high, why, the public can do very well with some substitute, and then farewell, a long farewell, to inordinate profits upon the goods named.

THE MELTING POT.

Patriotism is not like a garment that can be put on or thrown off at will. Nor is it like a mushroom that can be dug up after having been sought. It is a development or growth, and if of substantial character it must be inspired by feelings of gratitude to one's country for protection or whatever other amenities government can supply. Material welfare and the possession of a home are perhaps the greatest stimulus to patriotism.

Yet there can be no objection whatever to the movement on the part of certain employers of labor to insist that a prerequisite to employment must be loyalty to the United States government and to the flag. The mandate as laid down is that only employes who are native born or are naturalized citizens, or those who have taken steps to become citizens will be promoted. Employes of foreign birth who retain their citizenship in the country from whence they came will not be discriminated against in their present positions of work but they will not be promoted to positions of responsibility and trust.

Quite likely that kind of naturalization may be better than none at all, but it will not create much patriotism. Naturalization by even the semblance of compulsion, or where the stake is the bread and butter of a man or of his family, will not count for much. The statement that since the rule has been put into effect in Detroit there has been an increase of 50 per cent. in the applications for first papers toward citizenship is more significant that a "job" is at stake than that there is a sudden quickening of patriotic feelings.

But an oath of allegiance means something, and it imposes certain responsibilities and duties. We owe much to our foreign-born citizens, and the melting pot of their children and their children's children, has in the past produced splendid material upon which to build the structure of a self-governing nation.

PROPOSED LEGISLATION.

The forces for and against the proposed automobile regulations in this State which were prepared by Police Commissioner Woods of this city are lining up and a warm contest is foretold. The bills in question are as follows:

First, a provision requiring that all operators of automobiles in the State, whether chauffeurs or owners, shall pass an examination as to their qualifications.

Second, a provision that in cities of more than 2,000,000 inhabitants the Police Commissioner shall be invested with power to revoke licenses of operators.

It need hardly be said that we are opposed to the first named bill. As has often been stated in this magazine, no examination can be made to determine correctly whether a man is capable of driving an automobile or a horse so as not to endanger the public. Some of the best judges of horse flesh in the world are hardly fit to drive one, and men who have the construction and manipulation of an automobile at their fingers' ends are liable to endanger other users of the highways and streets when driving them.

We favor the giving the police force more power over automobile drivers—but not power to take away licenses, for there should be no licenses. Yet they should have the power to arrest all who are driving recklessly or in such a way as to endanger other users of the highways or streets, and the word of the officer making the arrest should be considered not only testimony but evidence as to the fact. Do this, and "make the punishment fit the crime," and the streets and highways will soon be safe.

No matter how much a man knows about a car, he is likely to injure other users of the highways if he is reckless or careless, and no matter how little he knows about one he is not likely to injure them if he is discreet, has common sense and possesses a due regard for the rights of others.

COMMERCIAL CARS.

Within the next year or two more commercial cars and trucks than pleasure cars will be sold for city and town use. Draft horses will soon be a rare sight except where frequent stops are to be made, as for instance, in delivering milk to consumers, or for work on wharves. Automobile delivery has now been demonstrated as far more economical and elastic, and places where light snows come and go in winter the work of the horse cannot compare with that of the horseless vehicle.

The time is at hand when agents for pleasure vehicles and others should secure the agency for one good line of commercial automobiles. For express and store delivery, and for the miscellaneous work around mills and factories, or for the hauling of freight from railroad stations, horse-drawn vehicles are so much more expensive and inferior in every way that it needs no superior salesmanship to fully demonstrate it.

Our readers who already have the agency for pleasure cars ought to get the agency for commercial cars at once. The sales will be heavy this season, and those who get established first will do a profitable and satisfactory business. Both horses and feed are too high priced to compete with the automobile.

With fair use a commercial car will give less trouble and be less expensive for upkeep than pleasure vehicles. It is high speed that ruins automobiles, and high speed in commercial work and trucking is needless, although of course even the six-ton truck can be driven twice as fast as the gait of the walking draft horse.

There are plenty of chances to secure the agency for reliable commercial cars but the opportunities are too attractive for such chances remaining open long.

Brake Repair.

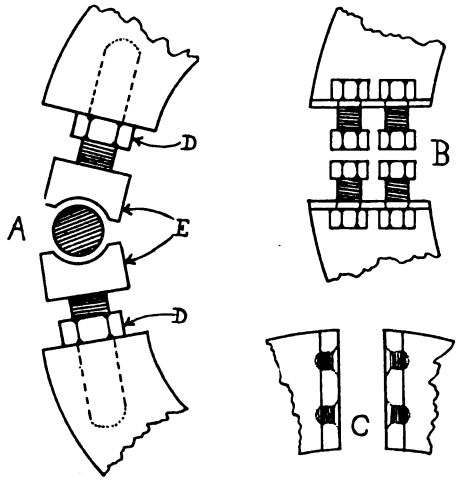
Although the use of metal-to-metal brakes of the expanding type are confined to older cars they are still employed on one or more modern models. It is not always an easy matter to restore worn brake shoes and their mechanism of this type particularly when the stud on which the shoes pivot, and the expanding cam and faces with which it contacts be worn badly. When these conditions exist the cam must assume almost a vertical line before the shoes begin to grip, and the leverage is considerably decreased. Added to these complications is the lost

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motion brought about by wear of the pivot end of the shoes and the stud on which they bear.

While it is not always an easy matter to restore the brakes to their original efficiency their operation can be considerably improved by reducing as much as possible the lost motion in the pivot ends and expanding mechanism. And if these parts can be restored to a satisfactory operating condition, the brakes will hold much better as considerably more of the frictional surfaces will be brought into service. When the pivot end is not worn to any great extent and the action of the cam is faulty, the method suggested at C in the drawing is practical. It consists of two steel plates conforming to the shape of the shoes, and of sufficient thickness to compensate for the worn sections. Clamp the plates to the shoes, drill and tap for a flat headed machine screw, and be sure that the heads of the screws are well countersunk.

The method shown at B can be utilized when there is considerable space between the shoes. As may be noted by the drawing it consists of drilling and tapping the cam end of the shoes and fitting hex headed bolts. The last named are held in place by lock nuts, and as the bolts are adjustable the space can be regulated as desired to obtain a maximum expansion of the shoes.



Practical suggestions for restoring worn expanding metal-to-metal brakes to an efficient condition.

When the pivot ends of the shoes and the stud are so badly worn that bushing or building up the stud does not obtain the desired results, the repair at A can be employed. The recessed ends of the shoes are cut off flush and two block members E, are recessed to fit the stud. These blocks are fitted with a threaded bolt by drilling the block and making a drive fit after which a hole is drilled through the block and bolt and parts pinned. The holes in the shoe should be slightly larger than the diameter of the bolts, and the last named are fitted with locking nuts D. The advantages of the construction are obvious. The bolts cannot turn because of their recessed ends bearing on the stud and the threaded sections permit of lengthening or shortening them as may be necessary to compensate for wear. This suggestion is of value when new shoes must be cast, and in making the pattern allowance should be made for the space occupied by the mechanism.

Trouble with the Two-Cylinder Maxwell.

From W. E. C., Connecticut.—I note in your January issue, No. 1755 is experiencing trouble with his two-lunger Maxwell, that he cannot obtain power. If Mr. Caswell has changed the mixture so as to offset the leakage of air past the valve stems he should obtain power, especially when the motor is speeded up. I would advise him to make a careful test of his compression for it is possible that the rings have so moved that the slots are registering. His trouble also indicates faulty ignition although he says he has cleaned the contact points, but has he adjusted the gap? A weak spark will cause the symptoms described, and a thorough overhaul of the magneto and an inspection of its timing may prove beneficial. I do not agree with your writer when he says the cause is due to leakage of air and I think he will agree with me that an enriched mixture or high speeds would compensate for the extra air drawn in. Will be pleased to hear further from Mr. Caswell as I have had some experience with two-lungers. Would further suggest that Mr. Caswell test his valve springs.

Carbon in Exhaust Pipe and Manifold.

From Ford, Rhode Island.—Chas. W. Finney of No. 1751 inquires in your Trouble Department how to remove carbon deposits from the exhaust pipe and manifold of his Ford. If the deposits are what is termed baked on it is doubtful if the method recommended will prove satisfactory. The manifold can be scraped, but a simpler method is to have it burned out by the oxygen process which is not expensive. Tapping the exhaust pipe usually will displace carbon and Mr. Finney should go a step further and clean the muffler for if he is experiencing back pressure it will be found to be caused by the muffler being clogged with soot. It is doubtful if the accumulations of carbon in the exhaust manifold and pipe cause trouble. It is more likely to be the muffler. If Mr. Finney has a cutout he can test for the trouble very easily.

Low and High Powered Cars.

From Geo. S. Boucher, Virginia.—Concerning the comment our North Carolina friend has made on my article in your September issue, in which he states that he can "pull any hill with his Ford that I can pull with my six cylinder car," but fails to give us any idea concerning the speed.

Granting that our friend's experience with motor cars has been (as he claims) very extended, his statement in a manner is correct, as there is very little difference in the pulling qualities of the different makes of cars on low gear when in good condition. The small portion of North Carolina which I have been over has some very bad roads and the Ford would be an ideal car for the roads, and our friend is not to be censured for making the very broad statement concerning the pulling qualities of his car. However, it might be well to ask him just how he would perform on a hill a mile and a half or two miles long, the very best of asphalt roads; but so steep that even the high powered six and eight cylinder cars cannot climb them on high, but have a second speed which gives them easily 30 miles per hour, which is faster than the Ford should be run on level ground. Do you really think that you can climb a hill of this kind at the same speed as the

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high powered cars? If you do, try it out. I think your idea of speed would be like the little boy who said "There comes a fellow going." I will frankly acknowledge that the Ford car, both in initial cost and tire expense, would suit my income much better than the heavier cars. However, I motor the same as I hunt—strictly for sport, and when a brother motorist blows his signal horn behind me, I will either give him room to pass, or get out of his way. I have tried out the smaller cars, and the sport to me would be the same as shooting a bird sitting. I took a trip last summer of 2,000 miles with three grown people and five children, baggage, tent, folding cots, cooking utensils, blankets and the necessary equipment to live outside. On this trip I did not meet any person who could make a Ford perform as favorably as you say you can; which is speaking very highly both of you and your car.

I have no desire to enter into any controversy, neither am I an expert in handling automobiles, but I wish to extend to you in this article the same courtesy that would be due you should we meet on the road.

How He Climbed a Hill.

From C. G. Ware, Idaho.—In your December issue I noticed an article written by "W. L. R.," New Jersey entitled "Novel Way to Climb Hills." I experienced the same difficulty that W. L. R. experienced in making a trip to Spokane, Washington, from our town, Mullan, Idaho. One encounters some fairly steep hills through the notorious Fourth of July Canyon, which road one has to make in travelling from any of the Coeur d' Alene towns, by automobile to Spokane.

I was driving a 1914 model Overland touring car, the car belonging to a doctor of Mullan, he being one of the passengers, as was his wife and mine. Everything went lovely until we started up the first and steepest hill on our return trip from Spokane. We had hardly started up the hill when the motor began to sputter and finally died. I immediately knew that the carburetor was too high for the gasoline tank, which is located under the front seat.

Not being able to turn around and back up the hill, I began to study how I was to get gasoline into the carburetor. An idea struck me that if I could get a little air pressure into the tank I could get the gasolene into the carburetor.

I raised the cushion, which, by the way, is divided in the front seat of this particular car, and blew into the vent hole in the filler cap of the gasoline tank, all that was possible for me to blow, using a match, which I had previously pointed, for a plug. I plugged the hole to prevent the air from escaping. I replaced the cushion and was ready to proceed, which I did to the top of the hill, which is about a mile long, without another stop. On arriving at the top of the hill I improved our system of forcing air into the gasoline tank.

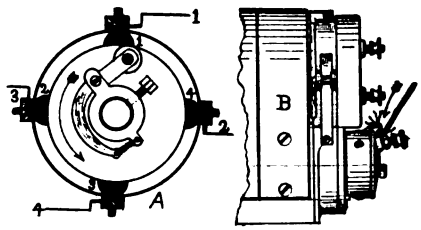
Having a doctor with us I asked him if he had such a thing as a piece of small rubber hose with him. As luck would have it, he had a stethoscope in his pocket. From this we took a piece of tubing, one end of which connects with the stethoscope. The other end is put into the car. We then raised the cushion and placed one end of the tubing over the vent hole in the filling cap.

The doctor sat on the seat by my side and when we came to a steep hill he would blow through this tube into the gasoline tank and we made all the hill without any more trouble.

The above may be of some interest to the readers of the Automobile Dealer and Repairer, especially to doctors who carry stethoscopes in their pockets, and contemplate climbing steep hills. By this system there is no waste of gasoline, and the motor runs normally, which is not the case in Mr. W. L. R.'s system. Where there is no tubing available, the first system works very satisfactory as one blowing up of the gasoline tank will run the car a long distance.

Ignition Troubles.

Much of the ignition trouble, particularly puzzling, intermittent skipping of the motor, could be avoided if the owner when replacing old wires with new, or cutting off an end of a worn wire, would use copper terminals and solder the bare end of the wire to the terminal. The fact that the wire utilized is made up of a number of tiny strands of fine copper invites opportunity for trouble if all of these strands are not gathered together and held firmly by solder. This is not news to the average motorist but a large number will not take the time or go to the trouble of soldering. Generally they are content to roll or twist the strands and trust to luck. It is equally as important to solder the primary wires as the secondary.



Illustrating cause of intermittent missing of engine and proper method of rewiring timer.

The reason for the wires working loose is because when 20 or 30 fine wires are twisted together they form a cushion, and when the nut is apparently set up tight it will not always remain so as the bulk is reduced by the pressure of the nut. The vibration is a factor, and in a short time one or more of the strands will untwist from the bunch. This unloosening is aided on timers by the moving of the commutator as when advancing and retarding the spark in operation. When one of these little hair like pieces of copper comes in contact with the metal of the timer, part or the whole of the primary current is diverted, for it must be borne in mind that electricity like the schoolboy, takes the shortest cut home. If the strand is moved in and out of contact by the vibration of the car, the skip is puzzling.

Many alleged magneto troubles are due to careless attaching of the ground wire to the breaker box of the magneto, and the drawing at B shows how the primary current may be grounded or shortcircuited. As may be noted, the strands are in contact with the metal of the breaker box, preventing the primary current from flowing to the secondary winding of the instrument or to the induction coil when the magneto is of the low-tension type. As the binding post or terminal on the breaker box is utilized for connecting the wire that grounds and thereby stops the operation of the motor, in that the supply of cur-

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rent to the spark plugs is cut off, it should be fitted with wire having a soldered terminal.

In rewiring the conventional type of timer as shown at A, it is a good plan to so attach the wired terminal that the wire will move with the commutator and not bend, or in other words, the terminal should be so located on the threaded post that the movement of the wire will not exert a flexing movement near the terminal section of the wire. The shank of the terminal should be bent slightly outward to avoid the possibility of its coming in contact with the metal of the timer when the last named is fully advanced.

The drawing is also of value to the owner who attempts to rewire without relying upon colored wires to locate the correct terminals. The use of colored cables is satisfactory when they are new but after they have become discolored by oil and dirt, they are useless. The better method is to understand the firing order of the motor and direction of rotation of the shaft actuating the roller or contact member. The firing order of the motor is indicated by the figures on the wires in the drawing and it is 1-3-4-2. The segments or contacts of the timer are marked 1-2-3-4. As may be noted, the wires are attached according to the firing order, consequently, 1 goes to 1, 2 to 3, 3 to 4, and 4 to 2. If the firing order of the motor be 1-2-4-3 as on the Ford car for example, the order of connecting the wires would be as follows: 1 to 1, 2 to 2, 3 to 4, and 4 to 2. The last figure of the pair indicates the coil connection and consequently the cylinder.

The drawing will also be of value in replacing a timer where it is not located in position by means of a pin through the timer shaft. When a set screw is employed for securing the roller mechanism to the timer shaft, fully retard the spark, and with the piston of the No. 1 cylinder at top dead center of the completion of the compression stroke, secure the timer mechanism as shown in the drawing, with the roller just making contact with the No. 1 segment. Some owners scratch the figures 1, 2, 3, 4 on the fibre of the timer for identification. In replacing the timer make sure that the set screw is set up snug, and it is a good plan to test its tightness after the car has been run a few miles.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Dazed by Headlights.—While driving on the car track, near Battle Creek, Mich., the driver became confused when the headlights of an interurban car struck him and instead of turning to the right he turned to the left and met in a head-on collision. As the cars were going slowly, serious accident was avoided. Passengers were cut and bruised but otherwise were uninjured.

Gates Out of Order.—A woman was hurled from the car in which she was riding and instantly killed and the driver was severely injured at Chicago, Ill., when the car was struck by an elevated train, which runs on the surface at that point. As the gates were out of order the flagman states he signaled to the driver, but the driver saw no signal and witnesses say he made none.

Riding with Curtains Up.—An accident occurred near Waurika, Okla., in which a man and his wife were instantly killed when they were struck by a passenger train. It is believed that they were riding with the curtains up on the automobile and they were unaware of the train's approach.

Head Out of Door.—A man was killed near Closter, N. J., when the car in which he was riding gave a sudden lurch, which caused him to thrust his head through the glass in the door. Before he could draw his head out of danger the automobile grazed a telegraph pole and his head was crushed. The chauffeur was unaware of the injury to his passenger and sped on.

Enveloped by Fog.—Owing to a dense fog which obscured the light of an approaching automobile, an old man was knocked down and injured at Kansas City, Mo., just as he alighted from a street car and started to cross the street. He died on the way to the hospital.

A Careless Crossing Accident.—Two farmers lost their lives in an automobile accident near Humboldt, Ia., when they were struck by a passenger train. There were three men in the party; the accident occurred in daylight and it is stated that the tracks for a considerable distance in each direction are unobstructed. One of the victims was instantly killed and the other died in a few minutes.

Dashed Off Docks Into Deep Water.—A young man was taken from Lake Michigan, near Sheboygan, Wis., nearly frozen to death, and his companion's body was found far from shore. The survivor states that they dashed down the street at the rate of fifty miles an hour into the deep water.

Engine Went Dead.—Three young girls were killed and a fourth injured at Alvo, Neb., when the car in which they were riding was struck by a passenger train. The driver who was seriously injured said at the hospital that the engine went dead on the track.

At a Dangerous Turn.—Near El Paso, Texas, two men were killed when the car in which they were riding skidded on the soft sand at the side of the road when the driver attempted to negotiate a sharp curve. They were going at such a terrific speed that when the car struck the railroad tracks it turned completely over, both occupants being buried beneath, sustaining injuries from which they died in a few minutes.

Skidded Off Embankment.—A man died from the effects of injuries received in an automobile accident and the driver was severely injured at Colfax, Wis., when the car in which they were riding skidded over an embankment. The men were out in a snow storm, and the driver thought he could make the turn in the road successfully.

Caused by Broken Steering Knuckle.—Near Louisville, Ky., a man received serious injuries when his automobile plunged down a 40-foot embankment. As the automobile neared the bridge the driver lost control of the machine, because the steering knuckle was broken. One man was thrown from the car and the other was held by the steering wheel.

Driver Kills and Speeds On.—A boy was run down and killed at Detroit, Mich., by an automobile going at a high rate of speed. It is said when the driver discovered what he had done, he looked back, speeded up his engine and disappeared. The boy had been laboriously picking coal from around a steam shovel, and was struck as he stepped from the curb to cross the street.

Power Fails on Grade.—Three women were killed and two men were injured at Grantham, Pa. The

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party had crossed the railroad tracks and were on the grade when the driver tried to shift his gear to mount the hill. His power failed and the car backed onto the tracks and was hit by a freight train. The women who sat in the back seat were crushed. A two-year-old baby carried by its mother was only slightly bruised.

Cost Is Less as Load Increases.

From N. G. Near, New York.—It is generally conceded that it doesn't cost as much, per unit, to do things on a large scale as on a small scale. In New York City, for instance, the New York Edison Company sells current to run motors at a much lower rate than to private citizens for lighting houses. When goods are hauled in "carload lots" it costs less per pound than when a single pound is shipped. In nearly every phase of life that rule exists and that is why many men have become rich—they have arrived at the point where they can buy in carload lots and sell at retail, or can ship in carload lots and sell retail at the other end. They have an admitted advantage over their smaller competitors, and it is difficult to show that such an advantage should not exist in the face of the rule just cited. The automobile people are guilty of following the same rule in cost price of carrying capacities of gasoline motor trucks.

I have done some figuring along this line and find, as is inevitable, that the smaller the truck the greater the cost per pound capacity. For instance, the chassis for carrying 500 pounds sells at an average of 86 cents per pound capacity. The one-half ton truck is a little less expensive, in accordance with the rule, and sells at 77 cents per pound capacity.

Jumping to the higher extremes I find the 4-ton truck to sell as low as 44 cents per pound capacity, and the 6 and 7 ton trucks at 38 cents and 34 cents, respectively. The 500 pound truck therefore costs a little over two and one-half times as much as the 7-ton truck per pound capacity. It would take 28 trucks of 500 pounds capacity to carry 7 tons and 28 drivers would be required instead of one. The cost of fuel, lubricant, storage, upkeep—everything—would be greater with the many trucks in place of the one.

There is nothing really new about these statements for American railroads have long recognized the economy of large capacities. That is why freight is carried at a lower rate per pound in the United States than in other countries where wages and other expenses are considerably less.

To be sure it wouldn't pay you to buy a 4-ton truck for hauling one-ton loads only. Nor should light trucks be overloaded. A truck, no matter what the capacity, never looks right to me when running along empty or with a light load. I should say, then, that the best truck to buy is the one that can be "kept loaded" to capacity or nearly to capacity at all times. It is always well to remember, though, that the first cost of high capacity is the least.

Tire Sizes.

"Work toward simplifying the number of tire sizes has made very satisfactory progress, as any one who remembers the jumble of a few years will agree," says E. R. Hall, member Standards Committee of the S. A. E. "At one time some companies listed and provided as many as 51 distinct sizes of tires for automobiles. In those days tires cost the consumer much more than they do now—and that was one of the reasons why. Equipment to make so many tire sizes cost a great deal of money. Then, too, in the years when so many sizes were called for there was less scientific knowledge than now of carrying capacities, and individual fancies were sometimes consulted as much as practical requirements. At any rate, the jumble became so pronounced that finally the tire makers and the Society of Automobile Engineers undertook a simplification. There were many obstacles in the way at first, but very gratifying success has been the final result.

"The S. A. E.'s standard list now contains only nine sizes—with nine oversize profiles to correspond. They are:

Standard.	Oversize.
30 x 3	31 x 3½
30 x 3½	31 x 4
32 x 3½	33 x 4
32 x 4	33 x 4½
34 x 4	35 x 4½
34 x 4½	35 x 5
36 x 4½	37 x 5
36 x 5	37 x 5½
38 x 5½	39 x 6

"It is found that this list comes close to satisfying present-day demands. It certainly has greatly simplified the tire business, for the tire seller and the consumer."

Calendar of Shows.

February 19-26—Harrisburg, Pa., show.
February 20-27—Grand Rapids, Mich., show.
February 21-26—Louisville, Ky., show.
February 21-26—Omaha, Neb., show.
February 21-26—Syracuse, N. Y., show.
February 22—Los Angeles, Cal., speedway race.
February 28-March 4—Indianapolis, Ind., show.
February 29-March 4—Sioux City, Ia., show.
February 29-March 4—Fort Dodge, Ia., show.
March 4-11—Boston show.
March 8-11—Davenport-Rock Island-Moline show.
March 8-11—Mason City, Ia., show.
March 9-11—Kenosha, Wis., show.
March 20-25—Twin Falls, Idaho, show.
March 21-25—Deadwood, S. D., show.
March 22-25—Saginaw, Mich., show.
April 10-15—Seattle, Wash., show.

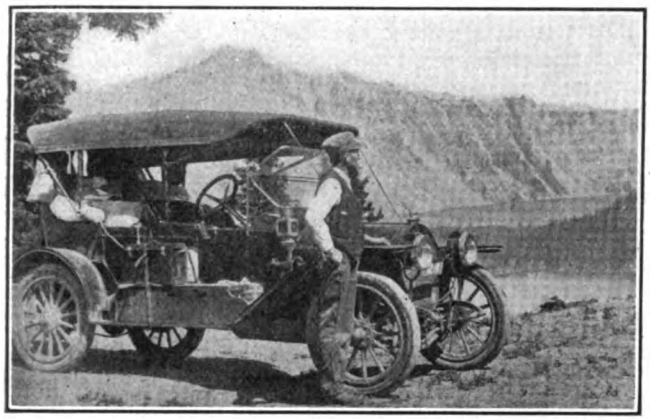
Races.

May 6—Sioux City, Ia., speedway race.
May 13—New York, Sheepshead Bay speedway race.
May 20—Chicago speedway amateurs' race.
May 30—Indianapolis speedway race.
June 10—Chicago speedway race.
June 28—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
July 4—Track meet, Couer d'Alene, Idaho.
July 15—Omaha, Neb., speedway race.
August 5—Tacoma speedway race.
August 18-19—Elgin road race.
September 4—Indianapolis speedway race.
September 9—Des Moines, Ia., speedway race.
September 15—Indianapolis speedway race.
September 29—Track meet, Trenton, N. J.
September 30—New York, Sheepshead Bay speedway race.
October 7—Omaha speedway race.

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A Fine Automobile Tour.

From W. S. Bowman, Oregon.—We made a 3,000 mile trip from Pendleton south to Medford and north to Seattle, Mt. Hood, Mt. Ranier, and the coast. We



Just Below the Clouds.

never had a chain on our car and there was no grade too steep to climb. The photos give something of



The Camp Outfit.

an idea of our camp and of the scenery 1,000 feet above the rim of Crater Lake. My wife and daughter were with me.

HANDLING GASOLINE.

Result of Tests Made by G. A. Burrell for the Bureau of Mines.

In connection with investigations regarding safety and efficiency in the use of petroleum and its products, the Bureau of Mines has made numerous tests of gasoline and kerosene, and in Technical Paper 127, by G. A. Burrell, states the hazards that may result from handling these liquids and the precautions to be observed.

Gasoline vapor mingles with air in the same manner that water vapor does, the amount carried depending upon the temperature of the air and the readiness with which the vapor can be obtained. If one takes the cover off a full pail of tightly inclosed gasoline and applies a match to the surface, the gasoline will flare up and burn as long as the gasoline lasts. On the other hand, if one puts a few drops of gasoline in a small, tightly inclosed pail, waits a few minutes and then produces a flame or an electric spark, a violent explosion wlil likely result. In the first case the vapor burns as fast as it comes from the gasoline and mixes with the oxygen of the air; whereas in the second case the oil vaporizes in the pail and mixes uniformly with the air to form an explosive mixture and upon ignition, explodes. One gallon of gasoline when entirely vaporized, produces about 32 cubic feet of vapor. If a lighted match could be applied to pure gasoline vapor in the absence of air, no fire or explosion would result.

At ordinary temperatures air will hold from 5 to 28 per cent. of gasoline vapor, depending upon the grade of gasoline. The author found that in 100 parts by volume of air and gasoline an explosion would not take place if there were less than 1.4 parts of gasoline or more than 6 parts. In other words, the explosive range is between 1.4 and 6 per cent. of vapor. Flashes of flame will appear in mixtures containing considerably smaller and larger proportions of vapor and considerable pressure will be developed, but propagation through the mixture will not take place. One gallon of gasoline can, under ideal conditions, render 2,100 cubic feet of air explosive.

When benzine, gasoline, naphtha and other inflammable liquids are employed, care should be taken to see that the smallest practicable quantities are used and that these are handled in an approved manner. No open light or flame of any kind, nor any machine or belts capable of producing a spark should be allowed in a room where the gasoline is used, all shafting or machines with belts that are liable to cause a static spark should be well grounded and only incandescent electric lamps should be used, these being provided with guards to prevent being smashed. All switches, fuses, etc., should be outside the room. Danger signs should be posted on all doors opening into the room, warning against the carrying of open lights inside.

When large quantities of inflammable liquids are used, the main supply should be stored in a metal tank buried under ground at a safe distance from the buildings. The working supply should be pumped into the building as needed and so arranged that when the pump is stopped all liquid in the pipes will flow back into the supply tank, and the gasoline barrels should be stored in the open air with the bungholes down. Rooms in which explosives or dangerous gases or vapors are used or generated, should be provided with an improved system of ventilation; as gasoline vapor is heavier than air, a suction fan will insure proper ventilation.

There are two principal methods of extinguishing burning liquids: (1) To form a blanket of gas or solid material over the liquid and cut off the air supply; (2) to dilute the burning liquid with a non-inflammable extinguishing agent that will mix with it.

Water may be used for extingiushing liquids such as denatured alcohol, wood alcohol and acetone, that are miscible with it. If such a liquid as gasoline, which does not mix with water, catches fire, the application of water produces little or no effect except to spread the burning liquid. However, the application of a large quantity of water to a small quantity of burning oil, by its cooling effect, may aid in extinguishing the fire. Among materials used to form a blanket of gas or solid material over the burning liquid may be mentioned sawdust, sand,

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carbon tetrachloride and the so-called foam or frothy mixtures.

The efficacy of sawdust is due to its floating for a time on the liquid and excluding the oxygen of the air. Sawdust itself is not easily ignitible, and, when it does ignite, burns without flame. The character of the sawdust and its moisture content is of little or no importance. It may be well handled for extinguishing small fires when just started, by means of long-handled wooden shovels. Sand probably serves about as well as sawdust for extinguishing fires on the ground, but is heavier and more awkward to handle. When thrown on a burning tank, it sinks, whereas sawdust floats. Carbon tetrachloride, the basis of various chemical fire extinguishers, when thrown on a fire, forms a heavy, non-inflammable vapor over the liquid and mixes readily with oils, waxes, etc. The vapor is about five times as heavy as air, and its success depends largely upon the skill of the user. If liquid in a tank is on fire, the height of the liquid is important. When the liquid is low, the sides of the tank form a wall which retains the vapor, but when the tank is nearly full of highly volatile liquid like gasoline, only the most skilled operator can extinguish the fire.

Care in Driving.

From G. Elton Greenleaf, New Jersey.—Often times one sees drivers turning corners at high speed. Even when this does not actually cause the car to skid, it produces a detrimental strain on the side walls of the rear tires and if they are not properly inflated will very likely cause a rim-cut. And just imagine what a strain is put on the wheel bearings both front and rear by that very force which tends to slide you side-wise from the seat. With wood wheels it is conducive to loosened spokes, as a wood wheel is weakest to withstand a blow or other stress against its side.

Quick starts and stops are likewise to be avoided if the owner is desirous of sparing his pocketbook. Sudden starts throw tremendous strains on all the driving members, as, for example, the gears, propeller shaft, and driving axles, besides breaking down the fabric of the rear tires. For similar reasons, sudden stops should never be indulged in, except in case of emergency and then the car can be stopped more quickly by not applying the brakes with such force as to slide the wheels. This is not remarkable when one considers that in stopping with the wheels locked, the braking force is solely dependent on the friction between the road and tire; whereas, by not locking the wheels the braking force is dependent on the brake lining against the drums, which contain vastly more surface than is against the tire.

Another place wherein a saving can be made is in fuel consumption, if your car is equipped with a dash adjustment for your carburetor. There are two types of these adjusters; one either diminishes or increases the supply of air, the other changes the gasoline adjustment. A motor which is idling consumes considerably more gas than when pulling the car on the level. By changing the air or gasoline adjustment so that you get the maximum amount of air or the minimum of gas which the motor will consume without "missing" at a speed of 25 or 30 miles per hour on a level road, the gasoline consumption will be greatly reduced. It will probably be found that with this changed adjustment, the motor will not idle nor have power on hills, but this can be remedied by simply changing the dash adjustment until the motor runs smoothly.

Care should be exercised in driving motors which have been run for many thousand miles, not to let them knock on account of having the spark advanced too far. This is one of the most common abuses which a motor car has to undergo and also one of the most injurious because it overstrains the bearings and connecting rods.

TWO-CYCLE ENGINES

Given a Fair Chance for Automobiles and Found Wanting.

From Victor W. Page, Connecticut.—The writer has been very much interested in the discussion that has been running in your columns for several issues on the subject of two-cycle engines and their adaptability to present day automobile requirements. In the last issue Mr. Duryea takes exception to the technical skill of practical experience of some of the authorities you quoted and another one of your readers also pleads for the two-cycle engine. The writer does not in any sense of the word, pose as an authority, though if a thorough familiarity with the workings of the automobile since the infancy of the industry will fit a man to be an authority, then I must insist that any of the quotations you have taken from my book, "The Modern Gasoline Automobile," are founded on a practical experience and not merely a theoretical knowledge as some of your readers seem to believe. It has always been Mr. Duryea's great failing to adhere to his own ideas and not to recognize those of contemporary practice. No one will question his great knowledge of automobile construction; in fact, Mr. Duryea was riding around in a practical automobile or rather a self-propelled vehicle at a time when the writer was in knee pants trundling hoops. The fault with Mr. Duryea's reasoning is not that he is not thoroughly capable, both theoretical and practical, but that he does not keep his reasoning abreast of the times and is apt to lay undue stress on his own experience, disregarding that of other engineers of nearly as much experience as he has had in the automobile industry. Mr. Duryea is very much of an idealist and has always had the courage of his convictions. One who judges the progress and development of the automobile industry must do so by considering contemporary practice and not the opinions of any one or two men no matter how brilliant they are. No one will question that the two-cycle engine is a practical form and well adapted for certain classes of work. The fact that it has been generally abandoned by everyone who made two-cycle engines in favor of the four-cycle principle must convince any one who is unprejudiced or unbiased and who has no hobbies of his own to ride, that there must have been an underlying reason for the abandonment of the two-cycle form. I believe that the majority of your readers will concur with you in your opinions and I, for one, am willing to wager a substantial sum of money that a two-cycle engine cannot be produced that will be twice as efficient as a four-cycle engine of equal piston displacement. Theoretically, the two-cycle engine should be twice as effective—in practice the reverse is the case and it is seldom that one obtains more than 50 per cent. increase in efficiency even by going to the complications of using distributing valves and differential piston arrangement to

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eliminate base compression. The writer is no novice in internal combustion engineering by any means and has given the two-cycle a thorough try-out in both the air and water-cooled forms. In fact, the writer has owned a two-cycle automobile and has had an opportunity of becoming thoroughly familiar with several two-cycle engined machines of earlier days. The two-cycle engine does not have the effective range of speed and the smooth power output that a four-cycle engine has. It cannot be throttled down so low nor can it be speeded up as high as a four-cycle engine. Its exhaust cannot help but have a pronounced odor because it is almost impossible to obtain a good, clean combustion when part of the inert products of a previous explosion are retained in the cylinders.

The writer is, by no means, prejudiced against the two-cycle engine and if any one would design a two-cycle engine that will perform as well as the average four-cycle and will be as reliable and not so susceptible to mixture variations as the two-cycle engines of present-day construction are, I would be one of the first ones to use this type of engine. The fact of the matter is that in all my experience, which not only includes repairing, but construction and block testing of engines of various types, I have always found the two-cycle engine wanting in some respects and in no case as satisfactory as the four-cycle engine which is at present universally used.

Mr. Duryea likens the distrust of the two-cycle principle to that that exists against the air-cooled or direct radiation principle. No one will contend that air-cooled engines are not practical. The writer has built air-cooled engines that would run on a block for hours in a steam-heated room without any signs of distress. No matter how carefully an air-cooled engine is built, however, it is not as enduring as a water-cooled engine and it is more apt to get noisy in service. It is difficult to keep the valves ground in properly and the cylinders are also prone to carbonize more than in a water-cooled engine. These are difficulties of a practical nature and will be evident to all who have had any wide practical experience with the air-cooled form. There is an old and trite saying that "Proof of the pudding is in the eating" and surely no one can question the evidence when it is indicated by so preponderous a majority of motorists and practical engineers opposed to both the two-cycle and air-cooled principles.

Mr. Duryea Still Adheres.

From Charles E. Duryea, Pennsylvania.—I have just read Mr. Near's remarks on the 2-cycle engine and call attention to the fact that he does not tell us how it is "shown mathematically that the 4-cycle should be more efficient." My belief, based on my experience, is that if the 2-cycle does not let fuel escape through the exhaust ports it will show a much higher economy than the 4-cycle for reasons I have heretofore stated, viz: It expands as far as it compresses, uses a constant compression instead of variable with throttle opening, and has far less internal friction and less work of valves and cam shaft to overcome. I am quite curious to see how anybody is going to "mathematically" or any other way show that these things are not in its favor. That most 2-cycles do waste fuel, I admit. That if both engines are tested at maximum power the 2-cycle will waste fuel most likely, but maximum power is not normal in auto work.

His air-cooling arguments are equally faulty. We condense steam to get a vacuum behind the piston and thus get more power. Nobody thinks of using a water jacket on a steam engine. On the contrary, we jacket the cylinder to keep it warm, and often steam jacket it. Both types are heat engines and one cannot waste that heat by warming water and have it also to drive the car. The usual water-cooling keeps the cylinder too cool. This is why the air-cooled cars show an efficiency far higher than the water-cooled ones. That water is a better conductor of heat than air proves nothing. Metal is still better. Many a farmer boy has had his tongue frozen to a frost-covered wagon tire that he tried to lick, but never to an icicle hanging alongside. Metal radiating fins will get the heat away faster than is necessary. The only trouble is that people "know so much that is not so" and will not learn the facts.

STEERING CONNECTIONS.

Useful Information About Lubricating the Two Ball Joints.

Some cars with otherwise proper provision for lubricating the steering joints, especially foreign

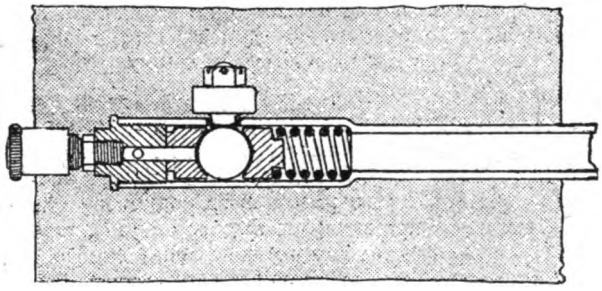


Fig. 1—Sectional view of the front end of the push-and-pull rod, showing the greaser in the cap and the holes drilled through the cap and thrust block to convey the grease to the ball joint.

cars, have none for the two ball joints of the rod from the steering box lever to the front wheels, which, in lieu of a better term, we call the push-and-pull rod. These joints are usually packed with grease when put together, and the leather gaiter over each is also grease packed. This is all very well for a few weeks, but when it comes to re-lubrication the job is a filthy and unsatisfactory one at the best. Although the leather covers keep out the worst of the dirt, a considerable proportion is bound to work in, and it does, so that when one opens them one finds them more or less full of grit and grease. Any attempt to introduce new grease into such portions of the ball joint as can be got at from outside is more or less futile because of the grit, so that the only remedy is to take the two ball joints to pieces, clean up all the parts carefully, grease them and put the things together again, finally replacing the leather covers. However, this is much too lengthy a job to take on lightly, and in nine cases out of ten it is not done, the motorist contenting himself by taking off the leather bags and putting in a little more grease.

It is difficult to imagine a more unsatisfactory happy-go-lucky system of lubrication than this, and on a car which is always kept in the pink of condition we decided to make a good job of the ball joint lubrication, so we took down the steering, and, after

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having thoroughly cleaned it, fitted a small grease lubricator to each plug nut. This merely meant drilling and tapping the plug nut. Then there was the question of getting the grease into the ball joint. This was effected by taking out the cup, softening it, drilling a hole through it, and re-hardening it. All that is now necessary to keep the steering properly lubricated is occasionally to fill up the lubricator at each end with thin grease and to screw it home.

It will be found on examination of the push-and-pull rod that the spring behind the cup at each end is at the back. The result is that the lubricator for the front ball joint merely has to pass through the plug nut and the ball cup, as shown in Fig. 1, but at the back joint it has to pass through the plug nut, then right through the spring chamber, finally issuing through the cup, Fig. 2. It might be imagined that this would necessitate quite a pressure of grease in the chamber before it would issue from the cup, but this is not the case, as in putting the steering together one fills up the spring chamber with grease, and the slight movement of the spring when the car is in use on the road acts almost like a pump, and the result is that the back joint is lubricated even better than the front.

It will be seen that the only objection to this system is that only one-half of each cup and ball joint is lubricated direct from the screw-down greaser, but we have not found in practice any objections to this, as the fact remains that clean grease is fed into the joint, and it soon works round to the other side of each cup. If, however, one desires to be doubly sure one can take a leaf out of the book of the designer of the Guy lorry, and can have a little channel ground in the ball right round to the other side.

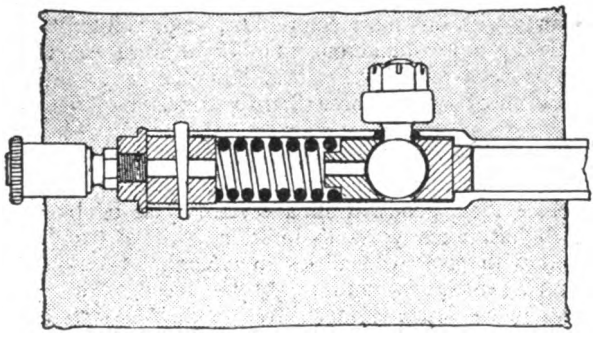


Fig. 2—The back end of the push-and-pull rod with the greaser fitted to the cap. The grease, it will be noticed, has to pass through the spring to reach the ball joint.

To make a success of the job it is necessary to bear in mind that thin medium grease should be used, and nothing of a hard stodgy nature. It is also a fact that once lubricated in this way the joint keeps in splendid trim for very long periods, and it should be noticed that the lubrication is always outward; that is to say, when the grease exudes, it pushes out grit, whereas with the old arrangement of external replenishment all one could do was to push grit in with the grease.

It may be interesting to add that when we took the joints down we found that they were in excellent condition, despite the fact that they were lubricated with a mixture of grit and grease, which had, however, resulted in there being some evidence of scoring. But what we confess rather astonished us was the fact that we found the proper lubrication of these two joints, which at their worst were very far from dry, very greatly improved the steering. We were very careful not to touch any of the other lubricators before making a test, as if we had gone over the whole steering we should naturally have ascribed the improvement to the fact that we had screwed up all the lubricators.

This brings to mind a little dodge that many old motorists know; that is, if at any time the steering become sluggish and is known to be properly lubricated so far as the supply in the lubricators is concerned, it is well to jack up the front wheels and then to refill and screw up the steering pivot lubricators. Having done this, turn the steering backwards and forwards a few times and let the jacks down again. There is no doubt that when the weight is on the wheels the grease sometimes fails to penetrate to the entire bearing surface of the pivot pins, but the relief afforded by jacking up permits it to get all round the pins, and enables the steering to be made perfectly free again for some considerable time.

NOW CLEAN THE CAR.

And Thus Put It in Shape for the Spring and Summer Work.

Fine weather will soon be here. Get ready for it by cleaning up your car. Clean underneath and wash the mud out of the frame channels. Clean up the engine with an oiled rag, removing the mud, grit, excess grease, etc. Clean out the compartments under the seats, brushing any dirt or rust which may have accumulated out of the tonneau and driver's compartment. Clean out the door pockets. In a word, remove all mud, dust and excess grease from all parts of the car.

Drain the cooling system, removing the drain plug from radiator, water pump or radiator intake pipe, according to the model. If it is a pet-cock, remove it entirely so as to give free drainage, and flush out the entire system with a hose. It is well to put the hose in the filler of the radiator, wrap a rag around it and force water in under a slight pressure, so as to get all the sediment washed out of radiator and water jackets. After this, close the drain hole and fill the system with clean water.

Drain the oil out of the crank case, clutch case, transmission case and rear axle, and wash all of these parts with good, clean gasoline or kerosene. After thoroughly washing these various cases put the drain plugs back, insuring that they are screwed in tightly, so that they will not work out, and fill the various compartments with fresh, clean lubricants. The crank case should be filled to the upper try cock with any first-class cylinder oil of about the consistency of Mobiloil BB, or with Polarine Heavy.

Thoroughly clean the clutch and transmission. See that there is no back lash in the steering gear. Better take the car to some good garage to have the carbon burned out of the cylinders, if they are carbonized. If the valves are in fair condition, let them alone.

Look over the ignition system for loose terminals, examining the wires for chafed spots. Tighten up any loose terminals, and if you find a wire chafed wrap it with a piece of friction tape. Go all over the

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car and feel every visible nut, bolt and screw with a wrench or screw driver, and if any loose ones are found tighten them up. Pay especial attention to the spring clips, because they are likely to have worked loose and to require tightening. Be sure that the body bolts are tight. Examine all water and oil connections for leaks, and if they are found be sure and stop them, because water leaks mean that you will have to fill the radiator oftener than necessary, and oil leaks mean that you are using an unnecessary amount of oil. The gasoline system should be filled and looked over carefully for leaks.

Finally, start the car and drive it for a few blocks, preferably over cobble stones, and hunt for rattles. These should be located and the parts tightened up. At the same time observe the action of the motor, and if it is running reasonably well let things alone.

Look over the equipment of the car, such as the speedometer, to make sure that the shaft is in good shape. See that the lamps are properly secured to their standards, that the curtains are all in good shape and working order, because later on you may be caught in a storm and need them badly at short notice. Pay particular attention to the tool kit. Make sure that you have not lost part of it, and that the jack and tire pump are in proper working order. Look up your old chains, and if they are badly worn in spots or have broken cross links replace them with new links. Look up your old tires and inner tubes. Perhaps these are in such condition that the casings can be retreaded, bad cuts vulcanized and the punctures in the tubes patched. Have the metal work all gone over, cleaned and polished. Clean your carpets, slip covers, etc. Then put your tools, spare tubes, a few clean rags and any other articles which you may carry into the car.

Remember, your automobile is a piece of machinery and must be cared for as such. The most economical thing you can do is use plenty of lubricant at all times. Except for filling up your crank case, clutch case, transmission case and rear axle too full, there is no such a thing as lubricating an automobile too much.

AUTOMOBILE DEALERS.

There Are Now About 18,000 Men Who Sell Cars in This Country.

In a recent address in Chicago at a banquet of automobile dealers, the president of the Studebaker Corporation said: "While we cannot yet claim that automobiles carry more people than their two chief competitors in self-propelled vehicles, namely, the railroads and trolley cars, the day will come before many years when this will be true. This prediction is made because of the far-reaching and ever-growing popularity of the automobile, its application to individual uses, its wide range of action, its economy, privacy, charm and healthfulness. The automobile is 'par excellence' the vehicle of every man and his family, and for business as well as pleasure. He clings not to beaten paths, but traverses the highways and byways of the country, and goes wherever he chooses. He increases the scope of his world, enlarges his knowledge of men and conditions, and thereby broadens his experience and ability, and becomes a happier and more prosperous citizen. The railroad and trolley lines do not afford man such traveling facilities, chiefly because they follow beaten paths, run on fixed time schedules, and compel men to travel in a body without privacy and often in discomfort, as witness crowded cars, bad air and the unhappy 'strap hanger.' It has been my observation that, given the choice in making a trip, every man will choose an automobile if the weather and roads are fair. When they are against us, I must admit that the railroads and trolley lines afford not only necessary but very comfortable and appealing means of travel. You may, however, see in this comment a hint of the value of good roads for our industry.

"I cannot leave the subject of adaptability of the automobiles to the use of man without specifically mentioning the farmer, who, as we know, as a class, is the largest user of automobiles in this country. The farmer was quick to realize that the automobile increased his efficiency on the farm, afforded means of daily visits to his neighboring cities, and less frequently the means of touring the country and far off places, and, above all, that the automobile forever dispelled the isolation of farm life by reason of its strong appeal to the entire family as pleasurable enjoyment, enabling them to visit their neighbors and relatives whenever so disposed.

"A representative of one of the great London dailies, while in America several years ago investigating the automobile industry, in reply to a question of mine about the demand for automobiles in England, said to me: 'Every man in England who does not own an automobile is hoping and looking forward to the day when he can buy one.' The appeal of the automobile has grasped the mind and imagination of more people than has perhaps any other manufactured article in the history of the world.

"Do you, gentlemen, realize that every man or woman who is able to own an automobile is a possible customer in whom you do not have to create the desire for possession?

"Can you name another manufactured article of which this can be said?

"Reflect upon this fact, ponder it well, and you have the answer to the wonderful growth and development of the automobile industry and its possibilities for you as a merchant.

"The selling policy of automobile manufacturers is to dispose of their products through local dealers instead of selling consumers direct through retail branches and salesmen, as is the policy of manufacturers of typewriters, adding machines and some other devices. The result of this policy has brought into existence in the United States about 18,000 retail automobile merchants whose annual sales, including automobiles, parts and accessories, aggregate roughly one billion dollars, from which they receive a trade discount from the manufacturers averaging 20 per cent., or $200,000,000, which averages a little over $11,000 gross earnings per automobile merchant per annum. You must remember that the sales and gross earnings of automobile merchants in large cities greatly exceed the figures mentioned, and that the average figure given includes many thousand small towns. This vast sum of about $200,000,000 finds its investment and resting place in the local communities of the country, either through the expenditure by the merchants for their ordinary operating expenses or in the shape of permanent investment.

"It is therefore quite apparent that the automo-

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bile industry is one of vast importance to the mercantile and financial interests of the country. It is an industry that has appealed, and will continue increasingly to appeal, to local merchants of the highest type and ability. Nevertheless, I believe that the business men of this country hardly realize, as yet, the great opportunities of the automobile business for merchants' success and local prominence.

"To illustrate the money-making possibilities of the automobile business, let us compare it with other businesses.

"Take a typical town of 10,000 population. We find in it nearly always one or more retail merchants in the grocery, dry goods, clothing, boot and shoe, drug, hardware and furniture business. Probably one of these retail merchants on the average carries a stock of $10,000 worth of goods, and sells an average of $20,000 worth of goods per annum, upon which he makes a gross profit of, say 25 per cent., or $5,000, leaving his cost of goods sold $15,000. This merchant, therefore, is turning over his inventory investment twice per annum, and making 50 per cent. gross profit thereon, from which, deducting his expense of doing business, exclusive of personal salary, which averages say 15 per cent. on his sales, or $3,000, leaves him a net profit of $2,000.

"These local merchants are the bone and sinew of our towns and cities. Many of them are able merchants and men of fine ability. Yet their profits are not large, as you see, and every year many of them fail in business. I believe and predict that many of these merchants will in the near future realize its possibilities and invest their money in the automobile business and become local automobile merchants. For comparison's sake, assume that one of them did so, what would be the result?

"In the first place, assuming that he represented a manufacturer whose cars averaged $900 list price, and he received 20 per cent. discount, he could carry an ample inventory of five automobiles for $3,600, which, with $400 worth of parts, would make his inventory investment $4,000. He would probably sell in the exclusive territory allotted to him by the manufacturer twenty-five cars per annum at $900 each, making his gross sales $22,500, to which I will add $500 for parts, making his total sales $23,000, from which he would derive a gross profit of 20 per cent., or $4,600, leaving the cost of his sales $18,400, which, against an inventory of $4,000, would mean a turn-over of his inventory investment 4.6 times per annum. His expenses, exclusive of personal salary, would hardly exceed $1,600, and his net profit would be $3,000.

"Thus, instead of an inventory investment of $10,000, he would need only $4,000 capital, and would turn over his investment 4.6 times instead of twice, and would make a net profit of $3,000, or 75 per cent., instead of $2,000, or 20 per cent. per annum.

"This comparison is made to illustrate the possibilities of the automobile business to retail merchants in towns of 10,000. For towns of 20,000 the figures can be doubled, and trebled for towns of 30,000, and so on.

"As a manufacturer I believe retail automobile merchants can prosper best by handling one make of car exclusively, because in that way they concentrate their attention upon one thing only, and can therefore intensify their efforts and obtain better results."

BACK WHEELS.

Why They Should Come Off Hard on Ford Cars and How to Remove Them.

It is only very occasionally that a back wheel has to be removed on a Ford car. Removal is usually needed when it is a question of replacing or adjusting the back brake shoes.

Removal is by no means easy, the back wheels being forced on to the hub. The axle is tapered, and there is a corresponding taper in the wheel, so that as the wheel is driven on to the axle by pressure from a nut, it tends to bind. The wheel is prevented from actually turning by means of a long key extending in a key-way along the back axle, and engaging a corresponding key-way in the hub. It is, of course, the binding of the hub on the taper that makes removal difficult.

A wheel-puller will be required for the work. Such tools are sold by dealers of Ford accessories at a low price. Screw off the brass hub cap with the kit tool provided. There will then be exposed a large hexagonal nut, castellated and split-pinned. Remove the split pin and screw off the castellated nut. Then take your wheel-puller, and after first screwing well towards you the central bolt therein, screw the body of the wheel-puller on to the threaded portion of the hub from which you previously removed the brass hub cap. Having got it on as far as it will go, screw inwards the central bolt of the wheel-puller until you have got it in just as far as possible. By so doing, you may be able to draw the wheel off without further trouble. That, however, is quite unlikely, owing to the jamming action referred to above. Take a good heavy hammer, and give one or two hard, smart blows on the head of the wheel-puller central bolt. Tin-tack blows are quite useless; give really good smacks. That will almost certainly loosen the wheel, and enable you to pull it right off. If it does not, inject kerosene from a spouted oil can round the central spindle of the hub. The kerosene will take some time to creep along the tapered hub, but it will eventually get there.

If you find that the wheel comes off very easily, you will know that it has been wrongly placed in position on a former occasion. The back wheels ought to be jammed very tightly. In replacing this time, take care not to repeat the mistake. Put back the wheel into position, seeing that the key enters the corresponding slot in the hub. Then replace the large hexagonal nut, and screw it up just as tightly as is possible with a sturdy wrench not less than a foot long—the longer the better, within reason. That will jam the hub on the taper tightly. When, however, you come to replace the split pin, you may find it impossible to do so, by reason of the hole being covered, or partly covered, by one of the castellations. Ordinarily, all you could do would be to slacken the nut back slightly until you can insert the split pin; or if the hole were only partially covered you would use a thinner split pin. In this case you must positively do nothing of the kind. Screw the nut off again, and put on the spindle a flat washer of such thickness as you calculate will enable you to tighten the nut up against it, at the same time leaving the split-pin hole uncovered. You may have to experiment with washers of different thicknesses. A tin washer even may be required. In any event, however, you must get the nut screwed up as tight as possible and leave the split-pin hole free. And

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you must have a split pin of full thickness—one that will only just comfortably go through the hole. If at any time a back wheel gets at all loose on its taper and begins to worry the long key, you may have serious trouble. Therefore, it is absolutely necessary that the nut should be tight up and that it should be prevented from turning, even a thousandth of an inch, after tightening.

If you get the wheel off too easily in the first case, this is an indication that you have been running risks.

Replacing Ford Brake Shoes.

Properly used, a pair of brake shoes will outlast 20,000 miles. Improperly used—for regular braking—they may be worn out within 1,000 miles. Remove back wheels in the manner described in the foregoing pointer. You will now see the brake shoes. Remove the bolt which acts as the main bearing to the shoes. This is a question of taking off the split-pinned nut behind the brake drum. When this bolt is out, the old shoe can be withdrawn and a new one inserted. Watch the way in which the various parts engage before removal, and you will have no difficulty in replacement.

You will, of course, have to readjust the clevises on the hub-brake connecting rods, which have presumably been screwed up quite a long way to take up the wear on the old shoes. The best time to adjust is when both wheels are off and the new shoes are thus exposed to view. The adjustment ought to be such that when the hand-brake lever is vertical, the brakes are just coming on to the drums. It is important that both should meet the drums simultaneously.

If the internal brake mechanism is not lubricated by overflow from the differential, give a good dose of grease at all friction points, particularly in the brake cams—the butterfly arrangements that separate the two halves of the brake shoe when the hand-brake lever is pulled.

Behind the cam wear is apt to occur, and a thin washer may with advantage be inserted if the wear has been considerable. If the wear has only been slight, it may be taken up by winding round and round its spindle, inside the brake drum, a length of fine steel wire of the kind that can be bought in coils at hardware stores (often used as a substitute for gut in fishing lines). This tip by the way is also applicable to other parts in the car where slight wear has occurred, and where the result of looseness sets up a rattle. If a washer has to be inserted, it will be necessary to drive out the pin which attaches the hub-brake cam lever to the cam itself, and that is hardly a job for an amateur. It is quite possible to drive out this pin with a punch, and thus free the levers, so that the cam can be removed, and a washer inserted behind it; but it is not so easy to ensure the pin being properly replaced afterwards. It must fit tightly in position and be burred over at the end by pounding with a hammer. This work, however, is better entrusted to a motor mechanic, for it is not wise to take the risk of this pin getting loose on the road, the back brakes being vital to your safety.

Broken piston rings will make themselves known by decreased compression, and by an excessive amount of oil in the combustion chamber and on the spark plugs.

Useful to Car Owners.

From Lawrence W. White, Massachusetts.—I drive one of the earlier model Lancia cars which has for sole source of ignition a Bosch magneto. Except in cold winter weather starting the engine is a very quick and easy matter, and I have never known a back kick with the spark properly set. In cold weather I am obliged to remove the four spark plugs and inject gasoline into the cylinders in order to loosen up the congealed oil on the cylinder walls so that I can spin the engine. It is an L head motor so that priming plugs are of no use. The motor starts thus on the second revolution even in cold weather. Does the raw gasoline in the cylinders create an undue amount of carbon, and am I thereby choking up the cylinders with considerable carbon? Upon starting there is only a puff of smoke from the exhaust, and it would appear that the priming charge burns up cleanly. I have tried a great many kinds of carbon removers in the past, and do not hesitate to say that the only satisfactory way of getting rid of carbon is to have the engine burned out with oxygen. It is my opinion, based on observation, that at least eight out of ten drivers keep the spark too far advanced in driving, and I believe this accounts to a great extent for the pounding loose of the main and connecting rod bearings. Every manual and instruction book tells you to keep the spark as far advanced as possible without causing a knock. Therefore, most drivers keep it at full advance, or nearly so, under all conditions. The strain on the crankshaft and engine bearings is tremendous when the car picks up from a slowdown, or on a hill. By actual tests I have learned where to carry my spark under all conditions and am getting more out of my car than I ever supposed it was capable of. If the engine in my car was handled the way different friends of mine and garagemen advise, it would be junk in short order.

Women Make Good Chauffeurs.

"Women not only make good auto drivers, but the proportion of women who attain proficiency in handling cars under adverse conditions is probably larger than with the men. This was the declaration of H. C. Brokaw, principal of the automobile school of West Side Y. M. C. A., New York, when his attention was called to a statement by a Brooklyn coroner and later comments in the daily papers:

"The coroner may be right in his remarks," said Mr. Brokaw, "for doubtless the type of women who come before him in his official capacity are temperamentally unfitted to run an auto. But so are the men of the type he deals with. There is unquestionably a type of persons who are wholly unfitted to drive a car in a ten acre lot all alone, but the type is not limited to the women and my experience is that the male of the species is more deadly in the case of the auto.

"In our school we often have to tell men that they never will learn to operate a car. They are either too nervous and act spasmodically, or so slow that they do not move in time, or so stupid that they never get the levers straightened out in their minds and so cannot stand the strain of our congested traffic.

"We find in the school that women know they are supposed to be shy on mechanical capacity. It

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makes them cautious and supplies any defficiency. We take them into crowded streets, put them in all sorts of emergencies requiring quick action and quicker thought and decision, and they meet the emergency. The men are apt to 'take a chance,' the women never. Then they are only able to run the car, but to keep it in order and if it goes wrong to fix it in a jiffy. They know what they are dealing with, how it is made and works and what they can do with it. Scores of women are operating cars successfully and those who hold contrary opinions would better revise them."

New York Licenses.

There has been an impression in many parts of New York State among owners that a half rate for registration of cars that have been registered for the four preceding years is to prevail. The law was repealed last April.

Among other matters set forth in the letter sent to automobilists are the following revisions:

"The owner of a car who disposes of same to another is required to file immediately with the Secretary of State a notice of sale giving date, register number, name of purchaser and address.

"The purchaser of a car which has been previously licensed under an owner's registration, is required to file within ten days of date of purchase, with the Secretary of State, a vendee's affidavit on a form furnished by the latter. A fee of $1.00 is payable at the time of filing.

"Cars bearing dealers' plates are to be used for demonstration purposes only, and dealers are warned against the use of plates except as prescribed by law.

"The car itself is registered and plates issued at the time of such registration are intended for that particular car. Therefore, plates cannot be changed from one car to another.

"Any person operating a motor vehicle as an employe or any person operating such a vehicle for hire is required to take out a chauffeur's license."

Cure for a Reversed Battery Cell.

It sometimes happens that one particular cell in a battery will be the cause of much trouble and annoyance to the user, the specific gravity of the electrolyte falling during charge and recovering again during the discharge of the cell.

This action is, of course, the exact opposite to that which takes place in a normal cell, and it is fairly safe to predict that a reversal of polarity has taken place. Before attempting a cure, one should carefully examine the cell to ensure that it is correctly connected to the other cells in the battery. The positive of one cell should be connected to the negative of the next, and so on throughout the series. If the distinguishing positive and negative marks have been obliterated or omitted from the cell, the plates should be counted, and since there is always one more negative than positive the polarity may be readily determined. If the cell be found then to be wrongly connected the mystery is explained, but if the connections be in order we must look elsewhere for the cause of the trouble.

Through some loose paste lodging between the plates, or some outside substance causing a short circuit, the cell may have been run down. If this action occurred during charge the cell would be practically cut out and the density of the electrolyte would remain at the discharge valve. Now it is quite possible that the shorting substance may be removed during the battery discharge, and the current flowing through the discharged cell will then result in a change in its polarity.

To effect a cure the cell should be removed from the battery and thoroughly cleaned, all loose paste and sediment being removed and the separators between the plates attended to. The cell should then be charged in the correct direction, preferably at a slow rate, and gradually brought back again to its normal condition.

In this connection it might be well to recall that the density of the electrolyte increases during ordinary charging, water, owing to the chemical changes that take place, being replaced by sulphuric acid of higher density. On discharge the density falls, acid being replaced by water. The polarity of a cell is determined by the direction of the charging current, and it will be clear then that a discharged cell will have its polarity reversed by a general discharge current from the battery. The density of the electrolyte in the defective cell would then increase during discharge, the density of the remaining cells falling at the same time.

Some manufacturers send their batteries to purchasers with a large amount of lead sulphate present upon the plates, or, in other words, in a discharged condition. It is then very important to charge the cells fully when they are received and to maintain the charge during the interval of time specified by the makers. It is quite possible that a reversal might be caused owing to lack of this precaution.

Removal of Ford Valves.

First get a valve lifter to remove the valves, it is necessary to take off the cylinder head and also the valve covers. You can remove the valve covers without taking off the inlet and exhaust manifolds, but the subsequent work becomes much easier if you take off these manifolds. The removal of the valve covers is simply a matter of taking off the nut at the center of each, and then prising the cover away; but be careful not to injure the oblong felt gasket (which is under each cover) in so doing. The removal of the manifolds is simply a question of removing the clamps that hold them to the cylinder. These manifolds are numbered 3060 and 3062 in the Parts List. The best time to remove the valves is when you have the cylinder head off for decarbonization.

To use the valve lifter, compress the spring (with the spring seating) upwards by the method applicable to the particular tool you have, thrust down the valve head from above, and you will then be able to withdraw the pin, or cotter, that goes through the valve stem. The valve can then be withdrawn upwards. You will then be able to inspect the valve thoroughly.

In replacing the valve, you may have difficulty in reassembling the parts, viz., valve, spring, spring seating and cotter. First put spring and spring seating together; put into position under cylinder casting, and press up with the valve lifter. Then push valve through from above, noting position of cotter hole in stem before doing so. The valve should preferably be dropped in so that this cotter hole runs diagonally from front to back. If you do not note

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position of hole before dropping valve in, you may hunt for it for quite a time in your effort to insert the cotter. See that the cotter is central—not sticking out more at one end than the other. Lower spring and spring seating on to the cotter, and check cotter again for centrality. (If not central, it may work out.) If cotter is worn or bent, replace with a new one.

ELECTRIC CARS.

Prospect of a Great Increase in Their Use and Usefulness.

From A. J. Marshall, Secretary Electric Vehicle Association of America.—The past year has seen many changes and improvements in the electric vehicle industry, all of which point to an unusually bright future both for the electric in the commercial field and as a passenger car. There have been no sudden, illusory spurts of popularity in the progress of the electric vehicle, rather, it has been a gradual, steady growth, forming a good strong foundation upon which to build up its ever-increasing business.

Ever since the transportation world has recognized the value of the motor truck as a medium for transporting merchandise, it has invariably been admitted in the larger cities, where there are opportunities of testing the various forms of trucks, that while the gasoline motor truck is especially adapted for long, uninterrupted hauls, the electric vehicle is the desirable and economical vehicle for city and suburban work.

The Boston Institute of Technology, employing the best authorities in an unbiased study of transportation problems, bears out this statement of the electric's adaptability to city traffic after four years of observation and statistical study. Indeed, all we need do is to observe the large fleets of electrics in our city streets which have been adopted by our largest and most conservative business houses.

While nearly all of the largest fleets of electric vehicles have been installed primarily through the efforts of the vehicle manufacturers, the electricity supply companies (central stations) of the country have exercised considerable influence in the promotion of the electric vehicle. However, there are comparatively few that appreciate the tremendous opportunities attending its further development.

In New York City, for example, there is a minimum of something over $10,000,000 annually to be derived from the sale of current for electric vehicles in place of horses. Of 10,000,000 horses that are in use in the cities and towns of this country probably all could be successfully displaced by electric vehicles. This would mean an additional income to some 6,000 electricity supply companies of about $1,000,000,000. This is all the more significant when we consider that the combined income of all these central stations from all sources last year was approximately $450,000,000, of which but a very small percentage was derived from the sale of current for electric vehicle charging. Even if only a small fraction of the business in sight were obtained, it would represent a tremendous increase in the total incomes to the electricity supply companies.

That the horse and wagon is gradually being displaced by the light electric delivery wagon has been demonstrated by the very successful campaign recently carried on by a well-known manufacturer of vehicles of that type. Within its capacity rating the small 750-pound electric delivery wagon costs less to operate than a single horse wagon, and can perform a far greater amount of work. Where conditions are such as to demand mileage ranges of thirty, forty, or fifty miles per day, the saving obtained by the use of this car may actually cover its cost in less than two years, and this after all other running expenses have been paid. It costs less to keep this car in tires than it does to keep a single horse in shoes for the same work done.

Another important development of the electric vehicle during the past year in a special field is its adoption for municipal service by many of our most progressive cities in one form or another. It is with considerable interest that fire chiefs throughout the country are watching the results and performance of electrically propelled fire trucks and engines in the cities where they have been adopted. This should prove an especially fertile field for the exploitation of the electric because of its inherent qualities of absolute dependability, its ease of operation, immediate response to driver's touch, and great simplicity of working parts, all of which are vastly important in operating fire apparatus.

The very latest development and one which will play an important part in further popularizing the passenger electric is the electrically driven taxicab. The present gasoline taxicab service in many of our larger cities and especially in New York, is inefficient, in many instances unsafe and costly to operate. An electric taxicab has been developed by a company in Detroit, where there is now a fleet of forty-seven in operation, which has all the exclusive refinement of a privately owned limousine in appearance and is operated with far greater ease and safety than the very best of the gasoline taxicabs. Plans are now under way whereby a company will be formed to introduce electric taxicab service in New York and other large cities in this country.

The battery rental plan for commercial vehicles, which has been in existence for a number of years in Hartford, Conn., is just beginning to force recognition in other cities and will, without doubt, become extensively employed throughout the country during the coming year. The aim of the Battery Rental System is to widen the scope of the electric truck, increase its mileage, and reduce the initial cost. The truck user buys a truck with chassis and body adapted to his particular requirements without the battery. The electricity supply companies or charging stations of the various cities where this system is used keep him supplied with charged batteries to run his truck. In other words, he buys from the electricity supply company, not energy at so much per kilowatt hour, but transportation service. He pays a flat charge for garaging and battery maintenance depending on the size of his truck.

In addition he pays so much per mile for the total mileage traveled as indicated by the odometer on the truck. When one set of batteries are nearly exhausted he receives a freshly charged set from the nearest charging station, taking from two to four minutes for the exchange, less time than it takes to refill a gasoline tank. This system is already in practical use in Hartford, Conn.; Boston, Worcester, Baltimore, Salt Lake City, Fall River, Spokane and San Francisco.

The Battery Rental and Exchange System is also

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being developed successfully for the passenger car type. Coupled with this project will be a very substantial reduction in the price of electric vehicles. Already one large manufacturer of passenger electrics in Chicago is selling a vehicle minus batteries for nearly $1,000 less than last year, the purchaser renting the batteries from the various service stations throughout the city.

Other phenomenal price reductions in electric passenger vehicles have been due to quantity production and an unprecedented increase in sales. A decrease of $875 was announced by one company which has been carrying on an extensive sales campaign, and other manufacturers have offered reductions of from $300 to $800. All of this augurs well for future popularity of the electric, and already its recognition as the most satisfactory car for city and suburban use is evidenced in the greatly increased numbers which we see daily in the streets.

The past year has been marked by a number of successful long runs organized by several of the leading manufacturers. Fifteen hundred miles in fourteen days, using but a single charge of the batteries per day, was the record made at Los Angeles, Cal. Recently an electric made a run of 180 miles in less than ten hours, and the same make of car also accomplished a 375-mile run from Hartford to Washington in an actual running time of 121 hours. The trip cost $5.65, or less than 1½ cents per mile. One hundred and forty and even 160 miles on a single charge of the batteries has been made.

BUILDING A GARAGE.

The Size, Construction and Quality Depend Upon the Means and the Ends.

The building of a garage is a subject of such wide ramifications that it can be scarcely more than touched in a single article, quite a large volume being required to cover the matter fully. The question of material depends largely upon the locality as well as upon personal choice and cost. Then the size and equipment may be as varying as the size and equipment of dwellings or any other structures.

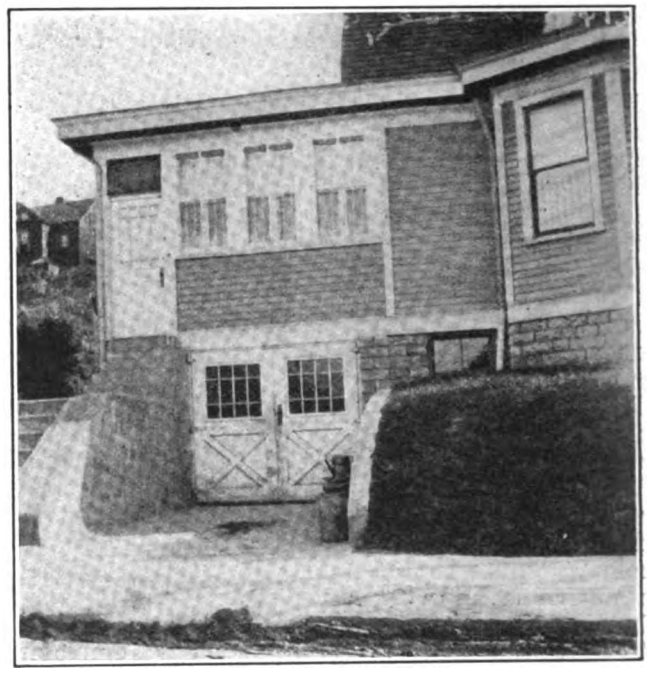
The writer recommends a perfectly level floor without any fall for drainage, otherwise considerable effort will be required on the part of one person to move a heavy car. The floor of a garage should be washed in the same way as a tiled lobby, consequently a sloping floor is not required. It is, of course, necessary that some fall should be given from the four sides of the washing space towards the drain in the center, but there need be no difference in level between the sides of the washing space and the floor.

As regards material for the floor, the writer does not favor the use of cement, for oil disintegrates a cement floor, and steel-studded tires are liable to cause the surface to flake off. Good, smooth-faced stone flags or bricks are to be recommended in preference—they are much more serviceable and are non-slipping. For the wash-floor a concrete finish is recommended with a "floating" of cement, sand, and granite chippings, although small hard tiles having a sunk chequered pattern, so as to be non-slipping, and laid on a bed of concrete, are equally suitable.

The Pit.

The question of whether or not to make a pit is one that immediately crops up when considering the building of a garage, and, although it must be at once admitted that the upkeep of a modern car does not often call for the use of a pit, there are occasions when it is necessary and urgently wanted, so that unless the cost of the building be a matter for very careful consideration a pit is recommended.

In most cases it will be advisable to drain the pit, but where this is impossible by reason of the level of the main drainage being above the floor of the



Inexpensive and Right at Hand.

pit a water-tight construction must be made, otherwise water will percolate through the bottom and sides and lodge within the pit. But whether a water-tight construction under such circumstances be made or not, a good plan is to have a small pump at one end similar to the gravy well of a meat dish, in order that water finding ingress from any source may be easily scooped up.

It is much better to have the pit at right angles to the position in which the car usually stands, rather than longitudinally, but, of course, the house must be of sufficient dimensions to allow the car to be pushed fore and aft to enable all under parts to be examined from the pit. Whether the pit be placed at right angles or otherwise to the car it is very important that it should be long enough for any person standing beneath the car to enter or leave easily.

As regards means of descending into the pit, the best method consists of a flight of steps covered over when not in use. A small garage space will not, of course, allow of this method being adopted, and a short ladder is then the best makeshift; manhole step irons are to be avoided, a spot of grease on any one of them being likely to cause a slip, and possibly a more or less serious accident. Further than this, when one is climbing out of a pit by means of manhole step-irons, there are no irons for the hands to clutch to prevent one falling backwards when more than half-way up—all one can do is to claw at the floor. In addition, one cannot get in or out of a pit with tools or parts in one or both hands when step-irons are used—the hands must be free to hold on by.

Many designers of car houses do not allow suffi-

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cient space all round the car. It is not enough simply to allow room for one person to pass around at a time, but three or four feet at least should be allowed to enable adjustments to be made without the operator being cramped. This extra room is especially convenient when there arises necessity for tires or spare wheels to be manipulated, and the three or four feet to spare should be in addition to any floor area taken up by benches or tool chests.

As regards lighting, it is very inadvisable, in the writer's opinion, to admit a south light, otherwise the house will be uncomfortably hot in summer. At the same time there are many owners who prefer to take advantage of the spring, autumn and winter sunlight in helping to keep the interior of the building free from damp, and to fix suitable blinds or shutters to exclude the summer heat and light. The writer invariably recommends that every car house shall have some provision for top light, for this adds considerably to the facility with which work may be done, especially on dull days. The ceiling light should be made to open so that it can be cleaned.

Artificial light would, of course, depend upon the facilities available. Electric light is undoubtedly desirable, but if care be taken to prevent any fumes from the gasoline escaping and the tank be not filled in artificial light there is no actual danger from the use of gas. Remember on all occasions that the fumes from gasoline descend, and consequently it is far more dangerous to work with a naked light in the pit than it is to have a gas jet burning above the car.



Convenient But a Bit Obtrusive.

Many car houses are spoiled by having an entrance door which is too small and necessitates careful driving to enter or leave without touching some part of the car on one of the door-posts. In no case should the doorway be less than 8 feet wide. If the run-in or entrance be oblique, extra width of doorway should be provided.

Where hot water radiators are used to heat the garage care must be taken that they are not placed in such a position that any direct heat will impinge upon the tires, wheels, or bodywork; they must be kept well clear from the car, otherwise perished tires, loose wood wheels, and cracked varnish will ensue.

As regards the exterior or architectural treatment, this will naturally depend upon the materials available, and in many cases a design and construction in keeping with those of the owner's residence will be preferable.

Where a roof ventilator is especially provided the upper portion of one or more of the side windows should be fitted with casements to admit fresh air, otherwise the circulation of the air will be prevented and the roof ventilator will not serve its purpose.

The Boston Show.

When the public are afforded a chance to peer into Mechanics Building, the home of the Boston Automobile Show, which opens March 4, there will be a greater number of motor cars and commercial motor vehicles on display than any other show in the United States or that any other country can boast of. One month before the date of opening the official list shows many cars in excess of those displayed in either New York or Chicago, with more than a score of pleasure car dealers and manufacturers clamoring for a chance to display their goods.

Manager Chester I. Campbell is at work endeavoring to rearrange the space in the balconies so as to make room for more cars. The accessory space has been sacrificed to make room for automobile displays. At least ten different displays will be located in the balconies. Although considerable flooring has been taken from the accessory department, yet over 175 individual exhibits will be made in that section of the show. Scores of applications for space in the accessory department have been passed up because of lack of room.

The official list at this time shows 107 different makes of pleasure cars and commercial vehicles. Seventy-four of this number will be displays of pleasure cars. There will be 33 different makes of trucks exhibited. In all probability there will be at least ten more added to the pleasure car list before the show opens.

Despite the crowded condition there will be six cars that will make their debut to the New England trade at the forthcoming Boston show. The debutantes will be the Owen Magnetic, Hollier, Bell, S. J. R., Fostoria and Daniels. There will be several new trucks exhibited.

Perfection Grease Retainers.

In our November number we printed a little item from one of our subscribers, H. F. Fracker, relative to Perfection Grease Retainers for Ford cars. This item has brought us a lot of letter inquiries for the name of the manufacturer. Several of our subscribers have now furnished us with this name and we understand that these devices are manufactured by A. P. Worthington, 1220 San Pedro Street, Los Angeles, California. One subscriber says "I procured a pair, had them applied and they have worked perfectly. I believe that before they were put on I had the nastiest looking Ford car in existence. The rear axle apparently was not intended to hold grease at all."

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THE MORE THEY WARN.

The More the Doctors Are Seen Using Speedy Automobiles.

Dr. D. Bryson Delevan of New York City recently discussed in a paper read by him before the American Laryngological Association the effect of motoring on the upper air passages. He referred to the unpleasant odors of the vapors and their harsh and irritating effect on the mucous membranes of nose and throat. The air currents and the dust have a still more marked influence. The particles of dust are now kept out of the eyes pretty effectively by goggles, which are often surrounded by felt or wool to prevent the small grains from working in under the rims. The face is often protected by guards. But so far no respirator has been invented to make the motorist thoroughly happy.

If the fumes of gasoline are to be seriously considered as a factor in modern automobile ills, one must go for his morning spin with all protection against evil gases just as if he were in the trenches of Europe. No one doubts that there come periods of dryness to the throat from prolonged rides in automobiles, but happily there are dispensaries along the main traveled ways where throat treatment amid congenial surroundings may be readily obtained.

Specialists have also pointed out that rapid riding in an automobile produces tinnitus, a certain ringing or jingling in the ears. It is a matter of official record that when one has recently acquired an especially high powered car he is afflicted with a peculiar deafness and cannot hear even loud voices of warning and the shrilling of official whistles. Often these sufferers have to be overtaken in motorcycles before their sense of hearing returns.

That high speed in automobiles often produces a nerve strain has been noted by neurologists, and papers have been read upon this subject before their learned societies. The neurasthenic conditions are often generally associated with the stress and storm of modern civilization. In certain nervous affections, however, there is that unconscious wish to be constantly in rapid motion, which is observed in speed maniacs.

When the motor car was younger and mankind was less accustomed to handling it, many neurologists referred to the tensity of nerves and of a featured expression commonly called "automobile face." This is due to the constant effort and the concentration of the will to the task of mastering unaccustomed tasks. The tightly drawn muscles, the protruding eyes, the open mouth, are aspects of the automobile face which are unpleasant and indicate a tremendous strain. Where the automobilist is more or less oblivious to his surroundings and is occupied with the intricacies of his car, the workings of his countenance are unpleasant to witness.

In the early years of motoring, physicians were much concerned about inflammation of the nasal passages and the frontal sinus, but lately there has not been so much trouble along those lines on account of the introduction of the windshield. These ailments were caused by the lodging of germs in throat or nose, hurled by the force of the wind.

The most recent ailment is described as chauffeurs' knee, the symptoms of which were set forth last month in The New York Medical Journal by Dr. Gustav F. Boehme, a neurologist connected with the West Side German Dispensary. Chauffeurs' knees, as he remarks, is not unlike tango foot, which is now rapidly disappearing, and was first described by him. It more closely resembles that prosaic ailment, housemaids' knee. Dr. Boehme says that within the last few months many chauffeurs have come to the dispensary and complained of pains in the knee caused by the operation of the pedals. Often the trouble does not appear when the motorist is following his usual gait, but manifests itself when he climbs stairs. He has prescribed for this complaint a cessation from driving and the application of a solution of sub-acetate of lead and opium. To prevent permanent stiffness of the knee he suggests the knee gets passive massage or the baking of the affected member.

The consensus of the medical profession seems to be that despite the ills which are from time to time catalogued as coming from the modern automobile it is in reality a boon to mankind. Suitable clothing, the protection of eyes, ears, and nose, and the development of the motor car's mechanism to such an extent that the strain on rider and driver is constantly reduced have all contributed to enhancing the benefits of automobile riding as an exercise.

Dr. Delevan and others have written about the merits of the limousine, which can be properly heated and so ventilated that for persons who cannot stand the direct exposure to the open air many of its benefits can be obtained.

Dr. P. G. Heinemann of the University of Georgia, in The Popular Science Monthly, gives an appreciation of the automobile viewed from the standpoint of the public health. He declares that if it had done nothing else, it had improved the sanitary condition of city streets and country roads, and that its continued use in years to come will greatly cut down the amount of disease of germ origin.

It is significant that the more that physicians and surgeons write about the maladies and the breakages ascribed to the swiftly speeding car, the more they themselves fly into the face of the danger. The automobile brings to them, as to all, the thrill of rhythmic motion and the joy of the open road.

BRICK ROADS GROW IN FAVOR.

The First Cost is High but They are Durable and Easy to Maintain.

A rapid increase in the mileage of vitrified brick roads in this country is predicted in a new bulletin of the U. S. Department of Agriculture. Such roads, it is said, possess three distinct advantages. First, they are durable under all traffic conditions; second, they afford easy traction and moderately good foothold for horses; and third, they are easy to maintain and keep clean. On the other hand, they are unquestionably expensive to construct and the effort to reduce the high first cost frequently results in inferior construction and consequent defects.

The cost of a brick pavement depends so much upon so many variable factors such as the locality, freight rates, and the distance from brick kilns that it is not possible to make any definite estimates. The cost of the rough grading, however, should be considered entirely apart from the cost of the pavement, for the grading would have to be done no matter what kind of a road was to be built. Ex-

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cluding this item, the bulletin already mentioned (No. 246) furnishes the following formula as a rough guide for the probable expense of a brick road with a 6-inch concrete foundation and suitable grades: Cost per square yard = 1.90 L + .213 C + .138 S + .157 A + .040 B.

In this formula C equals cost of cement per barrel, S equals cost of sand per cubic yard, A equals cost of coarse aggregate per cubic yard, B equals cost of paving bricks per 1,000, and L equals cost of labor per hour. Thus, if labor costs 25 cents an hour, the labor cost per square yard of pavement will be 1.93 times 25 cents, or 48.25 cents. The cost of the cement per square yard will be .213 times and the price of a barrel and so on with the other items. It is assumed in this formula that all materials are delivered on the work. About 10 per cent. should be allowed for wear on tools and machinery, and for every inch subtracted or added to the thickness of the foundation there will be a corresponding difference of 8 to 12 cents per square yard.

Paving bricks should be uniform in size, reasonably perfect in shape, tough in order to resist crushing, hard in order to resist abrasion, and uniformly graded in order that the pavement may wear evenly. With good paving brick the crushing strength varies from 10,000 pounds to 20,000 pounds per square inch when the load is applied uniformly over the entire top surface of the test specimen. In use, however, paving brick is seldom called upon to withstand a pressure of over 2,000 pounds to the square inch so that this factor is not one of great importance.

A more important test is known as the rattler or abrasion test. In this the bricks are subjected to destructive influences similar to those encountered in actual service, and the effects resemble those which traffic may be expected to produce upon the completed pavement. Briefly the test consists of inclosing 10 dried bricks in a steel barrel in which there are also placed a number of cast-iron spheres. Ten of these spheres weigh each 7½ pounds. Enough smaller ones weighing a little less than a pound are added to make the total weight approximately 300 pounds. The barrel is then revolved at the rate of 30 revolutions a minute for an hour. At the end of that time the bricks are taken out and weighed, and their loss in weight ascertained. In this test good paving bricks will lose from 18 to 24 per cent. of its weight. In drawing up specifications for the brick to be used on any road, it is, however, desirable to specify the minimum as well as the maximum loss of weight which a sample may sustain in order to prevent too great a difference between the softest brick that is acceptable and the hardest that may be supplied.

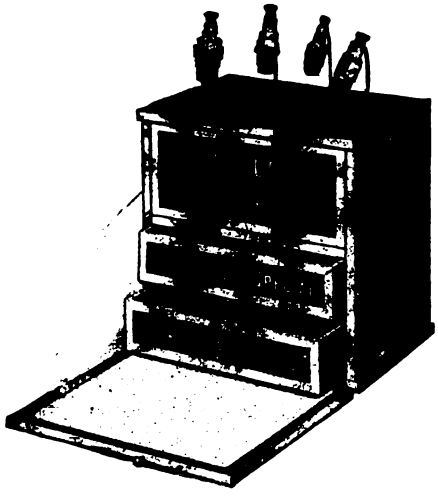
Equally important with the character of the brick is the character of the roadbed on which it is to

(*Concluded on page 93.*)

NEW AND INTERESTING THINGS IN MOTORDOM

The Mosler Display Cabinet.

This is an attractive display cabinet for Mosler Spark Plugs, which is very attractive when placed on the counter of any dealer. It is neat, complete and compact and it has receptacles for all



the different styles and sizes of Mosler plugs. This display cabinet is given absolutely free of charge to the dealer if he will order an assortment of plugs amounting to $24.60. The cabinet is beautifully finished in mahogany, nickel trimmed, and there is no glass to break. A full supply of these cabinets is now in stock ready for immediate delivery and dealers who are interested are urged to write at once for complete details to A. R. Mosler & Co., New York City.

Care of Tires in Winter.

"The winter season seems to strengthen the properly inflated tire," says an official of The Fisk Rubber Company. "Underinflation is responsible for a large percentage of tire expense. Most motorists think that during the summer months they should ride their tires at low pressure to prevent blow-outs. The decreasing of the pressure does not decrease the heating of the tire, but rather increases it, as the side walls are subjected to a greater bending strain and friction between the layers of fabric generates heat. Due to this excessive flexing the fabric cracks and loosens up to such an extent that the tire becomes weakened. The cracked and chafed fabric ruins the inner tube. During the winter season the motorist does not let the air out of his tires as he does in the summer, but allows his tires to have a greater and more constant air pressure; hence, the percentage of tires consigned to the scrap heap is much less in winter than in summer. It has been definitely determined by test, with a tire at proper pressure, that it is impossible to effect an increase in air pressure because of the heating of the tire when in use, to such an extent that it will injure it in any way. To prevent your tires from fainting, give them the proper amount of air."

The McCormick Wind Shield Weatherstrip.

This device closes the space on rain-vision windshields, making the shield absolutely watertight, also dust and windproof, and the advantage to the driver is too obvious to need comment. This weatherstrip is adjustable to any space or thickness of glass. It is easily removed and allows free movement of the panes. It is less than a half inch wide and will not obstruct the vision in any way. It sells for only $1.00 and is manufactured by the Robinson Mfg. Co., 508 Lincoln Bldg., Louisville, Ky.

Starting and Lighting for Fords.

The Westinghouse Electric & Mfg. Co., of Pittsburgh, Pa., has made a number of improvements in its lighting and starting system for Ford cars. A new type of cut-out switch has been fitted. The brackets furnished are adjustable, the unit being driven by a Westinghouse compensating sprocket through a special silent chain, which is twice as strong as last year's size. The price remains at $75.

Mattson Rubber Accessories.

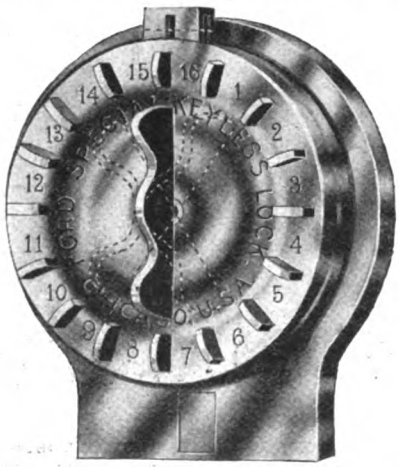
This is a very complete line of rubber automobile accessories including the Mattson Slip-On Pedal Pads which are made for all models of Ford and Overland cars and sell at sight. Also high grade tires which are very popular. The Mattson accessories are manufactured by the Mattson Rubber Co., 118 Main St., Lodi, Bergen County, N. J. They distribute their product entirely through the jobbing trade and their price list is sent only to jobbers, but dealers, repairmen, public garage owners or motorists who are interested should write for printed matter and full particulars direct to the manufacturers.

Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Special Keyless Lock for Fords.

Some time ago, a description was printed in this magazine of the Chicago Keyless Locks which were then being marketed by the Novelty Distributing Agency of Chicago. This concern has been reorganized into a corporation to be known as the Lockwell Company with offices at 20 West Jackson Blvd., Chicago, Ill., and the new organization will control the output of Chicago Keyless Locks in the United States and Canada. A new lock of this description has just been brought out especially for the Ford car, and an idea of its appearance may be gained by the accompanying cut. This lock has 16 buttons in a combination which can be set and changed at will by the owner on any number of buttons from one to 15, thus giving over 20,000 separate and workable combinations. In the special lock for Ford cars, the switch lever or key, is placed in the center of the lock. When turned to the extreme left this lever connects the bat-



New Car Lock.

tery, and to the extreme right, the magneto. When in a perpendicular position, it is in neutral state; the engine stops and the locking process follows. This is done by simply pressing down the lug at the top of the lock which renders impossible the moving of the lever in either direction or of extracting it. Hence the car is locked. There can be no sparking of the engine until the lock is opened and this cannot be done in any other manner except by pressing the correct number of buttons on the face of the lock. It will thus be seen that the owner has an absolute safeguard so that no one can start the car except himself. The device is certainly a clever one and will probably command a ready sale as it sells for a reasonable price and will appeal strongly to many owners of Ford cars.

Wants a Gasoline Inquiry.

A broad investigation to determine primarily whether the segregated Standard Oil Companies are boosting the price of gasoline has been proposed to the House of Representatives in Washington. The resolution calls for a general inquiry into the production, transportation, refining and marketing of gasoline and other petroleum products to lay bare the causes for the recent advances in the prices of these commodities. The resolution calls for the appointment of a select committee to be appointed by the Speaker of the House and to consist of nine members.

Tuthill Springs.

An interesting little booklet telling the story of the discovery of the principle employed in the making of Tuthill Titanic Springs is told in a booklet issued by the Tuthill Spring Company, Chicago. This booklet was distributed for the first time at the New York Automobile Show, and aroused considerable interest on the part of both owners and dealers. The Tuthill Spring is made without center hole or center nib, and it is claimed by the makers that this positively eliminates the possibility of breakage at the center. To anyone interested in the subject of springs, and everyone who owns or sells autos is—this booklet is of highly informative value.

The Tire Business Good.

The increase in the automobile tire business by leaps and bounds in the last two years has caused the Michelin Tire Company of Milltown, N. J., to increase their manufacturing building by an addition measuring 53 by 117 feet. John W. Ferguson Company, of New York and Paterson, N. J., has been awarded the contract. The addition is to be a single story, brick walls, and a sawtooth roof.

Service Standardized Trucks.

Dealers in pleasure vehicles who have not already taken the agency for a line of trucks are neglecting a great opportunity. It has been found in nearly all instances that the live dealer can make a great deal of extra money by taking a truck agency. The Service Standardized Trucks are manufactured by specialists, and truck building is their sole business. The units which are assembled in these trucks are of standard excellency. They include the Buda motor, Timken axles and Timken bearings, Stromberg carburetor, Eisemann magneto, Long's radiator, Brown-Lipe transmission and Ross steering gear. A particularly attractive offer to dealers is made on these trucks, and considerable good territory is still open. Correspondence with dealers is especially invited, and all letters should be addressed to the Service Motor Truck Co., Grand Street, Wabash, Ind.

New Oxy-Acetylene Welding Outfit.

F. W. Stewart, 1509 Michigan avenue, Chicago, is marketing the Russ oxy-acetylene welding plant. The Russ No. 22 welding and carbon burning equipment consists of oxygen and acetylene heads, welding torch with four tips, three aluminum welding rods, steel wire welding rods, six cast iron welding rods, Tobin bronze welding rods, one pound of iron welding flux, and the same amount of aluminum and Tobin bronze flux, one pair of welding goggles and instruction book. This outfit sells at $60.

Storage Battery Charger.

The Lincoln Electric Co., Cleveland, Ohio, is offering a charger for storage batteries, which is made up of two standard electrical machines mounted on the same shaft. One is an alternating current motor, which is driven by the electric current from the regular supply line. The other machine is a generator, which is turned by the motor, thus generating the direct current necessary for storage battery charging. The charger is furnished with all necessary instruments, switches and attachments mounted on a black slate switch-board. The charger is claimed to charge any number of batteries from one up to the capacity of the machine.

New Apco Specialties.

The Auto Parts Company, Providence, R. I., makers of the Apco line of specialties for the Ford car, has brought out a fender brace which occupies the spaces between the fenders and the aprons, completely filling in these places. Not only does the installation prevent movement and rattling of the fenders, but the entrance of mud and other foreign ele-



Apco Fender Brace.

ments. The braces are made up of heavy pressed steel and finished in baked-on black enamel. A set includes four, two for each fender, and screws for attachment. The set retails at 50 cents.

Another Apco specialty is the emergency brake handle. It is easily attached and is positive in its action. It not only adds to the appearance of the brake lever but to its efficiency. Slipping of the lever is positively avoided when the brake is set, as when starting the car on a grade, for example. The new



Apco Emergency Brake Handle.

device retails at 60 cents and comes black enameled. Readers who are interested should send for catalogue, also see attractive two-page advertisement in this issue of the Automobile Dealer and Repairer.

New Heater for Ford Cars.

A new car heater, especially designed for Ford cars, is manufactured by C. E. Bridges, 4537 N. Whipple Street, Chicago, Ill. This device utilizes the wasted heat from the exhaust. It can be attached instantly, and when you have it installed you can ride all day at 10 degrees below zero and your feet will not get cold. If the car has side curtains, the whole interior of the car is kept warm. This heater replaces the regular floor board, and you simply cut the mat away over the heater. This device is inexpensive and it has been adopted this year by a great many owners of Ford cars, and they report that it meets every requirement for heating purposes.

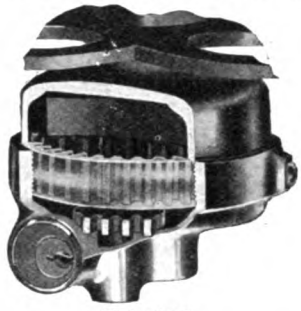
Auxiliary Radius Rod for Fords.

An auxiliary radius rod for Ford cars is manufactured by the Lenolite Mfg. Co., 6 N. Clark Street, Dept. Z, Chicago, Ill. This is an accessory which appeals to every Ford owner immediately, and it is a great seller. The manufacturers state that they expect to sell one million of them this year. Exclusive territory is now open and correspondence is invited.

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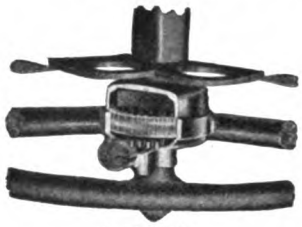
An Effective Car Lock.

The problem of safeguarding a Ford car against theft is at last effectively solved by the use of the Rex Auto Lock, a geared casing, which, when attached to a Ford car, is a positive protection. It takes the place of the regular steering gear cover which is a part of the construction of every Ford car and is attached to the steering gear internal gear



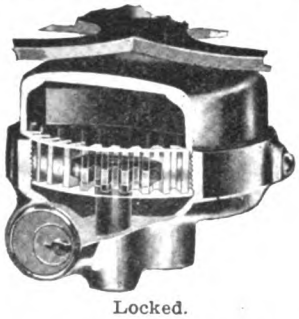
Unlocked.

case just below the steering wheel. The gear case contains an internal gear and a set of differential gears, and when the key is turned the geared sector contained in the lock moves downward between two of the differential gears and intermeshes with the internal gear as shown in the cut marked "locked." This locks the gears so that the wheels cannot be turned and if the car is started it will move at the angle at which the front wheels are set. The lock permits the wheels to be



Installed.

set at any angle desired and it will at once be seen that when the front wheels are set at an angle and locked, the car cannot even be towed. The Rex is an absolute protection against theft and is the cheapest and best form of theft insurance that can be purchased. An insurance policy protects a car only so long as the premium is paid, but with the Rex only one expenditure is necessary. The lock cannot be manipulated and if a thief tried to break same he



Locked.

would only succeed in damaging the steering gear so that the car would be unmanageable. A car equipped with a Rex lock complies with all fire ordinances because when locked it permits the car to be moved but only at the angle at which the front wheels are set. The Rex auto lock is a durable casting highly polished and is equipped with a non-pickable lock. The construction is so simple that it is practically impossible for it to get out of order and it is easy to install, as no drilling is necessary and no unusual tools are required. The price of the Rex Auto Lock is $4 and simple complete directions are packed with each device. Patent pending. Manufactured by De Tamble Manufacturing Company, 1607-1611 Prairie avenue, Chicago.

Hyatt Service Prize Contest.

Results of the mileage contest conducted by the Hyatt Roller Bearing Company are of interest not only to manufacturers of automobiles but owners of cars as well. The company's announcement sets forth that the first prize winner, a 1909 Buick, owned by F. E. Slason, of Plainville, Kans., traveled 261,800 miles on its original equipment of Hyatt bearings up to last October, when the car's record was submitted to the judges of the contest.

Seven different makes of cars are represented among the sixteen prize winners, the total distance traveled by the sixteen cars being 2,512,435 miles—equal to more than 100 times around the world. The average distance traveled by the prize winners was 156,814 miles, or more than six times around the world. All of the cars are being operated by their owners to-day, and are piling up mileage records daily on their original equipment of Hyatt bearings. Mr. Slason, who received the first prize of $500, says that more than 300 tires, representing a value of $8,000, have been worn out by the car. All the prize winning records also were made to stand a searching investigation by the company. Other prizes, ranging from $10 to $200, were awarded.

A New Type of Signal.

An entirely new type of warning signal for automobiles has been placed upon the market by the Buell Mfg. Co., 1143 East 46th Street, Chicago, Ill. This is called the Buell Explosion Whistle. It is not an exhaust horn, but is operated directly by the explosion through the priming cup opening in the cylinder, and its extreme simplicity assures freedom from all trouble. It consists of a poppet valve and a 5-oz. whistle. The first cost is low, there is no operating expense and it is very easily installed. It gives a powerful, distinctive note. The manufacturers claim that this signal is far more effective than an exhaust horn, and the gas operating has at least ten times the pressure. This signal is sold on trial and guaranteed for life. A descriptive circular will be sent on request, and good agents are desired throughout the country.

Extending Their Business.

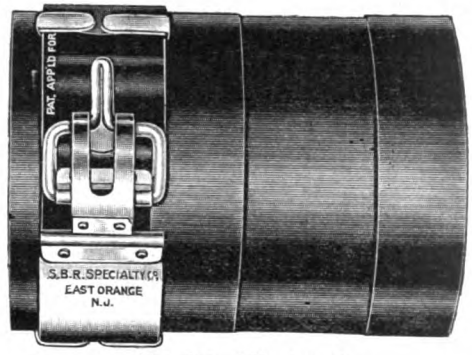
Northwestern Chemical Co., of Marietta, O., took another forward step January 1, when they opened a branch office, display and warerooms at No. 47-49 West Street, New York.

They now have there a complete stock of the various "chemically correct" automobile specialties and will deliver from that point all goods intended for New York, New England, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, North Carolina, South Carolina, Georgia, Florida, City of New Orleans, and City of Montreal. All export orders will also be taken care of from the New York branch. The branch is in charge of Mr. G. Sam Scott, who has for a number of years had charge of the Eastern sales of the company. Goods shipped from New York will be invoiced from New York, but will be payable at the home office, in Marietta. By the system of invoicing, the home office can always tell how much stock is on hand in the New York warerooms, and thus keep the supply complete at all times.

The Northwestern Chemical Company make about forty different automobile specialties, the best known of which is Se-Ment-Ol, the radiator cement so extensively advertised as the cement that "finds the leak and fixes it." The company has been very successful, having risen in six years from almost nothing to a position of prominence in the trade, both national and international. And from the outset the affairs of this growing concern have been in charge of that rising young business man, Mr. F. R. Hall, who has been general manager of the company from the time, six years ago, when their factory was an abandoned dwelling house and their mechanical equipment consisted of a tub and a paddle.

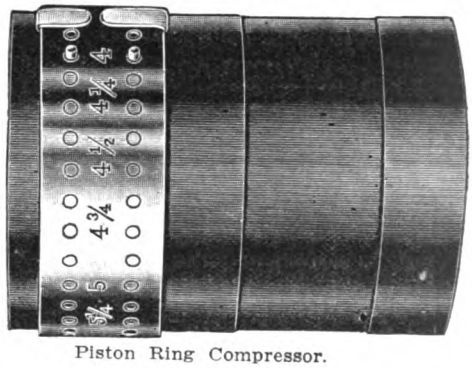
Empire Piston Ring Compressor.

With this appliance, which is illustrated herewith, it is possible to evenly contract the rings on a piston so that the same will easily slide into the cylinder.



Showing Adjustment.

It can be adjusted to take all sizes of pistons from 3½ to 6 inches in diameter and it is a very handy article for every mechanic's outfit, being especially useful to garages and repair shops. The device is made of spring brass, nicely nickeled,



Piston Ring Compressor.

and it retails for only $1.50. This article is manufactured by the S. B. R. Specialty Co., 17-19 Princeton street, East Orange, New Jersey.

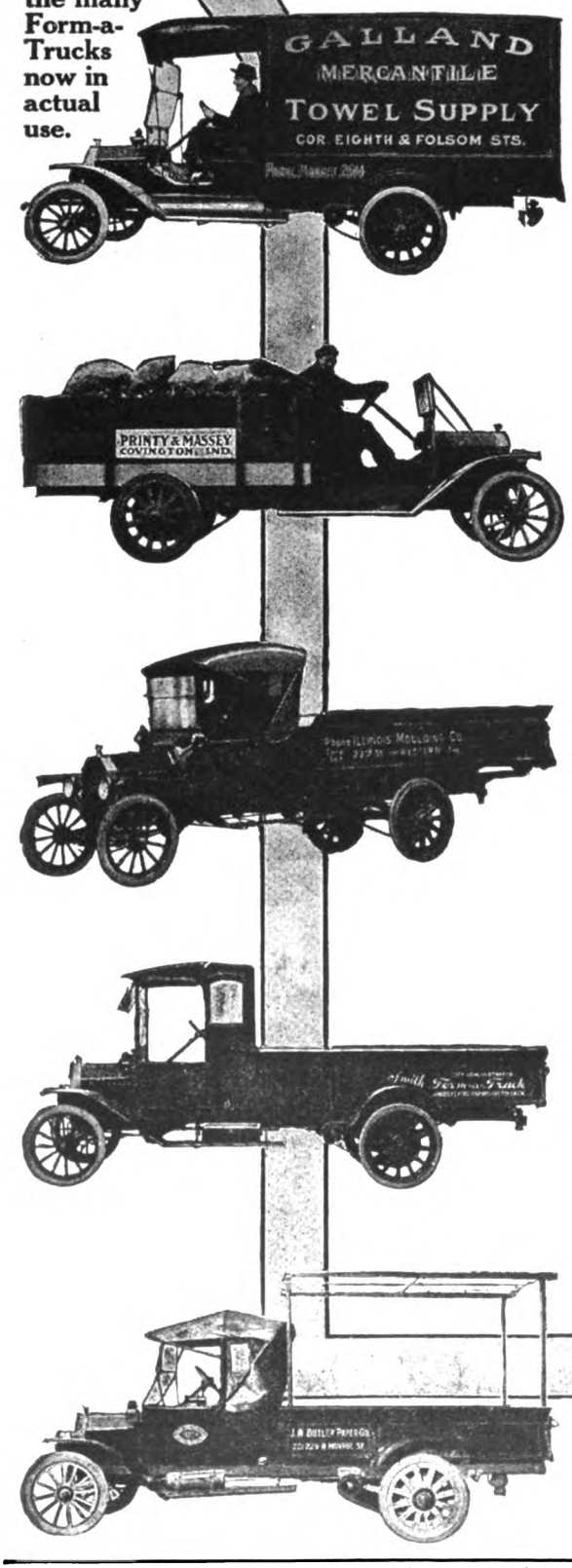
Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.
71-73 Murray Street, New York

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Announcement to DEALERS

A few of the many Form-a-Trucks now in actual use.



WHAT IS UNQUESTIONABLY THE biggest money making opportunity ever offered dealers is now within your easy reach and, if you act quickly, you can secure an exclusive contract for your territory with full protection.

THE SMITH FORM-A-TRUCK IS NOT AN experiment nor a makeshift. It is a time tried and proven proposition. Over $3,000,000 worth have already been sold. The truck is in daily use everywhere, and is selling like wildfire.

THINK OF THE MONEY YOU CAN MAKE as exclusive dealer for this sensational new invention. Just figure the big number of Ford owners in your territory—then think of the vast number of users for this attachment.

The *Smith Form-a-Truck* will convert an old or new Ford into the most economical and durable one-ton truck that can be made—and at half the price of any other one-ton truck. Highest quality materials used throughout. Think of it—real truck wheels, solid rear tires, chain drive, 125-inch wheelbase, 9-foot roomy body accommodation, special steel axle and springs, Timken roller bearings—and the wonderful Ford axle becomes the jack shaft without a single change—all for $350.

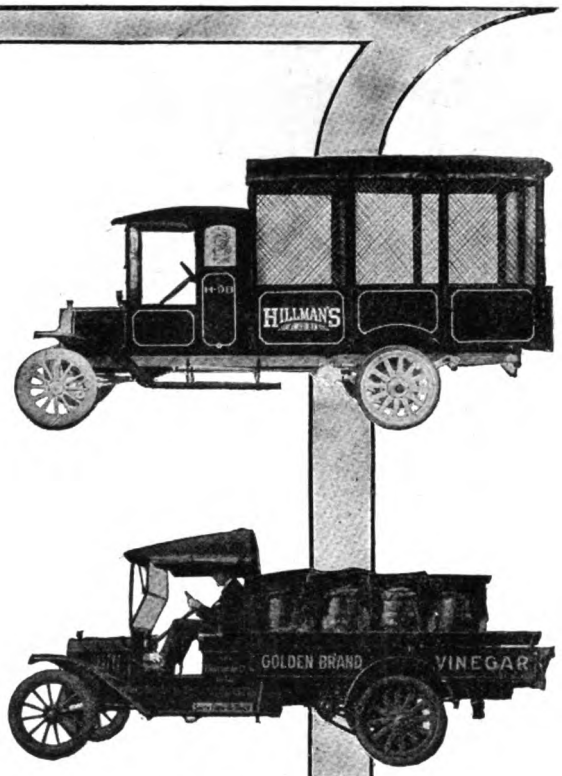
THERE IS NOTHING COMPLICATED about the attachment—it comes complete—no other parts required—and the selling price is only $350. It slips on to any Ford—new or old alike—without any bother or trouble. No skilled workmanship required—two men in a few hours can complete the job.

YOU MAKE BIG MONEY ON EACH attachment sold, more money on the sale of the wheels, tires and body equipment taken off the old car, an additional profit on the new truck body you sell and then you sell a new Ford—and you haven't any bothersome, money-losing trade-ins to contend with—can't beat that, can you?

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A Ford and $350 GIVES YOU A GUARANTEED ONE-TON TRUCK HAULS 1½ TONS

ONLY THE VERY BEST materials are used in the Smith Form-a-Truck, guaranteed One-Ton Truck. It is honestly built throughout and is so designed that 90% of the load comes on the rear axle. 10 to 15 miles per hour, under full load, easily attained at the lowest possible cost of upkeep and fuel. You drive it just like a Ford pleasure car—no change in the gear shift. The wonderful Ford engine and mechanism remains unchanged.



THIS COMPANY WILL BACK ITS DEALERS to the limit—big direct mailings to consumers—big advertising campaign in national magazines, newspapers and trade papers—and co-operative helps galore. All inquiries for your territory will be referred to you as exclusive agent. No matter how sold, you get your commission if sold in your territory.

WE HAVE MATERIAL FOR AND ARE building 50,000 jobs this year. Within two months our big, new modern acre-and-a-half factory will be completed—everything under one roof. Immediate deliveries are assured. Promptest service guaranteed.

DON'T DELAY ANOTHER DAY—NOT another minute—while you are hesitating some one else may apply for your territory. Wire, phone or write today. Use the coupon—simply sign and send by return mail—this does not obligate you—but you will get our Dealer's Plan in detail.

Wire, write or phone—do it *now*—

Smith Form-a-Truck Co.

ROOM 912, ADAMS EXPRESS BUILDING
CHICAGO 115 S. Dearborn St. ILLINOIS

LONG DISTANCE PHONE RANDOLPH 2561



Mail this *Now*
Do not delay

DEALER'S COUPON

Smith Form-a-Truck Co.,
912 Adams Express Bldg., Chicago

I am interested—without obligating me, kindly send me your exclusive dealer proposition.

Name.....

Address.....

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The Smith Form-a-Truck.

Until the day the Chicago national automobile show opened little was known of the Smith Form-a-Truck Company of Chicago, although the company had been in operation six months and was feverishly pushing its production. Two days after the show opened, dealers all over the United States were interested and sending in orders for the attachment, which, for $350, makes a guaranteed truck with a capacity of from one to one and a half tons, of a Ford car.

Despite the fact that no attempt had been made by the company to get national distribution prior to the Chicago show, the potential efficiency of the attachment had secured for the company quantity sales. There are now being sold 50 of these attachments each day. Plans have been made to increase this production to 300 attachments a day, which is equivalent to 70,000 a year.

Orders are now coming into the general offices of the company in the Adams Express Company building on Dearborn street, Chicago, at the rate of 50 to 100 daily. Dealers are being secured without trouble in all sections of the country. Branch offices have been established in New York, Atlanta and Chicago and on the Pacific Coast. Work on a new factory to cost $150,000 has been started. The factory will be built on property recently acquired at 63d street and 56th avenue, Chicago, Ill. The present home of the company was opened August 10, 1915, at 411 North Claremont avenue. This will not be abandoned until production has been started in the new factory at Clearing.

Since December of 1915 a large sales staff composed of men formerly identified with other automobile concerns has been organized. S. D. Porter, who for ten years was connected with the McCormick Harvesting & Machine Company, International Harvester and later supervisor for the United States Motor Company, and the Maxwell-Briscoe Company, was brought into the organization as general sales manager, and the services of Charles E. Stuart, former sales manager of the Michigan Buggy Company, were enlisted as assistant sales manager. Stanley H. Twist, well known in both local and national advertising circles, was made advertising manager. With this organization behind it, the truck has scored a sensational success. Representation has been secured by the company all over the United States. The Smith Form-a-Truck attachment makes a complete one-ton delivery truck when installed on a Ford chassis. The retail price is $350 f. o. b. Chicago. It forms practically the rear half of the motor truck. The frame is 14 feet in length and when attached to a Ford chassis, gives a body space of eight feet ten inches back of the gasoline tank. The method of attaching makes the Ford frame a sub-frame, and gives the combined frame far more strength and solidity than the original chassis of the car.

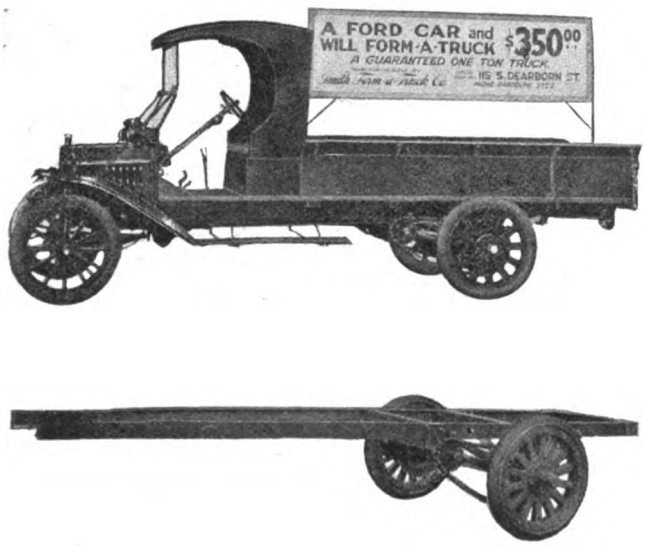
The Ford engine and transmission are the equal, if not superior, of any on the market to-day, but the frame and rear axle assembly are not intended for "dead weight" loads. The Smith Form-a-Truck takes advantage of all the Ford's good qualities and adds to them a truck attachment that will carry "dead weight" loads of one ton and over. The Form-a-Truck frame of 4-inch channel steel telescopes and reinforces the Ford frame. The two frames are bolted directly together at the front and at the side, and at the rear the Ford frame is riveted to a steel cross member on the Form-a-Truck frame, insuring great strength and rigidity. The new frame is supported in the rear by carefully designed springs resting on a solid 2x1⅝-inch axle, equipped with roller bearings and heavy truck wheels, with Firestone solid rubber tires. There is a heavy relief or bumper cross spring over the axle to take care of overloading.

The Form-a-Truck is so designed that practically 90 per cent. of the load is carried on the rear axle, and only about 10 per cent. is carried on the Ford front axle and wheels. The rear axle assembly of the Ford is converted into a jack shaft and rigidly attached to frame by especially designed hangers. The Ford wheels are replaced with heavy sprockets which transmit the power to the rear wheels by double side chains. Emergency brakes, ample to handle loads on heavy grades, are provided on the rear wheels. This combination produces a solidly built one-ton truck with the simplicity, dependability, and low maintenance cost of a Ford delivery car. Every piece of material entering into the construction of the Form-a-Truck is of the highest grade, and the parts are assembled by the best mechanics. The same careful attention to detail, mechanism and workmanship is exercised as in the construction of high-priced motor trucks. Smith Form-a-Trucks have been in service for two years. None has gone wrong, according to officials of the company. They cost no more to operate than a Ford touring car. They now are being used as stage coaches in the Western mountains, and heavy trucks as well as light delivery vans.

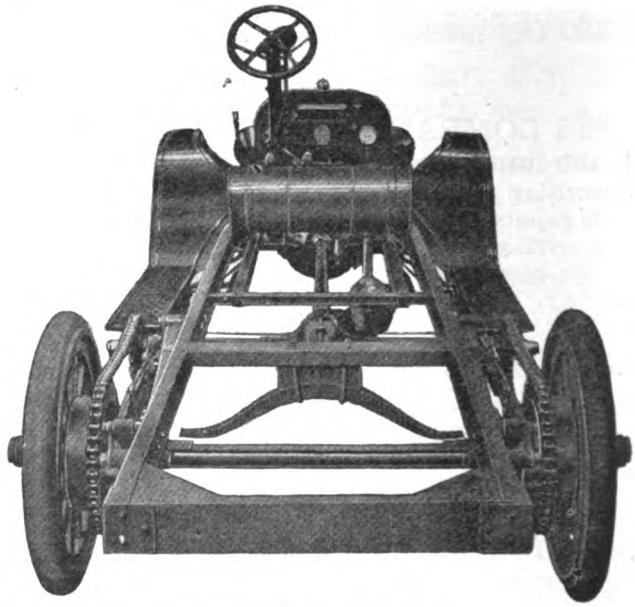
One great field of usefulness which makes the Form-a-Truck exceedingly popular with business men is its adaptability in converting used Ford cars into one-ton delivery trucks. Every owner of a Ford runabout or touring car, the body of which is beginning to show wear, and the purchase of a new car is contemplated, is now given the opportunity to convert it into a useful truck at the small outlay of $350. Specifications of the Smith Form-a-Truck attachment:

Carrying Capacity—2,000 pounds.

Frame—Length 168 inches, width 32 inches, 4-inch channel, rolled steel.



The Attachment.



Showing the Complete Chassis.

Axle—2x1⅝ inches. Roller bearings.

Springs—Semi-elliptical, 2 inches wide, 42 inches long, 10 leaves. Bumper cross spring.

Wheels—Heavy artillery type, twelve 2-inch spokes, 32x3½ inches.

Tires—Firestone solid rubber, 32x3½ inches, pressed on type.

Gear Ratio on Sprockets—20 teeth on jack shaft, 42 teeth on rear.

Drive—Baldwin chains, heavy roller type; ¾-inch diameter roller, ⅝-inch wide, 1¼-inch pitch.

Brake—Emergency on rear wheels, expanding type in drums operated by hand lever; 12-inch drum, 2½ inch shoe, fibre lined.

Loading Space—9 feet or more back of seat, depending upon body.

Wheel Base—When attached to Ford chassis, 125 inches.

Tread—56 inches, center to center of wheels.

Weight—Form-a-Truck attachment, 1,000 pounds; attached to Ford chassis complete, 2,000 pounds.

The company is working out details of its plan for a national advertising cam-

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paign which will be inaugurated in the near future.

Woodworth Treads and Overshoes.

The recent increase in the price of tires makes it more important than in the past to prolong the life of the tires to the greatest possible extent. Woodworth Treads and Overshoes made by the Leather Tire Goods Company, of Niagara Falls, N. Y., can be used over any make of tire and will not only prolong the life of the tires but will eliminate punctures and do away with the bother of chains for wet and muddy roads. Woodworth Treads have been on the market for many years and differ from all other tire covers on account of being held with coil spring fasteners which automatically adjust them on the tire. The overshoes are of comparatively new design and are held on the tires by fastening to the rim. Both the treads and overshoes are made from especially water-proofed leather studded on the middle portion with steel rivets. These tire covers can be used over old tires to retread them after they become worn thin on the middle or can be used over new tires in which case the tires being protected from all outside injury and road wear will last much longer than if run bare. The



overshoes have very little effect on the speed or resiliency of the tire.

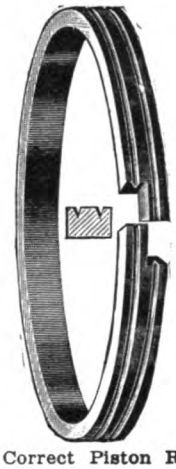
Automobile owners who are interested in protecting their tires should write to the Leather Tire Goods Company at Niagara Falls for full information in regard to these covers.

Twin Spring Shock Absorbers.

These are described as "supplementary" springs instantaneous in their action. The principle and result obtained is entirely different from the so-called shock absorbers, as these springs are free to act in every way in conjunction with the leaf spring. They not only leave the leaf springs free to perform the work for which they were designed, but they assist them to perform that work. These springs are especially made for Ford, Dodge, Overland, Maxwell, and in fact all cars, and good agents are wanted for these springs throughout the country. Write for agents' proposition and prices direct to the Twin Spring Company, 998 Boylston street, Boston, Mass.

Improved Piston Ring.

A few years ago when building water pumps for pumping water to the city reservoir a fabric packing was used to prevent water leaking past the piston. The improved water pump, such as is used to-day, has no fabric packing. A copper jacket is put in the cylinders, one or more grooves are cut around the piston. In operation the grooves soon fill with water, the volume of water in the grooves acts as a packing against the small particles of water, making a water packing against water. This principle is



A Correct Piston Ring.

embodied in a piston ring manufactured and sold by Automobile Accessories Company, 816 West North avenue, Baltimore, Md.

This ring is made in one piece, individually cast, concentric. It is cut step-lap with a groove running between the sliding face forming the lap and the side of the ring. In operation the grooves soon fill with oil; when once full they cannot take up more, therefore, the surplus oil is forced back into the crank-case. It is plain to be seen there will be a great saving in oil yet perfect lubrication. By saving the oil and keeping it out of the firing-chamber there will be little or no carbon. The spark-plugs and valves will keep clean, the gas cannot escape because the valves are clean and seat themselves perfectly, the oil in the grooves prevents the escaping of gas past the rings; therefore the motor will have maximum power all the time. Many of the large builders have adopted the rings after testing them out for a number of months, finding the principle to work satisfactorily, the results to be lasting and also finding it economy on account of the great saving in oil and gasoline. The cost of these rings is about the same as any well made rings of the plain type.

Valuable Graphite Products.

The above is the title of a booklet which has recently been brought out by the Joseph Dixon Crucible Company, of Jersey City, N. J., the well known graphite specialists, and it includes all the various lines of the Dixon greases for automobile and other uses, also Dixon's axle grease, pipe joint compound, belt dressing and leather preservative, Silica-Graphite paint, stove cement, graphite brushes for electrical use, and many other specialties. This booklet will be sent free on application.

New Electric Clutch.

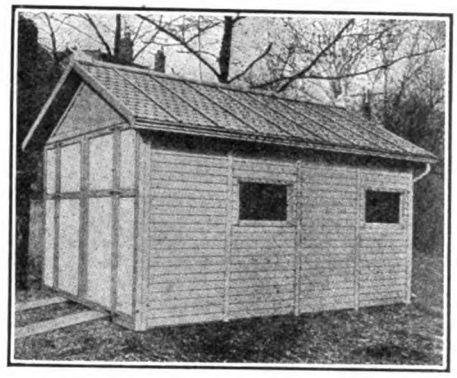
The Vesta Accumulator Co., Chicago, is bringing out a new electric clutch, which combines the functions of a generator, clutch and transmission, and starter. It has an unusual feature in that the commutator brushes are pressed directly against the commutator at high speeds, giving a positive mechanical connection for direct drive.

New Car Heater.

With the idea of providing for Ford cars a heater that will be moderate in price and at the same time efficient in operation, the Home Light Co., 3,353 Milwaukee avenue, Chicago, Ill., is introducing the Bridges heater, listing at $2.50. The heater takes the exhaust from the motor and is attached to a new floor board for the car.

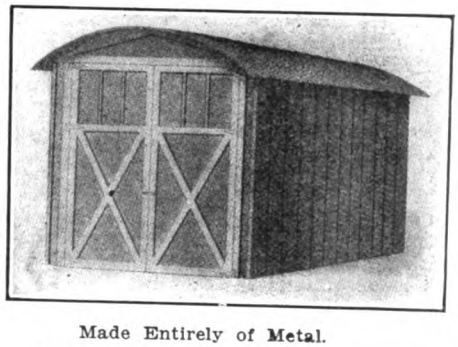
A Line of Garages.

The Moeschl-Edwards Corrugating Co., of Covington, Ky., are making a line of portable and other garages to suit all or any needs. Illustrations of two models are shown herewith. Stock garages are not as ornamental as their special designs. They are, however, made from the same material and in standard sizes. All parts being standard, they are able to make them up in large quantities and



Plain but Neat.

make shipment the same day on which they receive the order. The portable garages are made in sections and can be erected very quickly by anyone who can read simple instructions and understand plain drawings. The portable garage can be erected in four to five hours, where it takes twelve to fifteen to erect the standard. The standard is intended as a permanent building, while the portable can be easily taken down and



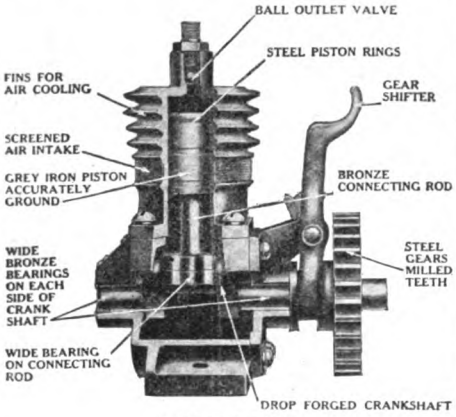
Made Entirely of Metal.

moved. The exterior covering of all their garages is made of heavy galvanized metal pressed into ornamental shapes and is attached to either structural steel or wood frames. Buildings covered with sheet metal comply with the building codes everywhere and take same rate of insurance as concrete, brick and stone. For full information and prices address the firm as given above.

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A New Tire Pump.

The addition of a single cylinder model to their line of tire pumps is announced by Manzel Brothers Company, Babcock street, Buffalo, N. Y. This new model, like all other pumps built by this company, is all metal. The cylinder, crank case and piston are made of fine gray iron, connecting rod and crank shaft bearings are bronze and steel piston-rings are used. The crank shaft is a drop-forging. The cylinder has a bore of 1¾" and the piston a stroke of 1½". The air intake and outlet on this model are on the same principle as on their well known two-cylinder pump. The air is taken into the cylinder when the piston is at its lowest point through holes in the side wall. These holes allow just sufficient air into the cylinder and are automatically closed by the piston the moment it begins its upward stroke. This gives the greatest possible efficiency, as all of the air must go out through the outlet valve. Particular attention is called to the wide bearings on the connecting rod and also on each side of the crank shaft. The pump is furnished with complete fittings ready for immediate installation to the various cars. These fittings are designed so that the pump can be installed without doing machine work of any kind, removing the radiator or altering the car.



Sectional View.

The pump is sold for $12 with fittings for all cars excepting the Buick, Overland, Dodge and Chevrolet. These models are sold for $10.

The Badger Steam Vulcanizers.

These very practical vulcanizers are manufactured by the Tire Repair Equipment Co., 740 Johnson St., Appleton, Wisc. They have just made an important announcement to the trade which states that on and after January 15th, they will distribute their vulcanizing equipment on the time payment plan to all garage men and buyers who desire to purchase on these terms. This is a new departure in the sale of vulcanizers and it ought to attract, as it doubtless will, a large volume of business.

Perfection Multiple Piston Rings.

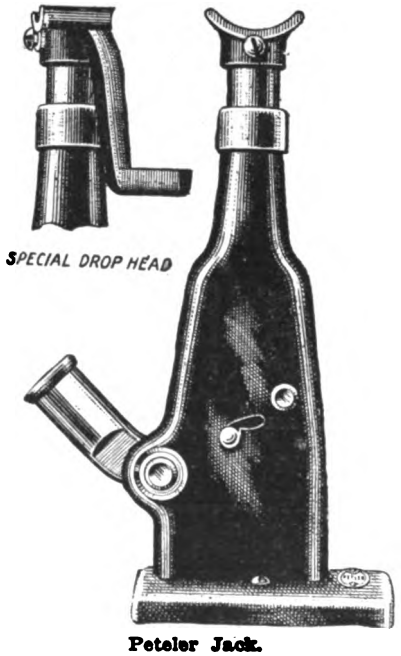
This represents a new type of piston ring, and it is claimed that they will save power and money for the car owner. These rings are made of 1-16" sections of special soft elastic steel. The openings in the various sections come at different points, causing the ring to always present a barrier to the escape of gas from the firing chamber. The equal spring tension at all points gives a perfect bearing on the cylinder walls. These rings are easily applied. They cannot be broken in putting on. They cause less friction, save power, reduce carbon and keep down gasoline repair bills. Good agents are wanted throughout the country. Write for prices and discounts to the Automobile Construction & Engineering Co., 45 North 7th Street, Philadelphia, Pa.

Process for Filling Scored Cylinders.

The Wilkes-Barre Welding Company, No. 6 West Ross Street, Wilkes-Barre, Pa., have a very successful process for filling scores in cylinders caused by loose wrist pins. They use a hard material composed largely of nickel and smoothed down to the face of the cylinder. The composition used has unusual heat resisting qualities and it is hard when applied. It forces its way into the pores of the iron, amalgamating with it and becomes a part of the cylinder and can never work out under any circumstances. This process is absolutely guaranteed and the work is turned out the day after it is received. The charge for doing this work is nominal and the same company also does oxy-acetylene welding on all kinds of automobile parts.

The Peteler Jack.

Illustrated herewith is a new automobile jack which has been placed on the market by Moreau & Pratt, Inc., 1834 Broadway, New York City. In this jack the power is transmitted from the handle directly to the lifting bar of the jack, thus avoiding a multiplicity of parts. The pawls are of hardened steel and the wear on the step is distributed as the lifting bar turns freely. When a jack is removed from under the car after the tire has been inflated the lifting bar is usually too high for use next time a blowout is experienced, because the flat tire reduces the distance between the axle and the ground. For this reason it is usually necessary to lower the lifting bar considerably the next time the jack is used, and in the average jack this necessitates working the handle up and down until the desired height is reached. A feature of the Peteler jack is that the lifting bar automatically drops to its lowest position the minute the weight of the car is removed from the jack. An automatic drop bar makes it so that the pressing of a button on the side of the jack gives instant reverse.

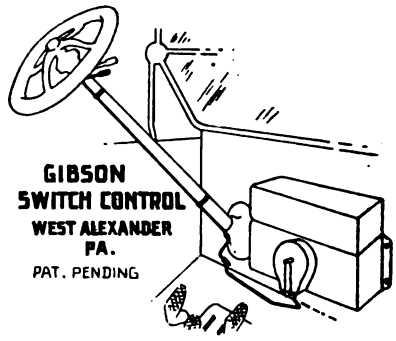


Peteler Jack.

The list price of the jack is $3.50 and a special head or low hung step for cars with low hung axles may be obtained for 50 cents additional. Pressed and hardened steel is used, no cast iron entering into the manufacture of the jack, and no screws or cotter pins are used in the working parts. The jack is finished in baked black enamel and nickel. It has attracted considerable immediate trade attention.

Gibson Switch Control.

This is a new device especially for Ford cars. It is especially designed to render the steering of the Ford car easier, also more positive and convenient, and it has been welcomed alike by expert and beginner. It bridges the gap between the driver and his motor by a touch of the finger, and enables the driver to throw the switch to any position instantly without removing his hand from the wheel or his eyes from the road. It is claimed that this device will save its cost in brake lining and gasoline in a short time. It only weighs 14 ounces, can be easily and quickly attached, and it is inconspicuous and entirely out of the way. This device is for sale by all dealers, or will be delivered by parcel post anywhere in the United States on receipt of the retail price, which is $2. The manufacturers also offer money back if the car owner is not entirely satisfied. Liberal discounts are offered to the trade. This specialty is manufactured by the Gibson Control Company, West Alexander, Pa., and they will be glad to mail full particulars to any of our readers.



Remarkable Performance of the Simms Generator.

The following telegram, which is self explanatory, was received January 14 by the Simms Magneto Co., of East Orange, N. J.:

"Simms Magneto Company,
"East Orange, N. J.

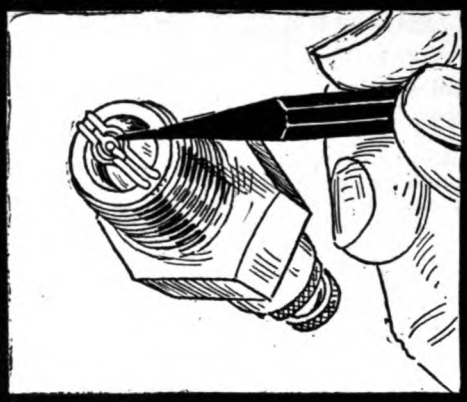
"Stock 1916 Maxwell "25" touring car running under A A A sanction completed total mileage of 22,022.3 miles over the road on the morning of January 5th. The Simms Magneto and Simms Generator performed perfectly throughout entire distance and were in perfect condition at completion of test. Car was stopped voluntarily by us. Was started within 50 seconds after stopped and starter worked perfectly. Car has been run 2,000 miles since the 5th without touching magneto, generator, starter or any other part of machine.

"LORD MOTOR CAR COMPANY."

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Mosler VESUVIUS Plug

INSIST UPON THE CIRCULAR KNIFE-EDGE ELECTRODES

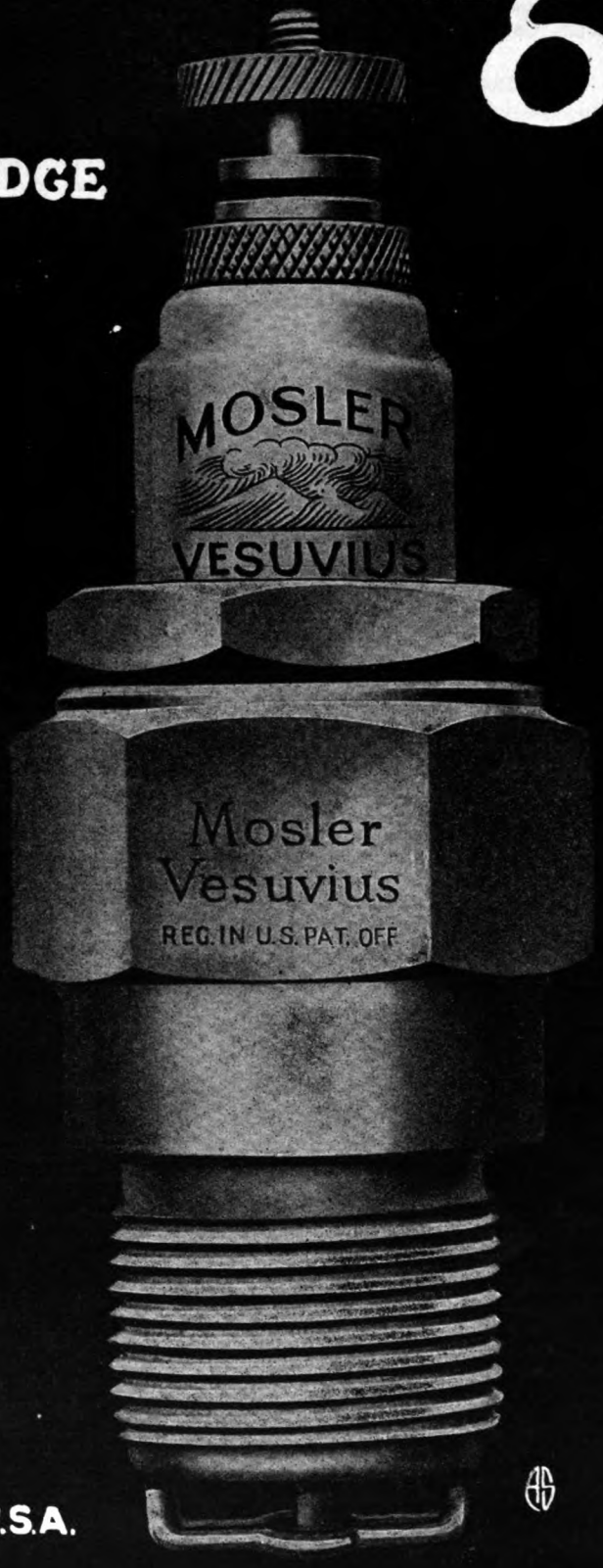


"BEWARE OF IMITATIONS"

Take a MOSLER VESUVIUS PLUG—
look at it the same way as in the picture.
Note the continuous, knife-edge electrodes
which give a "ribbon of flame," exploding
all the gas and developing all the power
of the motor.
The wire in a VESUVIUS PLUG is adjustable
and once the gap is set it will not change;
it is anchored at both ends and
no expansion can effect it.
Quality makes it

"THE INDESTRUCTIBLE PLUG"

Guaranteed to Outlast the Motor.
$1.00 Each in Round Metal Box.



DISTRIBUTION EVERYWHERE

A. R. MOSLER & CO. NEW YORK, U.S.A.

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The Improved Humidifier.

This is a new device for increasing the efficiency of the motor on any automobile. It automatically supplies moisture to the carburetor, and it is claimed that this makes the pressure in the cylinders, following the explosions, more elastic by lengthening the period of greatest effectiveness. The manufacturers claim this device will save 10 to 40 per cent. of gasoline, increase the power of speed and the first cost of the invention is the only cost as it is durable and entirely automatic, and can be easily attached to any make of automobile. This attachment is manufactured by the Improved Humidifier Co., 612 Michigan Ave., Pueblo, Colo.

Reflex Spark Plugs.

Dealers will be especially interested in the new selling plan for Reflex Spark Plugs, which has been adopted by the Reflex Ignition Co., 1711 Payne Avenue, Cleveland, Ohio. These plugs are good sellers on account of their high quality. They are fully guaranteed against defects in material or workmanship. Any plug that proves defective will be repaired or replaced free of charge with money back if the car owner is not entirely satisfied. A sample Reflex plug will be sent free to any dealer who will take the trouble to write for it, stating on his letterhead the size thread required. Free display cabinets will also be furnished to dealers handling these plugs, and circulars, signs, and other sales helps are also included in the selling plan. We advise correspondence without delay, as open territory is going fast, and readers who are interested should write, or wire manufacturers at once.

The Kimball Steel Protector.

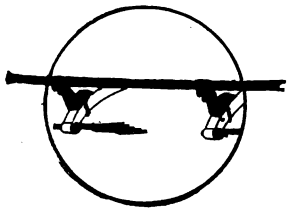
This is a device for the protection of tires, which not only lengthens the life of the tires, but, it is claimed, makes blowouts, punctures and rim cuts impossible and the tires are as flexible as ever. The same company also manufactures a mud chain which can be put on in a jiffy with one hand while standing on the run board. If you get into a mud hole this will get you out of the scrape in no time. It is only necessary to hook the ends of the chain together and pull the lever, and they are on tight. This chain is also good as an emergency repair for blowouts. Both these specialties are manufactured by the Kimball Tire Case Co., 174 Broadway, Council Bluffs, Iowa.

A Good Auto Top Roof Cover.

A good roof cover, at the very low price of $5.95 for a roadster and $7.95 for a touring car, is offered by the Split Hickory Wheel & Top Co., 1196 Sycamore Street, Cincinnati, Ohio. This roof cover will be sent parcel post paid at the price named, and the same company manufactures other covers up to $14. These covers are easy to adjust and will save two-thirds of the price on a new top. The same company also sells a line of Ford front springs $2.30, rear $6.50. They also build new auto tops and wheels, and repair old ones, and they have a free catalog which they would be glad to send to any who are interested. They also want good agents and dealers throughout the United States.

The Hartford Bumper.

This Bumper bolts on without drilling. Once on, it's as firm as Gibraltar and your car's lamps, mudguards and radiator are rendered immune from damage from bump or collision. It is a real shock-absorbing bumper. Two frictionally operating spring steel arms absorb the bump and jar of any impact. This takes all strain off the car itself. Special



Low Cost But High Quality.

Ford type $10. Large size for cars of 3,000 pounds or over, $15. Medium size for cars from 1,500 to 3,000 pounds, $12.50. Small size for cars up to 1,500 pounds, $10. Bross, nickel or black enamel bar supplied without extra charge. This device is made by the Hartford Suspension Co., 141 Morgan St., Jersey City, N. J.

New Welding Equipment Catalog.

We have just received their latest catalog on oxy-acetylene welding equipment from the Imperial Brass Manufacturing Co., 520 So. Racine Ave., Chicago, Ill. This catalog gives prices and full particulars on all articles in this line which are manufactured by the Imperial Company and contains a fund of valuable information for anyone who is using welding equipment or contemplates installing equipment of this character. This interesting illustrated catalog will be sent free of charge to anyone who will take the trouble to write for it.

Spindle Arm Silencer for Ford Cars.

This is a device which absolutely stops the rattle in the spindle arm of a Ford car and it is claimed that it will also stop the wear. It helps in steering the car. There are no nuts or bolts to take out. The attachment is put in from the front side with nippers and once there it will stay. The illustration will give an excellent idea as to the appearance



of this device. It is manufactured by J. W. Sanborn Mfg. Co., Hampstead, N. H., and will be sent to any one postpaid on receipt of the price, 50 cents per pair.

Cut Your Own Washers.

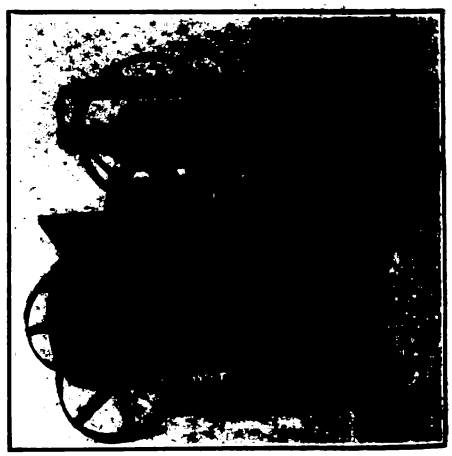
Every automobile repairman has occasion to use a great many felt washers, and to fill a long felt want in this respect the Advance Felt Specialty & Cutting Co., 159 W. Harrison St., Chicago, Ill., have brought out a machine with which any repairman can cut out his own washers instead of buying them from the supply house. With this machine you can select the goods desired from your own stock, and cut the size washer you want for any car in a minute, at the maximum cost of a few cents, and the advantages of such a machine is too obvious to need comment. The same company is also prepared to furnish felt washers of every description for the trade, and they invite your correspondence and orders not only on their line of washers but also on the very handy machine referred to before.

New Norma Precision Bearings.

We have received from the Norma Company of America their new booklet entitled "Norma" Precision Bearings. This is a work that is helpful to engineers and of some permanent text book value aside from the listing of the regular Norma Bearings which it contains, and anyone who is not informed on antifriction principles may get his facts from the first eighteen pages of this booklet. Following the text matter comes sixty pages of tabulated data, revealing the exceptional scope and completeness of the Norma line. This booklet, or catalog, will be mailed free of charge to any dealer, garage man or engineer who will take the trouble to write for it to The Norma Company of America, 1790 Broadway, New York City.

U. S. Two-Stage Air Compressors.

The accompanying cut gives a fair idea of the appearance of the U. S. Two-Stage



A Guaranteed Air Compressor.

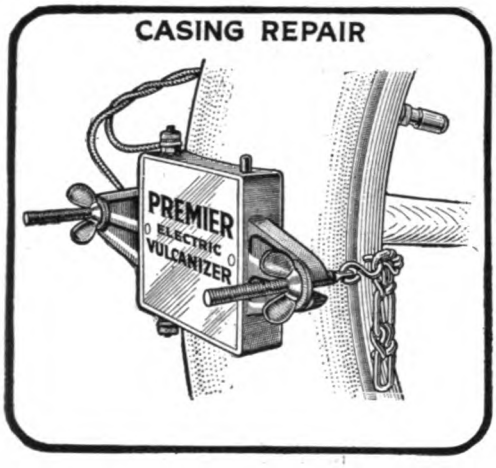
Air Compressor, which is made by the United States Air Compressor Co., 6534 Carnegie Avenue, Cleveland, Ohio. The manufacturers state that this air compressor starts quickly without strain and runs smoothly and quietly. The load is divided between high and low pressure cylinders, and there is practically no wear-out or repair expense. This machine is put out to garages on 30 days' trial and it is sold with an unlimited guarantee and on terms to suit the convenience of the purchaser. Many of our readers will doubtless find it profitable to investigate.

Battery Improvement.

In the endeavor to prevent buckling of the plates of its storage batteries, the Vesta Accumulator Co., Chicago, Ill., now makes use of celluloid clamps attached to the edges of the plates to hold them securely in position. These "Isolators" were first disclosed at the Chicago show, where the new Vesta storage batteries were exhibited. They are made of heavy celluloid and are said to in no way cut down the capacity of the battery.

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Press the button and forget it.



Vulcanizing Made Easy

The **"Premier"** vulcanizer operates under all weather conditions. No gasoline to measure or open flame to blow out in the wind. With the **"Premier"** you simply make preparations for the repair, stick on the vulcanizer and press the button. This requires about three to five minutes and no further attention is necessary, for when the repair is vulcanized the button is automatically released, which cuts off the current and the vulcanizer then cools off. The **"Premier"** is furnished to operate off any voltage storage battery or 110 volt lighting circuit. Price $3.50 for the complete outfit. **Ask your dealer** for this **real** vulcanizer.

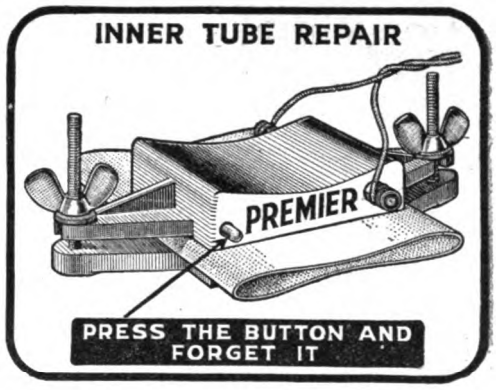
PREMIER AUTOMATIC ELECTRIC VULCANIZER

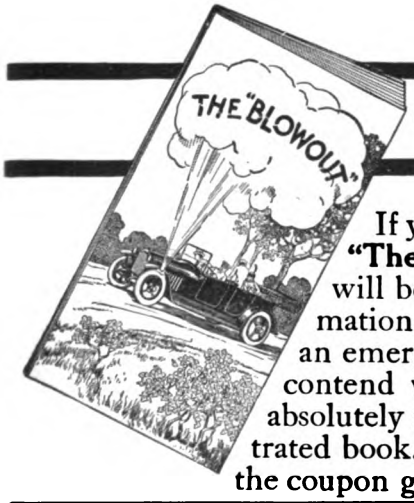
$3.50

No watching is necessary as the fire and explosion danger is eliminated. The **"Premier"** vulcanizer cannot burn your repair, garage or automobile. It uses no dangerous fuel which prevents safe use in the home or garage. Just a quick, convenient, economical, clean process of vucanizing.

DEALERS:

Sell your customer a vulcanizer that is safe in every way. Remember that if you don't handle the *"Premier"* you have got to *compete* with it.





GET THIS BOOK—FREE

If you are a motorist do not fail to read **"The Blow-Out."** This interesting story will be appreciated for the valuable information which it contains. The blow-out is an emergency which every motorist has to contend with. Don't guess, get the facts absolutely free by reading this up-to-date illustrated book. Simply drop us a postal or send the coupon giving your dealer's name.

PREMIER ELECTRIC CO.,
4038 Ravenswood Ave., Chicago, Ill.

Without obligation on my part send me your new book **"The Blow-Out."**

Name.....

Address.....

Dealer's Name.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Automobile Trade Names.

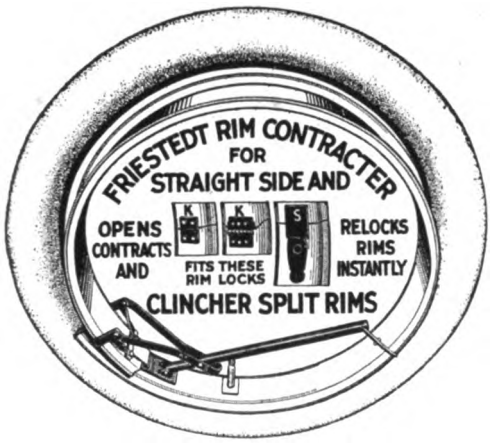
The Trade Circular Addressing Co., 166 West Adams Street, Chicago, Ill., is in a position to furnish to the trade names of automobile dealers, garages, repair shops, supply dealers, tire dealers, Ford dealers, Ford owners, and almost anything required in this line at reasonable prices. This company has been in the mailing list and letter business for 32 years and operates a large plant employing over 300 people. They are also prepared, if it is required, to do addressing, mailing, printing, furnishing envelopes, and in fact everything in connection with mail work in this trade.

The Mosler Vesuvius Plug.

One of the great advantages of this spark plug is found in the fact that it is has circular knife-edge electrodes, which give a "ribbon of flame," exploding all the gas and developing all the power of the motor. The wire in the Vesuvius Plug is adjustable, and once the gap is set it will not change, as it is anchored at both ends and no expansion can affect it. The manufacturers call this the indestructible plug and they claim it will outlast the motor. This plug is manufactured by A. R. Mosler & Co., New York City.

The Friestedt Rim Contractor.

This is an excellent tool for straight side and clincher split rims. It opens,



contracts and relocks instantly, and the cut will give readers an excellent idea of how this tool is used. The Friestedt Contractor fits Baker, Kelsey and Stanweld split demountable rims. This is a specific tool and not a makeshift to operate all rims. It will do in a second what it would take a longer time for you to do under ordinary circumstances. This article is placed on the market with an unusually strong and unequivocal guarantee. Readers are urged to write for complete information and prices to the Friestedt Rim Contractor Co., of 2931 W. Lake St., Chicago.

Evèrready Company Announces a Ford Starter.

A new electric starting and lighting system for Ford cars has just been announced by the American Ever Ready Works of Long Island City, makers of the Everready Non-Sulphating Storage Battery, also Everready Flashlights, Dry Cells and other products well known in the motoring world. Mechanically the new starter is based on the principle that a starting system should be located on the center line of the car where it cannot exert a side-pull on the crank shaft or develop any other strain which the Ford car was not designed to withstand. The only possible position in which a center hung starter of this kind can be placed is in front of the radiator directly on the end of the crank shaft, and it is there that the Everready Starter is located.

This position is regarded as of fundamental importance by the Everready Engineers. It not only prevents side strains on the crank shaft, but it does not disturb the three point suspension of the car, which is one of the important points in Ford construction. This balance is carried even to the storage battery, which is made in a flat shape and placed against the front seat, instead of being on the running board or on one side of the car. The position of the Everready Battery not only preserves the three-point balance of the car, but protects the battery from shocks and the low temperature of winter months. It is also claimed that because the Everready Starter is in front of the motor it eliminates considerable vibration in the same way that the second flywheel found in the front of the motor in one of the best known English cars gives that car the smooth riding qualities for which it is famous.

Another point in which the new starter differs from the usual design is that it runs at engine speed instead of turning at a two or three to one ratio. Tests have shown that instead of dragging on the motor and giving the car less power, the new starter makes it get away more quickly, adds to its power on hills, and makes it possible to throttle down to three miles an hour on high. Driving direct on the crank shaft through a flexible coupling, there are no chains to get noisy or break.

The entire system is enclosed in a small black enamelled case and can be attached in about an hour by any garage man without removing any parts. With it is supplied the well-known Everready Non-Sulphating Storage Battery—absolutely guaranteed against sulphating, perhaps the commonest of battery troubles.

Motor Trucks on Farms.

It is estimated that motor trucks are now being used by over 4,000 American farmers. This is about four per cent. of the total number of trucks sold in the United States. These vehicles nearly all have been bought within the last two or three years, indicating a swiftly proved economic success, a supposition strengthened by a careful canvass recently made by the Kissel Motor Car Co.

New Wheel Puller for Fords.

The quantity of Ford cars on the road has brought into existence a few special wrenches and tools that are fast becoming standard. The wheels on automobiles have a way of sticking fast to the axle on many occasions and when fast work is desired a wheel puller is an absolute necessity. Mossberg "No. 660" wheel puller overcomes several objections to the first designs of this device. It screws on to the hub threads with the very wrench that removes the hub cap and hub nut, and then a "grip clamp" is provided so that however hard the pull, the threads on the wheel hub cannot be stripped. An ordinary wrench applied to the square head shaft of the puller thrusts this shaft directly against the end of the axle. Sometimes the wheel gives gracefully, but in many cases, it is impossible to start it and the "660" is so made that a few taps of a hammer brings the most obstinate wheel on a Ford car. This hammering cannot harm the hub or puller itself because the shaft bolt is free running in the puller head,



Mossberg, No. 660, Wheel Puller for Ford Cars.

being retained by a square nut inside. Mossberg lists this at 56 cents and announces a new catalog of tools free upon request. Address Frank Mossberg Co., Attleboro, Mass.

Rhoades Ignition System.

The New York Coil Company, 338 Pearl Street, New York, now supply with their New Rhoades Ignition System the non-vibrating transformer coil with a back board of such size that it fits perfectly the space formerly occupied by the four-cylinder regular Ford coil box. Holes are drilled in the box which exactly register with those already in the dash, so that it is unnecessary to bore new holes to install the system. This is even true of the holes already through the dash, through which the necessary wires are run, reducing the labor of installation to a minimum. The new system is also supplied with a metal tube with proper

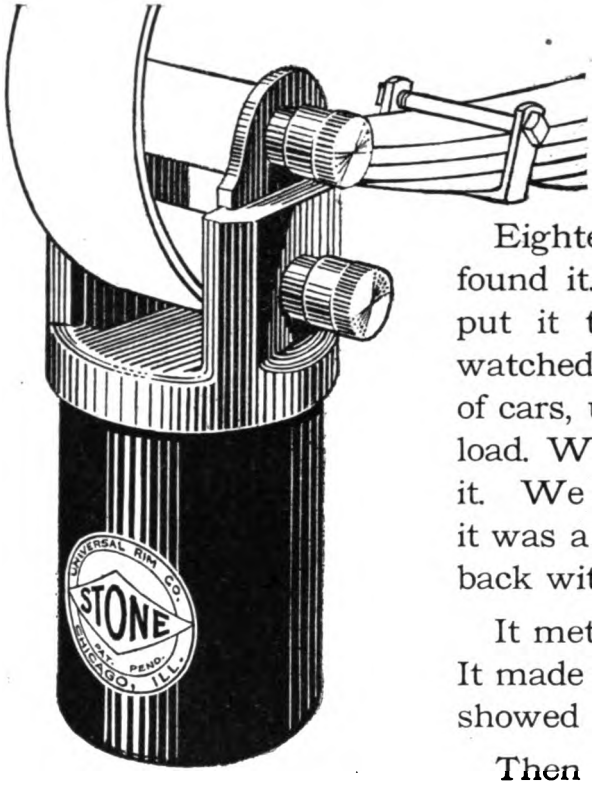


fastenings for supporting the wires in a workmanlike manner. All wires and cables are supplied, which are of an unusually high grade construction, equipped with terminals, and connected to the system so that the owner has simply to snap the terminals on the spark plugs. This also avoids the possibility of improper connections. The price of the system complete, including sparker, coil with kick switch, elevating gear bracket, and, in fact, every necessity, is $20, fully guaranteed.

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Stone Shock Absorbers

The Story of the Stone



WE SAW ROOM for a superior shock absorber—one which would prove as supreme in its field as our Baker Rim has proved among rims.

Eighteen months ago we believed that we had found it. But we wanted to make sure. So we put it to the test. For a year and a half we watched its performance. We tried it on all kinds of cars, under every possible condition of road and load. We had many others try it. We did not spare it. We wanted to know beyond any doubt that it was a shock absorber which we could afford to back with our reputation—and our money.

It met our demands—exceeded our expectations. It made riding virtually a new sensation. And it showed a surprising strength and endurance.

Then we set to work to find out how little we could make it for.

Quality

$10.00

Price

We found that we could produce it, using the best materials, skimping nothing, and sell it to car owners for $10, leaving a good profit for dealers.

A Sensational Seller

This Shock Absorber at this price is proving a sensational seller already. We are going to advertise it heavily. Men in your territory will be looking for it. Don't let other dealers get this business away from you. Act quickly. Be ready first. Write to your jobber today for prices, terms and descriptive matter. If he cannot supply you, write us. Address Dept. 12.

Made and Guaranteed by

UNIVERSAL RIM COMPANY

Makers of the Baker Rim

Dept. 12. 1502 Michigan Avenue, Chicago

(4)

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Premier Motor Car Company in New Hands.

A syndicate with a cash capital of $2,500,000 has purchased the assets of the Premier Motor Car Company, of Indianapolis. They have acquired the large and modern Laycock plant in Indianapois, where cars will be manufactured on a large scale, and it is said that the capacity of the new plant, when fully equipped, will be at least 10,000 cars a year. The syndicate which has made the purchase is composed of bankers and manufacturers from Detroit, Mich., Joliet, Ill., and Indianapolis, Ind. The men behind the enterprise are J. C. Flowers of the Gerlach-Barklow Company, Joliet; E. W. Steinhardt, a prominent automobile merchant of Indianapolis; C. F. Jensen, president of the Vanguard Manufacturing Company, Detroit; F. W. Woodruff, vice-president of the First National Bank and the Woodruff Trust Company, Joliet; George Woodruff, President of the First National Bank of Joliet and President of the Illinois Bankers' Association, Joliet; T. R. Gerlach, Vice-President of the Gerlach-Barklow Company, Joliet. Officers of the new Premier Company have been announced as follows: President, J. C. Flowers; Vice-President, E. W. Steinhardt; Secretary, C. F. Jensen; Treasurer, F. W. Woodruff; Directors, T. R. Gerlach, George Woodruff and H. F. Thompson. The Premier cars are already favorably known to the trade and the public, and under its new management this company will undoubtedly enjoy an increased prosperity.

So-Luminum.

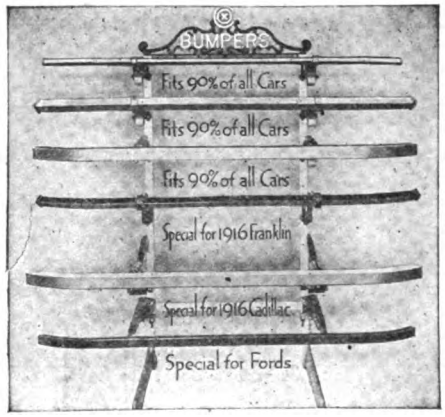
This is the name of a remarkable aluminum solder which is manufactured by the So-Luminum Manufacturing & Engineering Co., 1790 Broadway, New York City. When bits of aluminum are lost from aluminum parts, in a very few minutes the missing portions may be built in to crank-cases, manifold pipes,



etc., with So-Luminum. The accompanying cut shows a photograph of a crank case before and after using. In repairs of this character, if given the hammer test, it will be found that the new part built up with So-Luminum has twice the strength of the old portion and is much harder. This solder is used by the United States army and navy, Vickars, Ltd., of England, the Davis-Bournanville Welding Company and many other large manufacturing and welding concerns. So-Luminum runs at very low temperature, requires no flux, is non-oxidizing, and the only thing required in connection with it is a gasoline torch or gas blower. A lug can be built on a manifold pipe, or other parts, in anywhere from ten to twenty minutes. This product is not a soldering iron proposition, as the solder is too hard and strong to make the soldering iron feasible, and yet it runs at very low temperature and tins very easily. It is claimed that this method of repairing takes the place of welding and the work can be performed in one-fourth the time. Full particulars and prices will be furnished by the So-Luminum Manufacturing and Engineering Co.

To Display Bumpers.

The Cox Brass Mfg. Co. of Albany, N. Y., is offering to the trade, as a dealer help, a very good looking bumper display stand, carrying six bumpers.



Bumper Stand.

The stand is included with an order for six bumpers which comprise the standard round, diamond and channel rail type with the E-Z Clamp On which has long been a feature of the Cox product, a special bumper made for the 1916 Cadillac, special for the 1916 Franklin and the Ford. The stand is well balanced, with aluminum finish, the Cox insignia and the word "Bumpers" nickel plated at the top. The height of the device is 5 ft., depth 2 ft. 2 in., length 5 ft. 4 in. It has proven an excellent display for the dealer who goes after the bumper trade.

Trade in Your Old Typewriter.

A very interesting offer is made in our advertising columns by the Fox Typewriter Co., 6602 Front Avenue, Grand Rapids, Mich. If you will send this company the name, model and serial number of your old typewriter they will at once mail you their new catalog and make you a liberal exchange offer on the new Fox model No. 24 on either a cash or time payment plan. This company states that their prices are the lowest ever made on high-grade typewriters, and also that they have a new model, new price, and a wholly new policy under a new management. This is something that may be worth looking up by every business man.

Conover Cowl Dash and Windshield for Ford Cars.

This device is made not only for Ford pleasure cars, 1916 model, but also for Ford delivery cars, and it can be quickly and easily fitted on any Ford model, new or old. It gives an up-to-date appearance to the car and it is also a great convenience for the driver. This shield is of the rain-vision, ventilating type, and made for long service, of the best plate glass. The Cowl is heavy steel stamping, finely finished. This device is manufactured by the Page Woven Wire Fence Company, Windshield Department, Adrian, Mich., who will be glad to give full particulars not only on this article, but on their large line of other specialties.

Large Profits in Tire Repairing.

Many garages and repair shops make considerable extra money by repairing automobile tires, and a complete equipment for this work may be obtained from the Auto-Tire Vulcanizing Co., 140 Powell Street, Lowell, Mass. Special attention is called to their new No. 8 Adjustable Sectional Vulcanizer, which is a most efficient machine, superior in construction and economical in operation. Complete and thorough work can be accomplished with this vulcanizer at all times, and our readers will find it profitable to investigate.

Service Station for Atwater Kent and K-W.

Car owners who have the Atwater Kent or the K-W ignition on their cars will be interested to learn that E. J. Edmond Co., 1783 Broadway, New York City, who are the New York distributors for both these systems, have a very complete service station at the address named, where they will be pleased to supply old and new customers.

New Carburetor.

L. V. Flechter & Co., 245 West 55th Street, New York City, market the Flechter carburetor, which is claimed to embody the simplest means of varying the air supply to compensate for the increased suction at the fuel nozzle with higher speeds. A fixed nozzle or spray is employed. The only adjustment necessary is to the air supply. The Flechter carburetor is made in single and double jet types, for use according to the type of motor. The carburetor is supplied with an adjustment for air at low speed and another for high speed, in excess of 600 r.p.m. All models are provided with a hot air horn fitted with a strangling device to facilitate starting.

Braender Tires in Philadelphia.

Braender Rubber & Tire Co. now has a branch in Philadelphia. The Braender Rubber & Tire Co., with headquarters at Rutherford, N. J., have just opened a new branch in Philadelphia at 1327 Race St. This branch office will be in charge of W. L. Porter, and will carry a complete stock in standard sizes of Braender tires —Bull Dog non-skid and plain—also tubes. Mr. Porter was formerly manager of the Mutual Tire & Rubber Co., who were the Philadelphia agents for Braender tires and tubes.

Multibestos by the Foot.

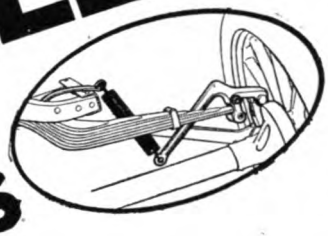
The Standard Woven Fabric Co., Framingham, Mass., is again offering its Multibestos brake lining, measured off by white lines, into foot lengths, a great convenience in the sale of this popular product. This company also puts out a special Multibestos cabinet for its dealers, separate compartments being provided for all the standard widths of the product. The Multibestos rolls are slipped into the compartments, where each roll revolves on its own axis.

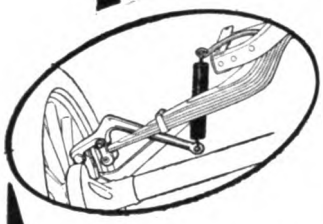
Subscribe to the "Automobile Dealer and Repairer," $1.00 Per Year.

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Now Begins a Great Campaign Advertising

AITCHANDEE SHOCK ABSORBERS





Every one of our dealers will be benefited

You Can Share in the Profits

With the first of the year began our big national drive to introduce Aitchandee Shock Absorbers to all Ford owners. It is creating a sensation. Of course many already knew of our invention under the name of H. & D. Shock Absorbers. That is what we called them during the first year, which we set aside for tests. Over 5000 test sets in every state in the Union have proved the many excellencies of our new application of the cantilever principle. No need to prove the mechanical superiority.

Now comes the 1916 model, which we have christened Aitchandee. It has several improvements. It is destined to be a leader. We know it because of the rapidity of sales before a bit of advertising was done.

Money will not be spared in making Aitchandee Shock Absorbers famous. We are preparing for a very large production.

You will be interested in our new profit basis for those who handle Aitchandee Shock Absorbers. Profits for you will be *large and quick*. We are meeting you half way, with the best proposition you ever run into.

Soon Ford owners everywhere will be wanting Aitchandee Shock Absorbers and wondering where in their neighborhoods to obtain them. We urge you to be prepared for the demand.

The quickest way to find out about our splendid proposition is to write us now, and we will send a complete description.

You can't afford to miss it.

THE H. & D. COMPANY, Inc.
58 Marion St. Goodland, Indiana

Write Today Sure

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New Sizes of Tire-Doh.

That the car owner is showing an increasing desire to repair his own punctures and blow-outs is evidenced by the rapidly increasing sales of Tire-Doh. On account of the increasing popularity of Tire-Doh, the Atlas Auto Supply Company, manufacturers, have found it necessary to get out new sizes. Heretofore Tire-Doh has been offered only in one size, retailing at $1. In addition to this size, which will be continued, the company now offers a Junior size package retailing at 50 cents, and also offers the Tire-Doh Cement and the Tire-Doh separately. Tire-Doh Cement can now be bought in 4 oz. packages for 25 cents, and the Tire-Doh alone in 2 oz. packages for 50 cents. Tire-Doh is not a new product with the jobber, dealer or the



Tire-Doh Outfit.

car owner. It has been on the market more than six years and in that time has undergone the most rigid tests, and, according to the manufacturers, has stood up under all of them. The manufacturers of Tire-Doh guarantee that Tire-Doh will permanently repair the smallest punctures or the largest inner tube tears without heat or tools. They state further that one of their dealers recently showed them an inner tube with a 37-inch tear in it that had been successfully repaired with Tire-Doh and driven more than 1,500 miles.

In addition to repairing punctures and blow-outs of inner tubes, Tire-Doh is most valuable in sealing holes and cuts in casings before they develop into sand blisters. According to the manufacturers, Tire-Doh is also an effective repair method for the re-seating of valve stems. The Atlas Auto Supply Company, manufacturers of Tire-Doh, have recently found it necessary to move into a much larger factory which they have purchased at 656-660 West Austin Avenue, Chicago. This company is considered one of the most successful in the field of accessory manufacturers.

Contracts for Tire Pumps.

Contracts have been given for installing the Master Engine Driven Tire Pumps as standard equipment for 1916 on the following cars: National, Marmom, Jeffery, Apperson, MacFarland and the Owen-Magnetic. These pumps are manufactured by the Hartford Machine Screw Co. of Hartford, Conn.

"The Greatest Business in the World."

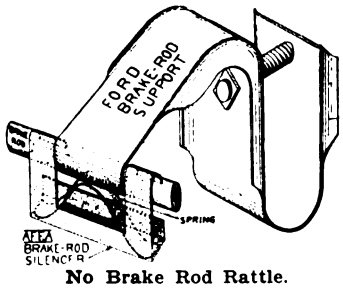
That's what one of the most successful garage and tire men in the country calls his business, says F. C. Millhoff, sales manager of The Miller Rubber Co. Akron, Ohio. And before this man went nto it, three or four years ago, he had n turn been a traveling salesman in the extile field, a branch salesman for a eading auto manufacturer, and proprie-or of a small tire and accessory shop. Now he owns a string of three garages n one of our largest cities, and people speak of him as having made his pile. So we can take considerable stock in what he says.

"The greatest business in the world." How queer—yes, almost ridiculous—that statement would have sounded a dozen years ago. Then a garage was thought of as not much more than a new kind of livery stable, and a garage man a rough, ignorant jack-of-all-trades who puttered with one's car when something was the matter with it. The garage and tire man of to-day is a real merchant, says Mr. Millhoff—a business man, first and last. True, he has considerable mechanical knowledge, and he "tinkers" as of old. But most of his ability and energy are directed along modern merchandising lines, which he has found are the lines of least resistance in building his business.

The modern garage man knows the principles of salesmanship. He knows how to adapt the great tool advertising to his business. He realizes the value of his show windows, and never neglects to keep in them attractive, inviting displays which will bring the passing motorist into the store. He co-operates with the advertising efforts of the manufacturers whose lines he handles, and thus cashes in on the thousands of dollars they spend each year on national publicity. He knows the importance of keeping his shop clean and tidy. And, best of all, he fully realizes the meaning of that all-important word, service—and he talks service and gives service at all times.

The Affa Brake Rod Silencer.

Another new Affa specialty for the Ford car is to be put on the market by W. S. Graffam of Northampton, Mass. It is to be known as the Affa Brake Rod Silencer, and is for the purpose of preventing the rattle of the brake rods in their supports. It consists of a small flat spring enclosed in a retaining box which



No Brake Rod Rattle.

can be snapped onto the brake rod and its support in such a manner as to hold the brake rod firmly against its bearing in its support so that it cannot rattle. It has the advantages of not being necessary to remove the brake rod supports that come on the car, of requiring no tools to put it in place, of not freezing up and sticking, of being guaranteed for the life of the car and of selling at the very low price of 35 cents per set. If not found at the dealers, they will be sent anywhere postpaid on receipt of price.

Willard Storage Batteries.

The Willard Storage Battery Co., Cleveland, Ohio, have made no specific changes in the Willard line this year, except a refinement of certain details. The Willard organization is especially proud of the fact that more than 700,000 of its batteries are at present in satisfactory use. Willard batteries may be had in any size for any type or sort of service.

The Aerofram.

This is a new auxiliary air device which differs from most others in size, ease of application and in being automatic in its action. It has been designed and built after exhaustive tests on various motors with a vacuum gauge, and it absolutely adapts itself to the actual vacuum at each variation of speed. In practice it has always shown increased economy of operation, less fuel required, or more mileage for a given gas supply. A recent test by a large commercial house in Chicago is interesting. This



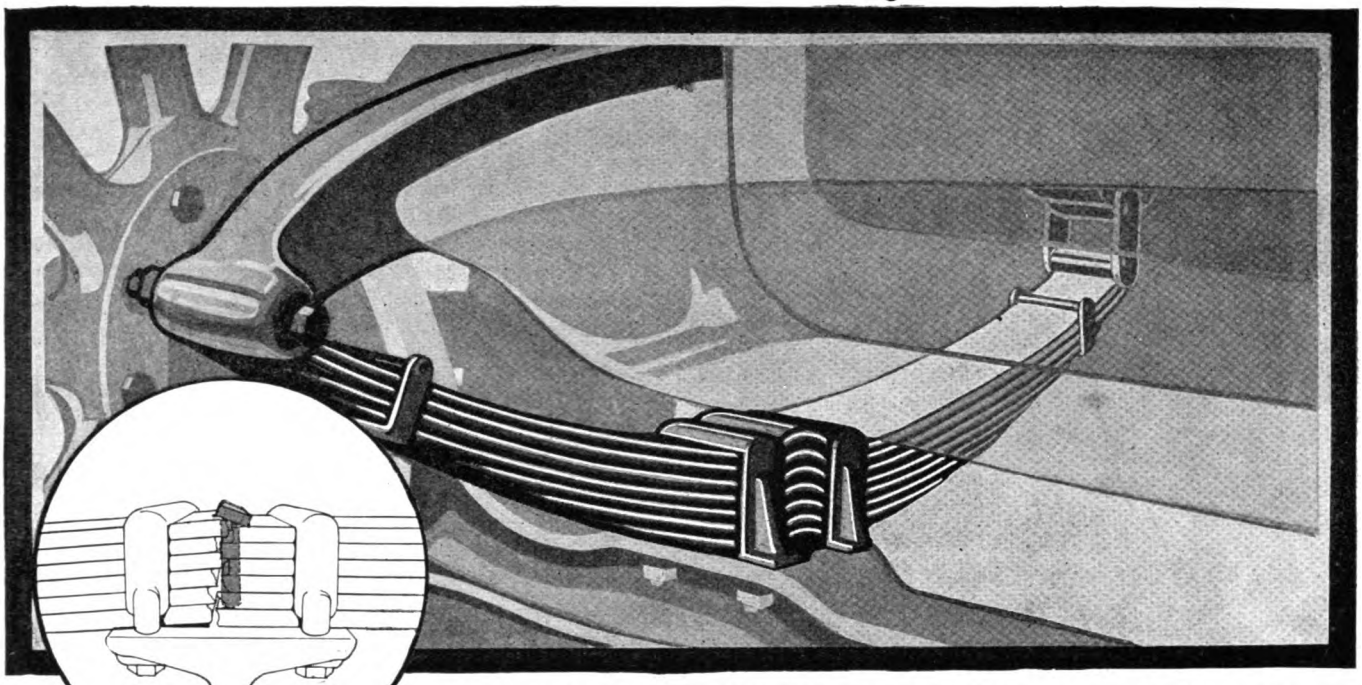
New Auxiliary Air Device.

firm uses over 100 delivery and commercial vehicles and wished not only economy in their operation, but were ready to market any device of merit to a large clientele. They had a Briscoe, 4 cylinder, 1915 model, which tested to 26 6/10 miles on 1 gallon of gasoline. Without change or alteration, and over the same course, it was tried with the Aerofram attached. The motor was first run long enough to be thoroughly warmed up, then it was run dry, that is until the tank and also the carburetor were drained. One gallon was supplied and a start was made, but trouble developed which proved upon examination to be dirt in the carburetor and supply pipe. In cleaning the carburetor and pipe some gasoline was lost, estimated at about 1 pint, but nevertheless the trial was continued with the balance of fuel and a record of 29 9/10 miles was made. This showing was so conclusive as to the merit and economy of the Aerofram that the firm immediately gave an order for 1,000 Aeroframs for their sales department, and also equipped all their own cars with them. At the present high rate of gasoline, when such economy can be secured by the use of a device costing only $1, its sale may be very large indeed. The Aerofram is manufactured by the Aerofram Company, 755 Boylston St., Boston, Mass., who will be glad to give full information.

Polson Puts Factory in Cleveland.

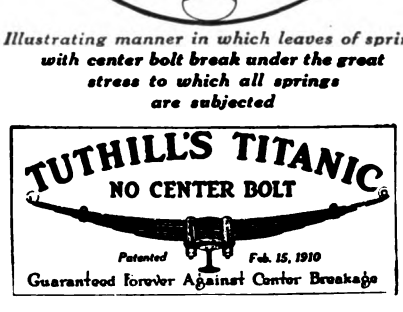
On account of a heavy increase in their Eastern business The Polson Rubber Co., of Kansas City, Mo., are putting a factory in Cleveland, Ohio, for the manufacture of their popular line of Blow Out Patches, Hook On Boots, Reliners, etc. The new factory is under the personal supervision of Mr. H. B. Polson and is now making shipments. Mr. C. A. Polson will continue in charge at the Kansas City factory.

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Illustrating the Tuthill Titantic Spring—see the hump, without center hole or center nib

Illustrating manner in which leaves of spring with center bolt break under the great stress to which all springs are subjected



WHY springs break

Punch a hole in anything and you decrease its strength—punch a hole in each leaf of an automobile spring and you decrease its strength—weaken it to a remarkable degree.

This is especially true if the hole is punched where the spring is stressed the most—at the center—and it is a fact that such a hole increases the liability of breakage at least fifty per cent.

Tuthill Titanic Springs

have no center bolt or center nib (which is practically as weakening as a center hole). That is why we are able to guarantee them forever against center breakage.

Tuthill Titanics outlast all others—outsell all others.

You are losing a money-making opportunity if you do not sell them. Replace with Tuthill Titanics—because you can depend upon them not breaking at the center.

Send for 1916 price list—the most complete list of springs for replacement ever published. No large stock or big investment necessary. Write for the list—or get in touch with the nearest distributor.

Other dealers are building up a nice permanent business on Tuthill Spring replacements—why not you?

Tuthill Spring Company

758 Polk Street **CHICAGO, ILL.**

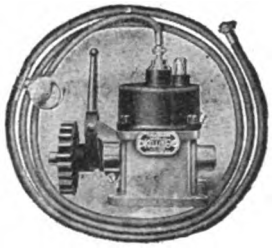
DEALERS—get in touch with your nearest Tuthill distributor

Albany	Albany Hardware & Iron Co.
Atlanta	Elyea-Austell Co.
Baltimore	Baltimore Hub Wheel & Mfg. Co.
Billings	Barry Motor Co.
Boston	Post & Lester Co.
Buffalo	H. D. Taylor Co.
Chicago	All Jobbers
Cincinnati	The Ohio Rubber Co.
Columbus	Griswold-Sohl Co.
Dallas	The Fisk Co. of Texas
Davenport	Sieg Iron Company
Dayton	S. T. & G. A. Gebhart
Denver	Auto Equipment Co.
Duluth	Kelley-How-Thomson Co.
El Paso	Western Motor Supply Co.
Fargo	J. D. Grant Co.
Florence, S. C.	D. W. Alderman, Jr.
Indianapolis	W. J. Holliday Co.
Kansas City	Faeth Iron Co.
" "	Motor & Machinists Supply Co.
Lincoln	Nebraska-Buick Auto Co.
Los Angeles	Chanslor & Lyon Co.
Milwaukee	Babcock Auto Spring Co.
Minneapolis	Western Motor Supply Co.
Nashville	Auto Supply Co.
New Orleans	Interstate Electric Co.
New York	W. E. Pruden Hardware Co.
Oakland	Chanslor & Lyon Co.
Peoria	The National Electric & Auto Supply Co.
Philadelphia	Manufacturers Supplies Co.
Pittsburg	Pittsburg Auto Spring Co.
Portland	Chanslor & Lyon Co.
Rochester	Sidney B. Roby Co.
St. Louis	Auto Devices Co.
San Antonio	The Fisk Co. of Texas
San Francisco	Chanslor & Lyon Co.
Seattle	Chanslor & Lyon Co.
Sioux Falls	The H. F. Brownell Co.
Spokane	Chanslor & Lyon Co.
Tampa	The American Supply Co.
Toledo	Union Supply Co.

Foreign Distributors:

Automobile Sundries Co., 18 Broadway, N. Y.

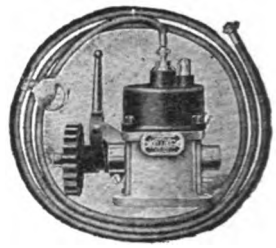
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Model 101

KELLOGG Engine Driven Tire Pump

and other Kellogg Products



Model 101

As Exhibited By

W. J. CONNELL CO., 171 Massachusetts Avenue, BOSTON

at the

Boston Automobile Show

are worthy of your careful inspection.

Do not fail to investigate the merits of this most successful line.

Catalog upon request.

Kellogg Manufacturing Company

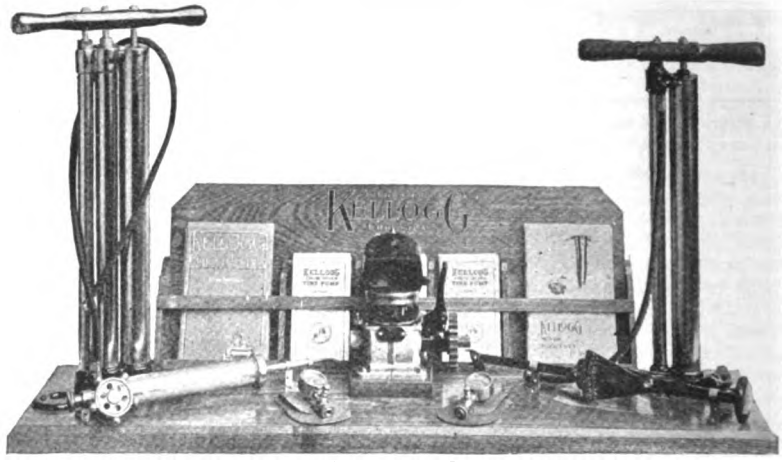
Rochester, N. Y.

New Battery System.

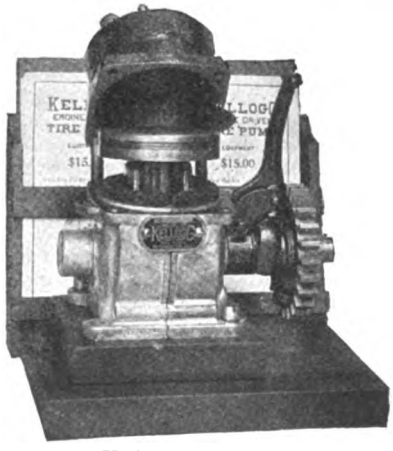
The N. Y. Coil Co., New York, has brought out a battery system for use in connection with a high-tension magneto, giving the latter easy starting features. This device consists of a special type magnetically-operated circuit breaker and condenser, somewhat resembling a master vibrator. A specially constructed kick switch also is supplied, which, when turned to the battery position, places six dry cells in series with the vibrator and armature windings of the magneto. When the magneto is revolved to the position where its breaker points separate a rapidly made and broken battery current flows through the armature. This induces a vibrating spark in the secondary winding of the magneto, which is distributed by the regular distributor of the magneto to the various spark plugs in the proper firing order. When the switch is turned to the opposite side, marked magneto, the magneto operates in the usual manner. As the switch is furnished separate (with wires attached) it may be located on driver's side of dash, allowing the special vibrator to be installed on the engine side of dash in any convenient position. Price is $8.

The Kellogg Display Stand.

We illustrate herewith the Kellogg Engine Driven Tire Pump, also the display stand which is furnished to dealers by the Kellogg Manufacturing Co. of Rochester, N. Y. On this display stand the cylinder of the tire pump is tipped back and raised so that customers can see the interior construction. Folders at the back describe the pump fully and give a list of the cars which can be equipped with it. This pump makes an ideal silent salesman. The stand is furnished free to dealers. It is only necessary to specify that you want one of the model 101 pumps mounted on a display stand. Of course the pump can be taken off from the stand and sold at any time, but it is generally better to retain it on the stand for demonstration purposes. On the stand a complete line of other Kellogg specialties can also be shown.



Display Stand.



Kellogg Tire Pump.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

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(*Concluded from page 75.*)

be laid. The four essentials for the roadbed are thorough drainage; firmness; uniformity in grade and cross section, and adequate shoulders. Where the first can be obtained in no other way it may be necessary to lift the road considerably above the surrounding land. Firmness is secured, if the road has been properly drained, by making certain that the roadbed is thoroughly compact. The sub-grade must be repeatedly rolled and reshaped until the desired grade is secured. The shoulders should never be less than 4 feet wide and not infrequently one is made sufficiently wide to form an earth roadway parallel to the brick pavement.

Strong, desirable curbing is necessary for all brick pavements in order to prevent the marginal brick from becoming displaced, which event would result in deterioration, finally spreading over the entire pavement. Properly constructed curbing, on the other hand, holds the bricks together and enables them to present a combined resistance. Portland cement and stone are probably the best materials to use.

One of the most essential factors of a brick pavement is a firm foundation upon which to lay the brick. The importance of this is evident when one considers that the ability of pavement to resist wear depends upon the smoothness of the pavement and a firm foundation. If the foundation is poor one of the bricks may be easily forced down causing unevenness in the surface. Where the traffic is comparatively light and the sub-grade composed of material that does not readily absorb water, broken stone may make a satisfactory base. For heavier traffic or where the material composing the sub-grade is at all unstable a concrete base is necessary. The stone base should be constructed much as in the case of first-class macadam roads. Concrete bases may be constructed of concrete composed of 1 part Portland cement, 3 parts of sand and from 5 to 7 parts of broken stone or screened gravel. Above the concrete base a sand cushion to correct slight irregularities and to secure an even surface for the brick is most desirable. This cushion is usually 2 inches thick, though in some cases it may be only 1½. It is important to have the sand clean, free from pebbles and dry when spread.

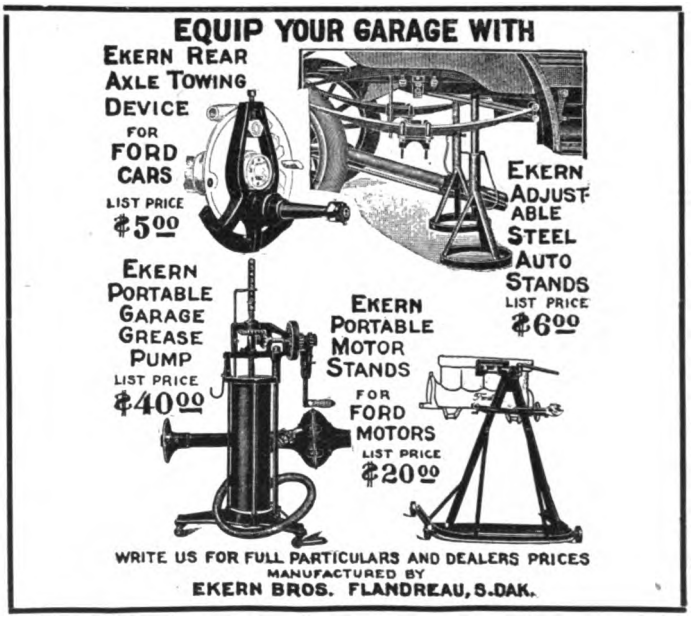
After the brick have been laid upon this cushion and the pavement gone over carefully to remedy all defects and remove all imperfect material, it should be rolled with a heavy power roller, gone over carefully once more, and the joints then filled with some material to prevent the brick edges from chipping. Of the various materials used for this purpose a grout made of equal portions of Portland cement and sand mixed with water is recommended. Sand alone is sometimes used because of its cheapness but it is open to several objections and its use in the end is probably not economical. Portland cement grout, on the other hand, binds the individual bricks together and converts the pavement into what is practically a monolith. Before the grout is applied the pavement should be swept clean and be kept moist by gentle sprinkling during the applications, of which there should be two. At the end of the second application the grout should completely fill the joints flush with the tops of the joints. The final step is to cover the completed pavements with a 1-inch layer of fine earth. This is done to protect the pavement from the weather and to keep it in a moist condition while the grout is hardening. The covering should remain on the surface for at least ten days and the pavement be closed to traffic during this period.

The objection frequently made to the grout-filled brick pavement—that it is extremely noisy—may be overcome by the proper use of longitudinal expansion cushions placed alongside of the curb. These expansion cushions are bituminous layers from ½ to 1¼ inches thick, varying with the width of the pavement.

In addition to the description of the various problems the new bulletin contains in an appendix complete typical specifications for the construction of a brick road.

Handed a Lemon.

From "Stung," Connecticut.—I heartily agree with your article entitled, "A Manufacturer's Mistake," and give you my experience with one of the kind which you are at liberty to publish, if worth the space. Early in October I purchased from a sub-agent in a nearby city a 1916 6-cylinder Model of a well advertised car. This car had seen 60 days' use as a demonstrator and was guaranteed to be in perfect condition and carried unlimited free service, under the hood on a plate was a nicely worded invitation to the purchaser to write the manufacturer, which I proceeded to do, asking for a price parts catalogue, a little information and stating that the car did not give half the gasoline mileage advertised, requesting them to inform me how to get the advertised mileage or give me the address of the best man in this State to tune up the car. The reply was the most evasive and unsatisfactory letter I ever received from a manufacturer. A dealer in green goods would have replied more openly. They did, however, say that a man would call on me, but he never called. The sub-agent tried his best to make the car run right, but without success. After two months of missing, stalling, disgust and cursing of the manufacturer, I disposed of the car for what it would fetch and went back to the Ford car. I have owned in eleven years eleven cars of eight different makes, cared for and repaired them myself and this was the worst lemon of them all.



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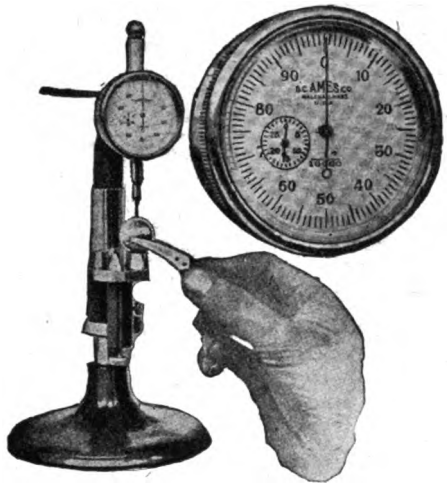
Change In Ownership.

The Martin Rocking Fifth Wheel Co. has taken over the business of the patent rights of C. H. Martin, Springfield, Mass. The officers of the new corporation are C. H. Martin, president, Adolph A. Geisel, Treasurer, and H. G. Farr, Secretary. Mr. Geisel will have the general management of the business and he is a veteran in the automobile industry, having been connected with it for the past 15 years. The new company in addition to making fifth wheels, of different sizes, will make semi-trailers for the Ford size.

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—in the manufacture of bearings is what determines their worth as component parts of any motor car.



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American Made for American Trade

by reason of their precision, plus the quality of material from which they are made, have become the choice of eighty-two per cent. of American car builders—the reliance of thousands of car owners.

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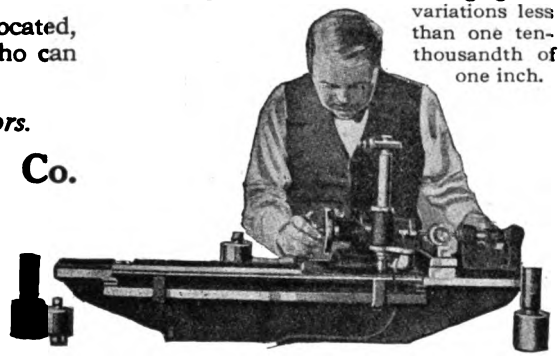
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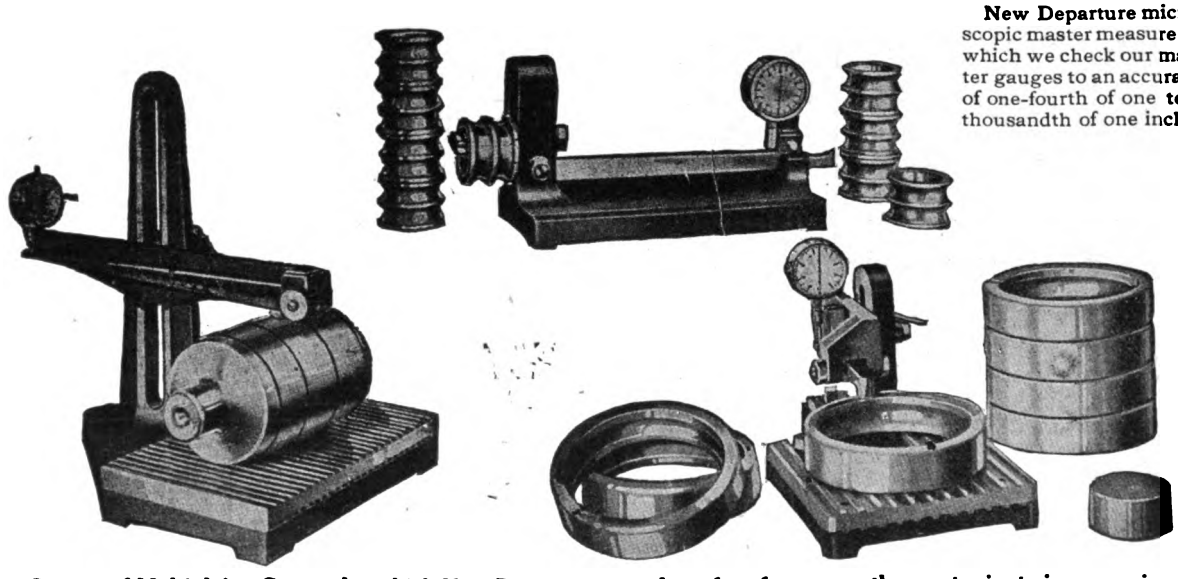
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Mail order and cut price houses make it imperative that

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should distribute his own catalog, with his name and address on Front Cover

OUR 1916 EDITION

Ready for delivery about March 1st.

Write for Sample Copy and Lowest Quotations.

CATALOG PRINTING CO., Inc.

1731-37 Broadway **New York City**

WE SPECIALIZE IN SUPPLIES

NOT CARRIED BY OTHERS

Including bearings, $1.00 up; Stromberg and Schebler Carburetors, Springs, Transmissions, Axles, Tops, Motors, Bodies, Windshields, Radiators, Steering Gears, Presto Rings, etc. Order any of this material specified with the distinct understanding that if you are not entirely satisfied you may return it and get your money back.

Send for PRICE WRECKER listing 3000 bargains.

TIMES SQUARE AUTOMOBILE CO.

World's Largest Dealers

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Established 1905. 1717-1719 Broadway, New York

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Black and nickel elec. head lamps, 11¼", $5.85; mechanical hand horns, guaranteed, $2.75; motor-driven elec. horns, guaranteed, $4.65; windshield searchlights, 4½", $4.25; 7½", $6.75; one-man Pantasote and Mohair tops, $26.00; steering gears, $9.00 up; Stromberg carburetors, all models and sizes, $8.00 up; Schebler model R, 1¼", $11.00, model L, 1¼", $8.00; Marvel, Holley or Kingston, 1½" carburetors, $3.00 each; model B Prest-O-Lite tanks, $10.00 each; Stewart model B Speedometers ($50.00 list), $12.50; same with clock and elec. light comb. ($85.00 list), $20.50; magnetos, Bosch DU, 6-cylinder high tension, $52.50; Eisemann high tension EMIR 6-cylinder, $42.50; Splitdorf model D or X, 4-cylinder, $14.75; Splitdorf model Y, 6-cylinder, $16.75; Splitdorf T.S. transformer coils for above, $12.50. Rambler motors, second-hand, thoroughly overhauled, guaranteed to be in perfect condition, all models, $115.00 with carburetor; D.W.F., Hess-Bright, New Departure, Timken, and other standard bearings, new at prices of reground. Send numbers of bearings for prices. Other parts and accessories at equally low prices.

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Model T, Honeycomb, V-shaped for Ford	$22.50
Buick 16 and 17, Honeycomb	33.50
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Hudson 20, 32 and 33	28.50
Chalmers 30	30.00
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Colby, models 40 and 50	30.00
Rambler radiators, all models	26.00

Write for prices and other makes.

AUTOMOBILE APPLIANCE COMPANY

1438 Michigan Avenue **Chicago, Illinois**

AUTO DEALERS, REPAIR AND GARAGE MEN

We want opportunity to quote on your accessory needs. Let us quote on anything wanted.

(SEE OUR 1916 HAND HORN.)

WESTCHESTER ACCESSORIES COMPANY

1777 BROADWAY **NEW YORK CITY**

Wholesale Only.

Auto Accessories

SPEEDOMETER TRUST EXPOSED

We forced them to reduce their prices, but our prices still beat theirs.

SPECIAL THIS MONTH

STEWART $7.50 Complete

$25.00 Models

Including all necessary attachments.

COMPARE OUR PRICES WITH THE TRUST PRICES

We also repair and carry in stock a complete line of parts for the following makes of Speedometers and Electric Horns:

SPEEDOMETERS:	ELECTRIC HORNS.
Jones,	Klaxon,
Stewart,	Newtone
Warner, etc.	Jones, etc.

Prices for Stewart Parts.

	Trust Price.	Our Price.
Flexible shafts	$5.00	$2.00
Shaft casing	3.00	1.00
Inside chain	2.00	1.00
Swivel joint	4.00	2.00
Wheel gear	1.50	1.00
Pinion or small gear	.75	.15
Clamp complete	2.50	.75
Glass	1.00	.50

Prices for Warner Parts.

	Trust Price.	Our Price.
Flexible shaft	$7.00	$3.50
Shaft casing	5.00	2.50
Inside chain	2.00	1.00
Swivel joint	4.00	3.00
Wheel gear	1.50	1.25
Pinion	1.00	.35
Clamp complete	1.50	1.00
Odometer	2.50	1.75

Heads Repaired (all makes), $1.00. Odometers reset to zero, 25c.

All workmanship and material absolutely guaranteed.

GENERAL SPEEDOMETER REPAIR CO.

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Ford Book *Free*

Tells you how to take care of your car. And it tells how to buy your supplies at prices cut to the bone. Besides the amazingly low prices, the quality is absolutely guaranteed. Ask for your Free Copy of Ford Book DR.

General Automobile Supply Company

1671-1673 Broadway **New York City**

Auto Accessories

RECTIFIERS to charge from A-C circuit 1 to 8 ignition lighting or starting batteries at one time, $12.00 upward. American Battery Co., 1136 Fulton St., Chicago, Ill.

ONE MAN TOPS—$20, $25

Fit Fords and others. Top enveloped, $1.

20th CENTURY COMPANY, 1694 Broadway cor. 53d St., N. Y.

AUTO TOPS—Built, re-covered and repaired. C. G. Meyer & Son., Dept. 6, Tiffin, O.

Magnetos and Batteries

Hecht's Magneto Exchange

INCORPORATED

Dealers in Magnetos of all Makes. Lighting Systems and Self Starters.

We have always on hand a large assortment of high and low tension magnetos, BOSCH, SPLITDORF, REMY, EISEMANN, and all other standard makes, at 50% off list.

Expert Repairing of All Makes.

Express your Magneto to us. Same will be repaired and returned same day received.

Distributors and Service Station for

MICHIGAN and NATIONAL MAGNETOS

—— Also ——

Esterline Generators, Norma Ball Bearings and Gould Storage Batteries

230 West 49th Street **NEW YORK CITY**

MAGNETOS

Expert repairing on all makes and types of Magnetos. Fully guaranteed. Quick service.

MAGNETOS BOUGHT, SOLD AND EXCHANGED

MAGNETO SALES COMPANY

1779 Broadway **NEW YORK CITY**

MAGNETOS

Of all makes repaired and guaranteed.

Manufacturers of **ISCO** Starting Coils.

IGNITION SPECIALTIES COMPANY

798 Seventh Avenue **New York City**

Official Service Station for

SIMMS, WILLARD, BERLING

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Auto Lists

1916 NEW ENGLAND REGISTRATIONS $13.00.

Special card lists by make of car and cities and towns. Filing cards and statistics. AUTO LIST PUB. CO., 138 Pearl St., Boston.

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Tires

SAVE 75%
ON YOUR
TIRE BILLS
BY USING OUR
DOUBLE TREAD
TIRES

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

ALL TIRES GUARANTEED 3500 MILES

A special discount of 2% on all cash orders will be offered on all tires for February only.

Size	Plain	skid Non-	Size	Plain	skid Non-
28x3	$4.00	$5.00	35x4	$8.00	$9.00
30x3	4.00	5.00	36x4	8.00	9.00
30x3½	5.00	6.00	34x4½	9.00	10.00
32x3½	6.00	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	9.00	10.00
30x4	6.00	7.00	37x4½	10.00	11.00
32x4	7.00	8.00	35x5	11.00	12.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

We also carry a complete line of new inner tubes, prices as follows:
30x3.....$2.00 30x3½.....$2.40 34x4.....$3.60

For retreading your old tires we charge you 40% off above prices.

Make sure when ordering tires to state whether Q.D. straight bead or clincher type.

We carry a full line of 1st and 2nd Tires of all makes. Prices upon request.

Terms: 10% Deposit, Balance C. O. D.

I. JAFFESS
MAIN STORE
1319A Fifth Avenue, New York
BRANCH AT
282A Halsey Street, Newark, N. J.

Tires Guaranteed

Our Double Tread Tires are vulcanized together instead of stitched or riveted together. There are no stitches or rivets to cut your inner tubes. They are practically blowout and puncture-proof. Let us send one to you to-day for trial. Money back if not satisfactory. Our new catalogue will describe to you the advantages of our Double Tread Tires.

These tires average about 5,000 miles.

Size	Tires	Tubes	Size	Tires	Tubes
28x3	$4.50	$1.75	33x4	$9.00	$3.15
30x3	5.00	1.93	34x4	9.75	3.20
30x3½	7.50	2.25	35x4	10.00	3.50
31x3½	7.75	2.25	36x4	10.00	3.58
32x3½	8.00	2.25	34x4½	11.50	3.60
34x3½	8.50	2.50	35x4½	11.75	3.75
30x4	8.00	3.00	36x4½	11.85	4.00
31x4	8.25	3.00	37x4½	12.00	4.50
32x4	8.50	3.15	37x5	14.75	4.75

Tires are sent subject to examination.

C. O. D. Shipments 10% Deposit Required.
Tubes Are Guaranteed.

TUXEDO AUTO TIRE EXCHANGE
304 W. 54th Street NEW YORK CITY

TIRE AND TUBE BARGAINS

SAVE 40 to 50% IN SELECTED FACTORY SECONDS. STANDARD MAKES.

Over 5000 tires and tubes in stock at all times.

AGENTS WANTED

Send for free booklet, "Tire Tips"

JANDORF AUTOMOBILE COMPANY
1763 BROADWAY NEW YORK

Tires

Cut YOUR Tire Bills
Save 75 Per Cent
—USE OUR—
Double Tread Tires

Send us your old tires and we will make from two old tires one double tread tire which we guarantee will give good service.

See that one has a good bead, the other a good tread. The cost will range from $1.50 to $3.50.

In case you have no old tires to send us we will sell you our own make double tread tires at the following prices:

Size	Plain	Non-skid	Size	Plain	Non-skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	4.50	5.00	32x4½	8.00	8.50
30x3½	5.50	6.00	34x4½	9.00	10.00
32x3½	6.50	7.00	35x4½	9.00	10.00
34x3½	7.00	8.00	36x4½	10.00	11.00
30x4b	7.00	7.50	37x4½	10.00	11.00
32x4	8.00	8.50	34x5	9.00	10.00
33x4	8.00	9.00	35x5	10.50	11.50
34x4	8.00	9.00	36x5	11.00	12.00
35x4	9.00	10.00	37x5	12.00	13.00

Write us for all other prices and for full particulars.

5% Discount on all Cash Orders.

Be sure to state the bead, whether Q.D., Straight or Clincher.

M. LIBEN & CO.
27A East 110th St. NEW YORK CITY
Branch: 205A W. 48th St., New York City

DOUBLE TREAD TIRES
AT 75% SAVING
GUARANTEED 3500 MILES

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3	$4.25	$4.75	36x4	$8.00	$9.00
30x3½	5.50	6.00	34x4½	8.50	9.50
32x3½	6.00	6.50	35x4½	8.50	9.50
32x4	7.00	8.00	36x4½	9.00	9.50
33x4	7.50	8.25	37x4½	9.00	9.50
34x4	7.50	8.25	37x5	10.00	11.00
35x4	8.00	8.75			

These Tires are absolutely Puncture Proof.

Terms: C. O. D. 10% Deposit.

BERGEN & ZAAGER
243a West 56th Street NEW YORK

BIG TIRE BARGAINS

Look at these prices for absolutely new Diamond, Blackstone, Imperial, Pullman and Congress second tires that were originally guaranteed for 3,500 miles.

Size	Plain	Skid	Guar. Tube
30 x 3	$6.40	$6.75	$1.75
30 x 3½	7.35	7.70	2.05
32 x 3½	8.00	8.40	2.15
33 x 4	11.90	12.45	2.95
34 x 4	12.25	12.70	3.05
36 x 4½	16.95	17.75	3.90

All orders must be accompanied by 10% of the amount of purchase. We have other sizes. Write for prices.

HENSCHEL TIRE & RUBBER CO.
1675 Broadway New York City

Tires

TIRES TIRES
Double Tread Tires
GUARANTEED 3500 Miles
AT FOLLOWING PRICES

Size	Plain	Skid	Size	Plain	Skid
28x3	$4.00	$4.50	36x4	$9.00	$10.00
30x3	5.00	5.50	32x4½	9.00	10.00
30x3½	6.00	6.50	34x4½	10.00	11.00
32x3½	6.50	7.00	35x4½	10.00	11.00
34x3½	7.50	8.00	36x4½	10.00	11.00
30x4	7.00	7.50	37x4½	11.00	12.00
32x4	8.00	8.50	34x5	10.00	11.00
33x4	8.00	9.00	35x5	12.00	13.00
34x4	8.00	9.00	36x5	12.00	13.00
35x4	9.00	10.00	37x5	12.50	13.50

Examine your old tires when you take them off, if the rim is not cut send them to us and we will remake them into a good double tread tire for 60% of the above prices.

Our tires are practically puncture-proofed.

Don't buy another tire until you write for information and illustrated catalogue.

We will show you how to make money on old tires too.

2% off where cash accompanies order.

B. LIBEN & COMPANY
261A West 54th Street 112A East 110th Street
NEW YORK CITY
The Home of Double-Tread Tires

SAVE YOUR OLD TIRES

Send us 2 OLD TIRES, one with a good bead and the other with a good tread, and WE WILL COMBINE them by our DOUBLE TREAD SYSTEM into a SOUND ONE for a cost from $2 to $4, according to size.

If you have ONLY ONE tire in this shape, we can Furnish you with the Other one at a cost from $4 to $9.

If you have NO OLD TIRES to have remade, you can Order Ready Remade ones, that we carry in stock from $4 to $12.

POSNER & BLOCK
1211A Bedford Ave. BROOKLYN, N. Y.

TIRES

Every Tire User is aware of the great savings by using Double Tread Tires; providing he buys the right kind of Double Tread Tires of the right kind of people. Buy of us and you know that you get the right kind at the following prices.

30 x 3	$4.50	34 x 4½	$9.00
30 x 3½	5.50	35 x 4½	9.50
32 x 3½	6.50	36 x 4½	9.50
34 x 4	8.00	37 x 4½	10.50
36 x 4	9.00	37 x 5	11.00

One dollar extra for non-skid.

A deposit of 10% is required on all C.O.D. orders. You can save C.O.D. charge by sending a money order. Please specify in order whether Q. D., Clincher or Straight Side desired.

For rebuilding the old tires the price is 40% from above list.

R. K. TIRE CO.
1401 Ridge Avenue PHILADELPHIA, PA.

NEW TIRES CHEAP

30 x 3	$4.75	34 x 4	$9.50
30 x 3½	6.90	37 x 5	14.75

Other sizes in proportion.

NEW YORK STEAM AUTO TIRE WORKS, Inc.
312 West 52nd Street New York City

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Tires

SAVE YOUR OLD TIRES
AND HAVE THEM
Reclaimed for $2.00 to $4.00
ACCORDING TO SIZE.
SQUARE DEAL TIRE EXCHANGE
247 West 49th Street NEW YORK CITY
Write for catalogue on Double Tread Tires.

UNIVERSAL TIRE DEALERS
MAKE LARGE PROFITS AND SALES
Write or wire for full particulars, prices, and our exclusive agency proposition. Don't delay, do it now while choice territory is still open.
UNIVERSAL RUBBER CO.
1511 ARCH STREET PHILADELPHIA, PA.

Starting & Lighting Systems

Starting and Lighting Systems
of all makes repaired.
All repair work done under our guarantee.
IGNITION SPECIALTIES COMPANY
798 Seventh Avenue New York City
SIMMS-HUFF SERVICE STATION

BRUSHES
Metallic and Carbon Brushes
for every make of
Starting and Lighting System
Magnetos and Generators Repaired
CARLILE & DOUGHTY
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SCORED CYLINDERS
Made equal to new without reboring
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RALPH N. FLINT, M. E.—Attorney-at-law in Patent Causes, late Assistant Examiner Internal Combustion Engine Division, U. S. Patent Office. Specialist in Internal Combustion Engine Cases. 2 Rector Street, New York, N. Y.

JOHN M. McLACHLEN, ATTORNEY AT LAW.—Patents, Trade Marks. Union Trust Bldg., Washington, D. C.

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Davidson Multiple Piston Rings will do that and more.

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The motor will not smoke and you save gas and oil.

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100 NEW VISES, $1.00 per inch width of jaw, all sizes, 2½" to 5". Send for circular. Lucas & Son, Fox St., Bridgeport, Conn.

An Aluminite Piston.

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The Corbin Speedometer.

The Corbin-Screw Corp., New Britain, Conn., has made several improvements in the way of attaching its speedometer. A new bracket is being furnished which may be easily adjusted to four positions on either side of the dash, thus enabling the operator to arrange it conveniently to his line of vision. A new type of swivel gear is now made in one piece with the shaft to which the cable is attached, the gears being held in correct mesh by a collar. The gear section is filled with grease when assembled and needs no attention for a long time.

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MILWAUKEE
TRADE MARK
"THE MARK OF SATISFACTION"

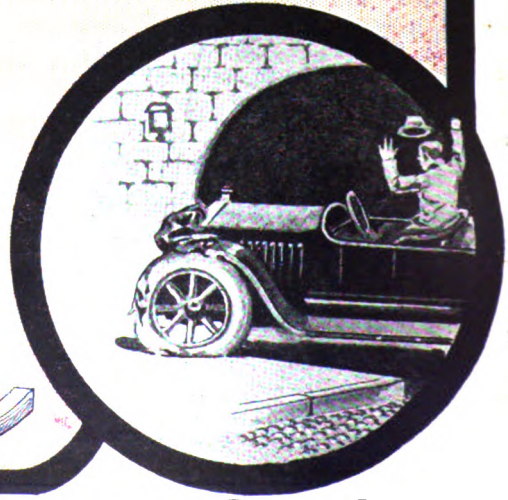
THE easiest sellers are the things that save your customers money

—and Gemco Bumpers protect the costliest part of the motor car. The major part of all the bumpers made are Gemcos. We make them in all styles suitable for attaching to any car. Built overheavy for extra strength.

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"Your Worn Tires!"

"What do you do with them?"



OR



Sell them to Jimmy the Junkman for 4¢ a pound

Get 5000 miles more service by putting on Steel Studded Treads

It's extravagant—and a **downright waste of good, cold cash**—to throw away your worn tires, or sell them to Jimmy the Junkman for a few cents a pound—because you can now get 5000 miles **MORE** service out of them by doing what European motorists have done for the past three years—and this will result in a ***SAVING*** of $50.00 to $200.00 a year to you.

European Motorists Get 10,000 to 15,000 Miles From Ordinary Tires

For the past three years European motorists have been getting from 10,000 to 15,000 miles out of a set of ordinary rubber tires, while American motorists have been satisfied with 1,000 to 3,000 miles—and what is even more important, European motorists have almost entirely eliminated the constant **dread** of punctures, blow-outs and rim cuts.

They do it by "half-soling" their tires with Steel Studded treads—and in the last eight months over 40,000 American motorists have followed their example and have "half-soled" their tires with Durable Steel Studded Treads.

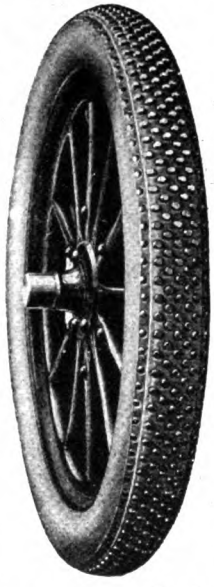
Guaranteed 5,000 Miles Without Puncture

To many motorists this fact—**guaranteed 5,000 miles without puncture**—is of more interest than the money saved by eliminating tire repair bills. The constant dread of puncture or blow-out spoils the joy of motoring. Each unnecessary noise—each bit of broken glass or sharp edged stone—each bump or "pop"—makes the motorist think of tire trouble FIRST.

Durable Treads are backed by a signed guarantee—as good as a government bond—**for 5,000 miles without puncture**—many users get 10,000, 12,000 and 15,000 miles. Think of the joy you could have in motoring when you absolutely KNOW in your own mind that your tires are protected by Durable Treads and are **impervious to the roughest roads.** When you KNOW that **you** won't have to get out and sweat fixing a puncture—and the guarantee holds good whether your tires are new or old.

No More Skidding

"Durable Treads" are as sure footed as a Rocky Mountain burro—look at the photograph—see those steel studs—they're simply bound to be safe—the sharp edges will grip the slipperiest roads and make skidding almost an impossibility. With Durable Treads your tires are protected instead of injured, and you don't have to **climb out in the mud and slush to put on chains.**



Protect Your New Tires—Small Cuts May Ruin Them

Don't take chances with them—don't wait until they are cut up with sharp stones, glass, etc. Remember that a small cut usually develops into a sand blister—water soaks in and weakens the fabric—with the result that the tread of your tire comes loose from the fabric or else you have a blow-out. Either way it costs you **money, time and trouble.** Take a stitch in time and put on Durable Steel Studded Treads **immediately.**

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Without a cent deposit—prepay the express—and allow YOU to be the judge. Remember that the new 1916 Improved Full Cover Durable Treads have **no springs or attachments.** They are gripped tightly by the rim, just the same as a tire—absolutely water and sand proof—and **easily applied in your own garage in thirty minutes** without special tools.

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We offer a Special Introductory Discount to motorists in new territory where Durable Treads have not been introduced on the **first** shipment direct from the factory. The sales of Durable Treads (the PRACTICAL Tread) increased **917%** in the United States alone during the past year—over 40% of these sales were **unsolicited**—made through the recommendations of other Durable Tread users. Where is there another automobile accessory that has received such countrywide endorsement?

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Tear it off now—don't run your tires **another** week in a barefooted condition. Whether your tires are old or new you should protect them at *once*.

We have an interesting book of "10,000 Miles On One Set Of Tires," sample and guarantee ready to send you FREE—mail the coupon TODAY and find out how to get at least 5,000 miles more service out of your tires.

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And Other "Doughs"

You may be offered other "doughs" for repairing tires, but only the original Tire-Doh will give you the satisfaction, the quick, permanent repairs that the original Tire-Doh has been giving over a half million car-owners in the past six years.

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NEW SIZES
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Large size $1.00
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2 oz. can..... 50c
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When you use the Original Tire-Doh. It does all we claim for it—and more.

Tire-Doh will repair the smallest inner tube punctures or blowouts and tears as long as your arm, because it has done so. It seals cuts and holes in casings so they will not develop into sand blisters—reseats torn-out valve stems and makes other difficult repairs. Don't fuss with cold patches or vulcanizing—Use Tire-Doh. Makes a quick, permanent repair without the use of tools or heat.

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For Ford Cars and Other Small Motors
Price 60c. Postpaid.
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Send for FREE SAMPLES and prices.

We have many recommendations from satisfied users.

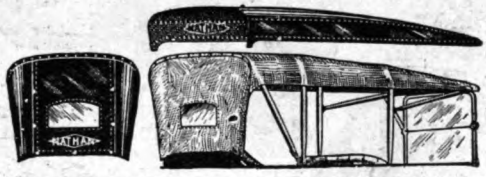
Nathan Perfect Fitting Tire Covers.



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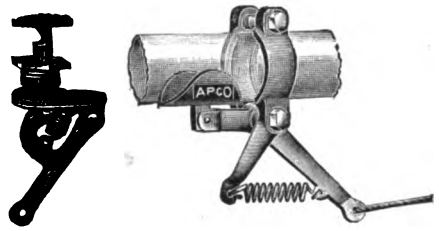
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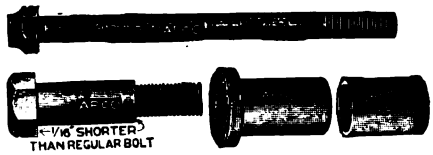
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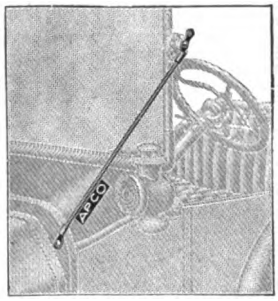


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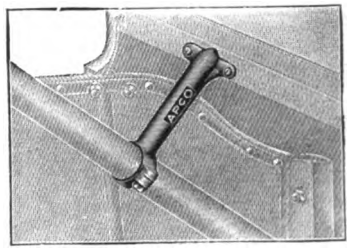
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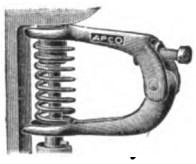
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STEERING COLUMN BRACE, $1.00 Each



VALVE SPRING REMOVER AND REPLACER, 25c Each



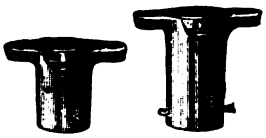
VALVE GRINDING COMPOUND, 25c Can



SPRING LEAF LUBRICATORS, $1.00 Set



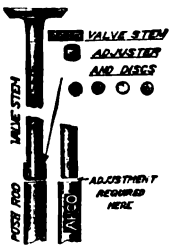
COTTER PIN ASSORTMENT, 20c Box



RADIUS ROD ANTI-RATTLERS
No. 1, Screw Adjusted, 50c Each
No. 2, Disc Adjusted, 20c Each



STEERING ROD ANTI-RATTLERS
No. 3, Screw Adjusted, 40c Pair
No. 4, Not Adjustable with Oil Cup, 30c Pair



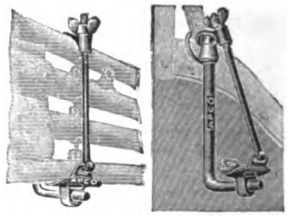
L E STEM ADJUSTERS, 20c Each



HOSE CLAMPS, 5c Each



BRAKE ROD CLEVIS ANTI-RATTLER 10c Each



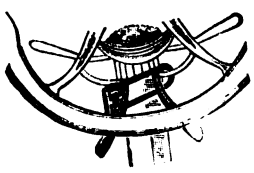
BOW CLAMPS, 50c Set
Patented January 4, 1916



RUNNING BOARD TRUSS, $2.00 Set

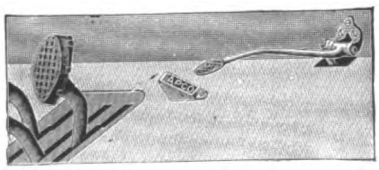


TRANSMISSION BAND WRENCH, 20c Each





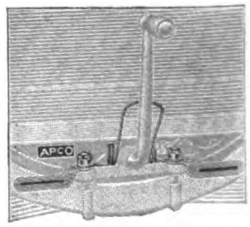
SPARK AND THROTTLE LOCK, 60c Each



FOOT ACCELERATOR, $1.00 Each



VALVE STEM PACKINGS, 50c Set



STARTING CRANK HOLDER, 20c Each
FRONT NUMBER HOLDER, 10c Pair

AUTO PARTS CO., - PROVIDENCE, R. I.

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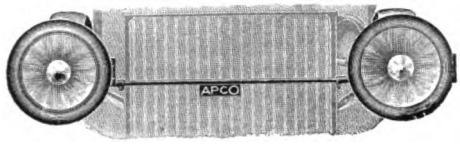
1916 TRADE APCO MARK 1916
SPECIALTIES FOR FORDS



SPINDLE ARM SILENCER, 35c Set
Pat. Aug. 31, 1915



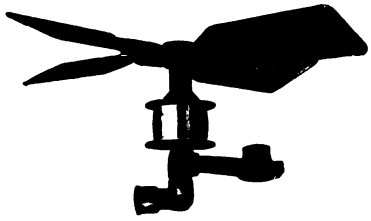
STEERING WHEEL PULLER, 50c Each



HEADLIGHT BRACE,
60c Each



DOOR ANTI-RATTLERS,
10c Each



FAN GREASE CUP EXTENSION,
25c Each



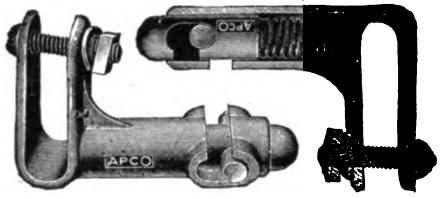
EMERGENCY BRAKE SHOES,
Lined, $1.20 Set
Plain Iron, 50c Set
Springs, 5c Each



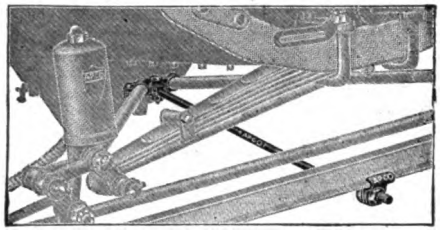
CLUTCH RELEASE, 30c



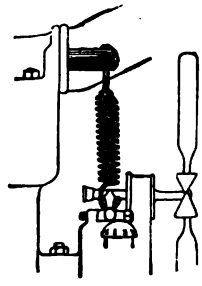
FAN BELT RETAINER,
15c Each



BRAKE ROD SUPPORTS, 50c Set



FRONT AXLE BRACE, $1.00 Each



FAN BELT ADJUSTER,
50c Each



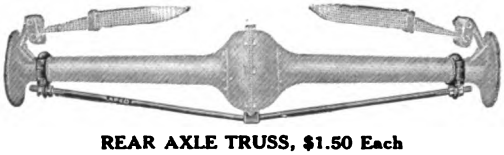
BREATHER PIPE AND OIL FILLER, 70c



OIL GAUGE, 30c Each



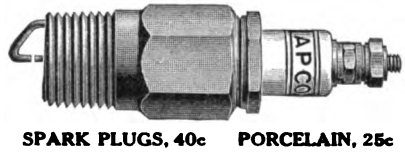
RUNNING BOARD TIRE HOLDERS, $2.40 Set



REAR AXLE TRUSS, $1.50 Each



DETACHABLE FAN BELT, 40c Each



SPARK PLUGS, 40c PORCELAIN, 25c

TRADE APCO MARK ALL--WAYS GOOD TRADE APCO MARK

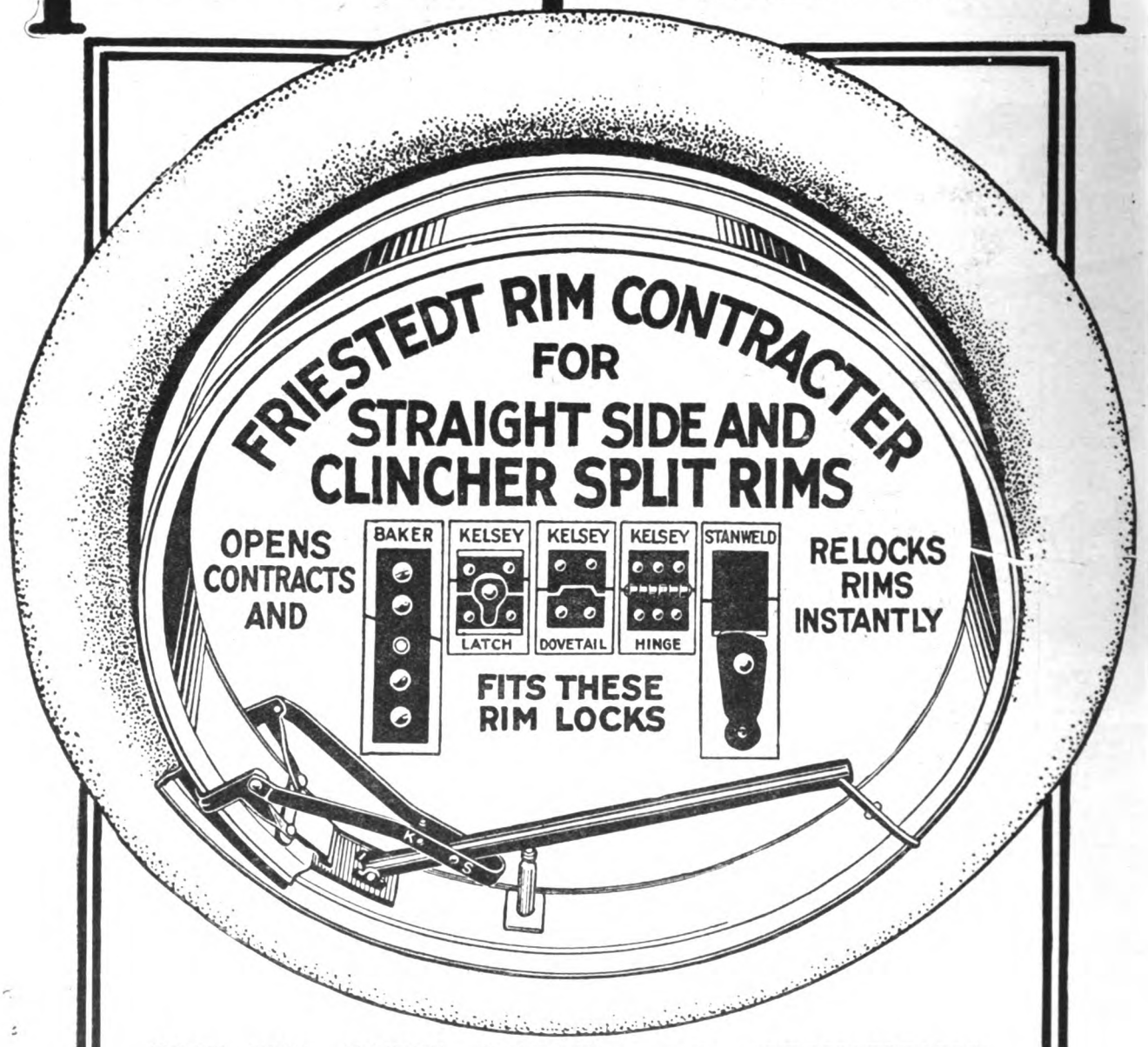
For seven years APCO Specialties for Ford cars have led the field, and today they are further ahead than ever. Every dealer and jobber should stock them and if you have any trouble getting the genuine APCO goods, send us the order and we will have filled by your nearest jobber.

Send for 1916 Catalog NOW

AUTO PARTS CO., - PROVIDENCE, R. I.

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The Only Rim Tool



THAT WILL EASILY, INSTANTLY AND AUTOMATICALLY

OPEN, CONTRACT AND RELOCK

BAKER, KELSEY AND STANWELD SPLIT DEMOUNTABLE RIMS. THE FRIESTEDT RIM CONTRACTER IS A SPECIFIC TOOL; NOT A MAKESHIFT TO OPERATE ALL RIMS AFTER A FASHION. DOES IN SECONDS, WHAT TAKES YOU MINUTES.

WE UNEQUIVOCALLY GUARANTEE

IT TO MAKE GOOD OUR CLAIMS AND THAT IT IS THE PEER OF ANY DEVICE FOR THE PURPOSE. THIS TOOL HAS THE PROVEN WORTH OF THE MOST INDISPENSABLE IN ANY AUTO KIT.

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For Complete
Information
and
Prices

FRIESTEDT RIM CONTRACTER CO.
2931-2939 W. Lake St., Chicago, U.S.A.

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Subjected To This Supreme Test

The New MASTER Calorite Spark Plug

Heated Red Hot - 1500 Degrees Fahrenheit
Plunged into cold water 40 degrees, 26 times

Heated White Hot - 2000 Degrees Fahrenheit
Plunged into cold water 40 degrees, 10 times

An Extreme Change of Temperature of 1960 Degrees

These two extreme tests convinced us absolutely of the marvelous efficiency and ability of Calorite as an insulating material to stand any strains to which it might be subjected in Spark Plugs in the modern motor car. We have long realized the necessity of an improvement and advancement in Spark Plug Construction as evidenced by prevalence of spark plug trouble in last season's races. Our observations, tests, analyses, etc., served to establish the fact that the seat of the trouble mostly was in the insulators.

Our MASTER shell design—our MASTER electrodes and the metal used in MASTER Spark Plugs have proven themselves eminently satisfactory and scientifically correct—there was no necessity of even considering a change there.

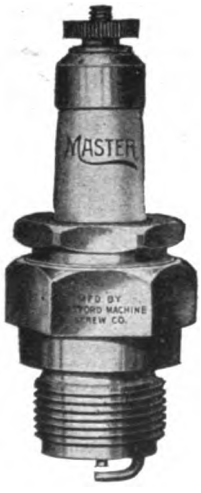
Until Calorite, the new insulating material was discovered, our porcelain was the best material obtainable for spark plug insulators. But, with the discovery of Calorite, the old belief in porcelain was shattered. The merits of Calorite are so many and it is so superior to porcelain that to continue using porcelain for our insulators would not be doing justice to the other Master quality specifications—nor to our long established policy of manufacturing only the best.

Calorite Makes Masters the Leaders

We saw its wonderful advantages—
We realized that we had at last found a material which should make us the world's leaders in spark plug manufacture.
But we could not afford to take the slightest chance of making a mistake—and we didn't.
We had made a wonderful success with our Master porcelain plugs—
If we were to change, the new material must be able to stand any abuse—
And so after exhausting all ordinary methods of test we determined to subject Calorite to the most brutal and destructive strains imaginable.

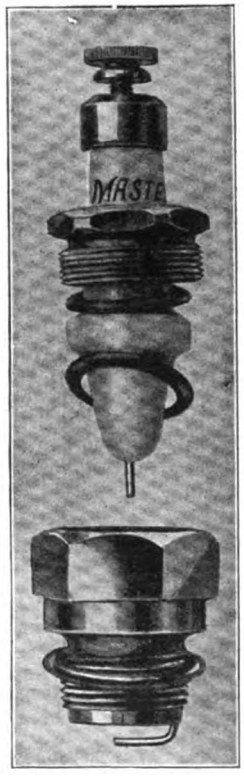
The First Test

Heated until white hot, 2000 degrees, and then plunged into cold running water. This heating and cooling was repeated—ten times—the MASTER CALORITE SPARK PLUG alternately heated to this terrific temperature and plunged into icy cold water.
The internal stresses set up by this instant change from white heat to icy coldness were terrific—yet the CALORITE insulator was just as sound after being put through this radical test as before being subjected to these immense temperature changes.



The Second Test

To exhaust every means of possibly wrecking this material, our engineers attempted a breakdown test. This consisted of heating the MASTER CALORITE SPARK PLUG to a red heat, 1500 degrees and instantly plunging it into cold running water. This alternate heating and cooling was repeated 26 times. MASTER CALORITE SPARK PLUGS came through both of these tests unscathed.
The remarkable qualities of Calorite were all demonstrated after it had emerged from these terrific tests.
Then and only then did we decide to adopt Calorite as the one and only material suitable to make Master Spark Plugs the actual leaders.
Porcelain a few months ago seemed the finest, most practical material for spark plug insulators.
BUT—the finest samples of porcelain—subjected to a fair test along with Calorite did not meet in any way the requirements we sought.
We wanted to be fair—
We gave porcelain its chance—but it couldn't stand the gaff—
Some of the best samples of porcelain—subjected to the same tests as Calorite—heated white hot—broke the first heating—never even got to the cold water.
MASTER CALORITE PLUGS will not break in service—no matter how severe.
Won't soot.
Won't leak compression.
Won't give any trouble at all—we have tested them in every variety of service and we know.
In Calorite we have adopted a material for the insulators of Master Plugs which easily makes Masters the most dependable, longest lived spark plugs in the world.
This plug should prove the most remarkable seller that has ever been offered to the motorists of the country.
A guarantee which is most liberal and comprehensive goes with each plug.
Every Master Calorite is now packed in a round wooden box decorated with a label which in itself attracts the customer's eye.
The progressive dealer and jobber will reap the harvest which will come to those taking this plug on first.
Write for the story of Calorite and Master Plugs and for complete information on the advantages of handling these remarkable plugs.



JOBBERS and DEALERS—A new schedule of quantity prices go into effect January 1st. The Trade will be advised specifically ample time in advance.

MASTER CALORITE SPARK PLUGS
Made in the U. S. A.

Manufactured and guaranteed by

HARTFORD MACHINE SCREW COMPANY
514 CAPITAL AVENUE HARTFORD, CONN.

Fifty years of prestige and successful manufacturing experience.

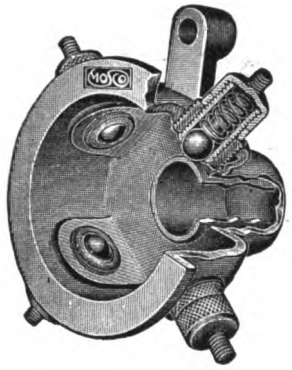
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CATALOGUE NOW READY

MOSCO

SPECIALTIES

FOR 1916





TIMER SHAFT EXTENSION



Bemus Timer Patents { Sept. 24, 1907 / Dec. 17, 1907 / Feb. 16, 1915 / Apr. 27, 1915 } Others Pending

WHY were tens of thousand of these Timers sold in 1915? Why were we able to obtain a national distribution in a phenomenally short time? Why did 1,000 dealers from Boston to San Francisco look to us exclusively in 1915 for Timers for Ford Cars? **BECAUSE**

THE BEMUS BALL CONTACT TIMER

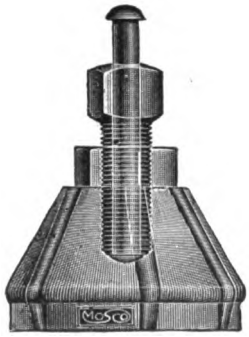
STOPS THAT SKIP. By reason of the method of mounting—on the time shaft—the main cause of skipping is eliminated. You will be surprised at the improvement here.

SMOOTHES OUT THE RUNNING to a degree which you would have believed impossible.

GIVES THE MOTOR MORE POWER, MORE SNAP, STEADIER PULLING, AND DOES AWAY WITH THAT JERKY RUNNING ON LOW THROTTLE.

PRICE $2.25

Reinforcement of advance arm by moulded-in steel bushing is a late feature.



Patented { Mar. 24, 1913 / Dec. 15, 1914

WHEEL PULLERS

(Loose Plunger Type)

For Ford, Overland, Buick, Maxwell and Chevrolet Cars

Every practical man knows that the only way to start a wheel which is stuck or "frozen" to the axle is to drive back the axle while pulling the wheel. Two men are required by the old method—the ordinary wheel-puller will never take off a stuck wheel—one man can do it easily with the MOSCO puller. They have loose plungers extending through the screws—and bearing on the end of the axle. A blow with a hammer on the plunger, a turn of the screw, another drive with the hammer, and the wheel is off—no matter how long it has been on, nor how fast it is stuck. Information and prices on request.



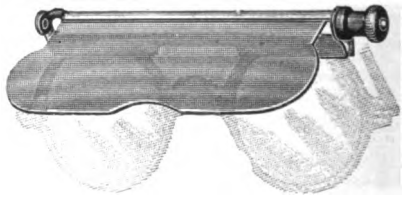
MOSCO Valve Grinder

The working principle of this tool is entirely different from that of any other grinder, having an automatic reversing motion that eliminates all danger of rotating the valve too far in one direction. It is twice as quick as any other tool, and insures safety of valves even when grinding is done by inexperienced persons. The superior finish which is produced is a delight to every user. Now furnished with two forged tools—one for Ford valves and a standard universal tool for other engines. This is one of the best specialties we have ever made. Should be in every tool kit.

PRICE $1.50 EACH

MOSCO Adjustable Eye Shade

Fits All Goggles and Eye Glasses



Readily Applied by the User

LIGHT — COMFORTABLE — CONVENIENT — SAFE

The first and only real solution of sun glare and night driving problems.

This attachment provides a convenient and inexpensive means for protecting the eyes from any blinding glare from any source, especially from automobile headlights by night and from sun rays by day. It is in the nature of a visor, but is adjustable to any angle to meet rays of varying heights. The shield is made of transparent material which subdues blinding lights without obstructing the view.

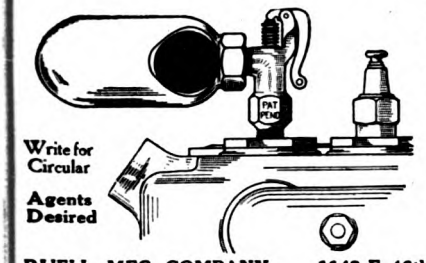
Price (in paper carton), 50c. each
Price (in leatherette case), 75c. each

MOTOR SPECIALTIES COMPANY

MANUFACTURERS, WALTHAM, MASSACHUSETTS

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THE BUELL EXPLOSION WHISTLE



Write for Circular

Agents Desired

A New Type of Signal

operated directly by the explosion thru the priming cup opening in the cylinder.

Not an Exhaust Horn

Extreme simplicity assures freedom from all trouble. Consists of a poppet valve and a 5 oz. whistle. First cost low. No operating expense. Very easily installed.

Far more effective than an exhaust horn as the gas operating has at least ten times the pressure. Uses but a portion of the charge, the equivalent of opening a pet cock for an explosion or two. When you hear that powerful, distinctive note, you will know it is a Buell.

Sold on Trial
Guaranteed for Life

BUELL MFG. COMPANY 1143 E. 46th Street Chicago, Illinois

Slip a New Roof Over Your Old Ford Frame



If you have a bad or leaky roof on your **Ford Top,** we can furnish a **slip roof outfit** which will make the old Top as good as new. You can easily take the old roof off and put on the new one in 15 minutes. We furnish new Roof, Quarters, Back Stays and Back Curtain with celluloid light, stitched and ready to slip on. Made of 32 oz. rubber for 1912 to 1915 Roadster and Touring Cars. Fit Guaranteed. We also make One-Man and Regulation Tops for Ford Touring Cars and Roadsters.

Write for samples of fabrics and prices, giving model and year of car.

CLEVELAND TOP CO., 3102 Franklin Ave., CLEVELAND, OHIO

Cut Headlights Yourself



"RED DEVIL" Circular Glass Cutter No. 033 cuts circles 2 to 20". Saves its cost on first job. Postpaid for 50c. Discount on quantities.

Write today for profitable particulars.

SMITH & HEMENWAY CO., Inc.
179 Chambers Street New York City



That Private Portable Garage

Which adds so much pleasure to every Car Owner. My New Illustrated Price List describes more than 20 Low Priced Pretty Buildings. And you surely want one, too. We will deliver it on approval. Send card with your address today.

Portable House & Garage Factory, Beaver Springs, Pa.

50 Mends for 50 Cents



Price 50c

Genuine Solder

With an ordinary match it easily mends and solders metals permanently. Used by the housewife, farmer, electrician, automobilist moving picture operator, jeweler, merchant and mechanic.

AGENTS WANTED

Show what it will do and it sells itself. Everybody wants SOLDERALL. Send 50c for large tube. Your money back if dissatisfied.

EMENAR CO., 52 E. 23rd St., New York City

Spindle Arm Silencer For Ford Cars



Pat. Aug. 31, 1915

If you have not got a pair, get them at once.

Absolutely stops all rattle in arm, and stops wear, helps in steering your car. No nuts or bolts to take out, put in from front side with nippers. Once there, will stay. Sent to anyone on receipt of price, **50 cents per pair, postpaid.**

J. W. SANBORN MFG. CO., Hampstead, N. H.

Coverall SUITS



This garment is made of close woven material, absolutely oil, dust and grease proof; will protect the clothes entirely when working around the car, garage or machinery.

Invaluable to Autoist and Machinist.

The only kind of garment that will keep the clothes entirely clean while working around a car. Made all in one piece. Easy to take off and put on. Comfortable and practical. Made of strong washable material.

Dark Tan Khaki	$2.25 each
Medium Weight Tan Khaki	2.75 each
Very Fine Weight Tan Khaki	3.25 each

Sent Parcel Post Free. Remit with Order.

State size of chest when ordering.

Duster Coats at Special Prices.

Tan Lineene	$1.25 per Coat
Tan or Slate Herringbone Stripe	2.00 per Coat
Gray Mohair	3.00 per Coat

Automobile Apparel Co., Port Chester, N.Y.

Dealers—Write for Trade Discounts.

SANDBO STARTER AGENTS DEALERS WANTED

FOR FORDS, Maxwells, Saxons, Cyclecars, etc. Differs from all others—never fails to start. It gives crank a complete revolution—past **Two Compressions** Over two ignition points. Fully guaranteed. Easy to attach. Nothing to get out of order. Price, $14. Write



SANDBO STARTER COMPANY, 34 Sandbo Bldg., Rock Island, Ill.

ASK a Ford Owner how much water he uses in his Radiator, and he will say,

"I fill it every day."



Attach a **Security Gear Driven Pump** and get away from this nuisance. Your engine will no longer be a hot water radiator to heat up the front compartment of your car. Saves oil and reduces carbonization.

Sold on ten day trial.

Price $6.00 complete. Agents Wanted.

THE SECURITY COMPANY, 56 Terminal Way, Pittsburgh, Pa.

Beartone



OAKES HORN and FAN combined for Ford cars. Not electric. Press button. Simple and Safe. Economical.

Write for booklet or dealers' proposition.

THE OAKES COMPANY
Dept F. INDIANAPOLIS

MATTSON RUBBER ACCESSORIES

Reliners, Blow-Out Patches, Red Inner Tubes, Etc.
Also MATTSON UNGUARANTEED TIRES.

Write for Price Quotations.

MATTSON RUBBER CO.,
LODI, Bergen Co., NEW JERSEY.

AUTO DEALERS, ATTENTION!

UTILITY VARNISH RENOVATOR is a money maker for you, and keeps your customers happy. Keeps the varnish on the Auto looking new, is non-acid, non-alkali; saves time, labor and varnish. Ask your jobber or send direct for trial size.

POUGHKEEPSIE UTILITIES CORPORATION
Department A, Poughkeepsie, New York

KEROSENE Gas Lamps



BRIGHT AS THE SUN
SIMPLE AS A CANDLE
A Flood of Shadowless Light

for every purpose. If we are not represented in your town, write for particulars in profit making deal for dealers and agents.

BRILLIANT GAS LAMP CO., 1009A So. Wabash Ave., Chicago, Ill

SEATS A SPECIALTY



THE HILL MANUFACTURING CO.
25-27 FULLER ST. BUFFALO, N. Y.

AUTO REPAIR SHOP

Complete Oxy-Acetylene Welding Equipment ready to weld including 200 feet of oxygen gas and 225 feet acetylene gas. Tanks loaned in the central West. **$58.50.** Write for free printed matter.

THE CAMPBELL IRON ACCESSORIES
815 Cass Avenue ST. LOUIS, MO.

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Oxy-Acetylene Welding and Cutting



Welding together pressed steel halves of rear axle housing; making one-piece construction.

This Modern, Profitable Method Deserves a Place In Your Shop

Every day you delay putting yourself in position to utilize Oxy-Acetylene welding economies in motor car manufacturing or repairing, you lose good legitimate profits.

Progressive automobile manufacturers are securing better features in design, such as reduction of weight, and increased strength, at less cost, than is possible by any other method of construction. Subsequent finishing of welded parts is easy, when required, since the metal is left in perfect workable condition.

The Logical Repair Method

For the same reasons that oxy-acetylene welding has proven itself tremendously valuable for manufacturing operations, the process offers the logical method for metal repairs. It supplies the best and cheapest method of joining broken or worn metal parts, giving increased quality at less cost.

In addition to regular automobile repairs, the live garageman can "cash in" on many welding repairs outside the automobile field. For this there is a large established demand.

At very moderate charges for work done, the profits thus gained mean a materially increased income. INVESTIGATE.

Prest-O-Lite PROCESS

Employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which provides dry, purified gas, insuring better welds, quicker work, and lower cost, and also avoids the large initial outlay and heavy depreciation incurred in making crude acetylene in a carbide generator.

The necessary equipment is not expensive. We furnish high-grade welding apparatus for $60 (Canada, $75); acetylene service at additional cost. Also adaptable for oxy-acetylene cutting by the purchase of a special cutting blow-pipe. Thorough instructions are furnished free to every user—any average workman can learn the process quickly. We will train your operators at our shop if you desire.

Enterprising Men Find This a Good Business Opportunity

Welding profits are sure and come quickly because of the growing demand for oxy-acetylene welding. Get your share now.

Free illustrated literature showing how you can secure oxy-acetylene welding profits in your shop, sent on request.



The Prest-O-Lite Company, Inc.

The World's Largest Makers of Dissolved Acetylene

Main Offices and Factory:

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53 Branches and Charging Plants

When Gasoline is High— Look to Your Lubricants!

The average car owner would save ten per cent on his gasoline bills, if he could coax another mile or two out of each gallon.

Friction is the greatest foe of fuel economp.

It eats up power in bearings and gears; it eats up bearings and gears too.

Efficient lubrication will do much to offset the depredations of friction.

Tests made by leading auto manufacturers have proved NON-FLUID OIL to be the highest grade and most efficient automobile lubricant produced.

You too would readily recognize the advantages of NON-FLUID OIL over common greases.

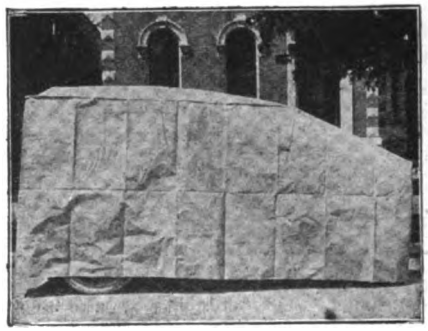


Get a can from your dealer today and try it, or write for free sample.

NON-FLUID OIL is packed only in orange-colored cans.

New York & New Jersey Lubricant Co.
165 Broadway New York

KENNEDY AUTO STORAGE COVERS



To meet the need of an inexpensive and efficient cover for automobiles while in dead storage we are making a paper cover, which is proving the right thing for this purpose.

These covers are made of strong heavy paper, properly reinforced to prevent tearing.

They protect the car against dirt, dust and moisture and will prevent the polished portions from tarnishing and the finish from checking in cold weather.

These covers are salable to individual car owners at a good profit as well as to furnish the dealer a protection for his stock of new cars.

We make them in four sizes: 7 PASSENGER, 5 PASSENGER, FORD SPECIAL, ELECTRIC.

Winter will soon be here and dealers can handle these covers with satisfaction and profit. Further information on request.

THE KENNEDY CAR LINER & BAG CO., Shelbyville, Indiana

CARBON
HART-BELL
REMOVER

is based on the scientific principle that live steam is the best solvent of carbon deposits. The Hart Bell is permanently attached to your car, you can attach it yourself, and can be used as often as desired or necessary. The cost of the evice is the only cost, and you can free your motor forever from the clutches of old demon carbon. Sold under an ABSOLUTE GUARANTEE

Write for descriptive literature to

UTILITY PRODUCTS CO., Times Bldg., N. Y.

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SAFETY FIRST

USE

THE LITTLE STEERSMAN

Ask Your Dealer or a Little Steersman User



LITTLE STEERSMAN



LITTLE STEERSMAN ATTACHED

Patented June 22, 1909

STOP THAT CONSTANT STRAIN, wobbling front wheels, make your car easier to drive, at the same time lessen the danger. Full particulars and prices at your dealer's.

MODERN AUTO APPLIANCES CO.

Dept. D. **CHATHAM, N. Y.**

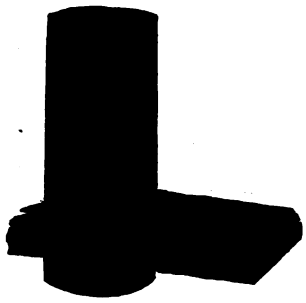
Why Every Car Needs this Special-Purpose Packing

Leaky carburetor connections, leaky transmissions, differentials or crank cases, or leaky cooling-water connections—these are faults that *cannot* be permanently overcome by the finest repair work on the parts themselves.

Only a packing, absolutely impervious to, and long-wearing in oil, grease, gasoline and hot water can add this finishing touch to the car.

ENDURA is made specially for such purposes as those. Send for free samples today, and a chart, "How to Pack the Car."

Endura Manufacturing Co.
6305 Eastwick Avenue
Philadelphia



ENDURA Sheet Packing

BETTER :-: LIGHTER Lower in Cost

Three of the most important reasons why you should buy a RAPID-FIRE Storage Battery for your car.

A 6 volt self starter requires an output of 100 amperes or upwards to turn the engine over.

Our battery will discharge 100 amperes two to four times as long as other batteries of like weight and size.

We will remake your old battery with new plates throughout and prove our assertion.

If you do not feel like buying a new battery let us remake your old one. We will guarantee you one full year of service.

Nearly all the trouble in storage batteries is caused by the plates buckling.

We guarantee our plates not to buckle. Remaking in this way gives you practically a new battery at about half the cost of a new one.

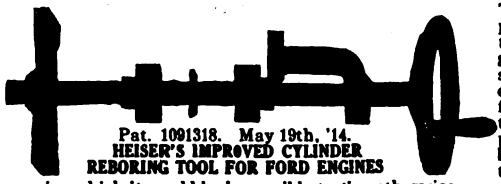
Ask for our Price List for Remaking.

The Wright Rapid-Fire Storage Battery Co.

96 MARKET STREET **Tiffany Building** **POUGHKEEPSIE, N. Y.**

REPAIRMEN!

MAKE MONEY REBORING CYLINDERS



Pat. 1091318. May 19th, '14.
HEISER'S IMPROVED CYLINDER REBORING TOOL FOR FORD ENGINES

This tool accomplishes results the same as grinders costing several hundred dollars and a few jobs enables the machine to pay for itself, besides giving the customer service which it would be impossible to give otherwise.

It requires an expenditure of $5.00 and 90 minutes energy to make the cylinders and pistons as tight, true and new as the day they left the Ford Factory. Reboring and fitting oversize pistons is the most important repair that can be given a worn motor, and this is the most important tool you can buy for your shop, for the low price of the tool together with the low price of the pistons makes it an attractive proposition for the repairman who wants to make his shop popular.

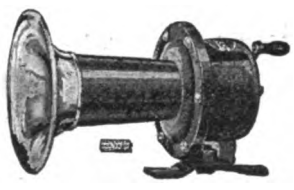
Do it now: The first job of reboring means $ $ $ $ $ to you, if it is done in your shop.

Write for Full Particulars and Proposition

We furnish the oversize pistons, $1.25 each, net.

HEISER SPECIAL TOOL CO., Dept. A., Kingston, Missouri

$4 SEISS Model A



$4 SEISS Model A

DOUBLE ACTING MECHANICAL HORN

A powerful, Commanding Warning Signal—the surprise in Mechanical Horns. Operated by touch of hand—turning either right or left—for short low or sharp blast—or for long continuous sound same as a motor driven Horn to demand attention and right of way.

At your dealer's or direct from factory—with 10 year guarantee, only $4.00. ***Write to-day for printed matter.***

The Seiss Mfg. Co., 443 Barr St., Toledo, O.

CARBON-NOT



PRICE

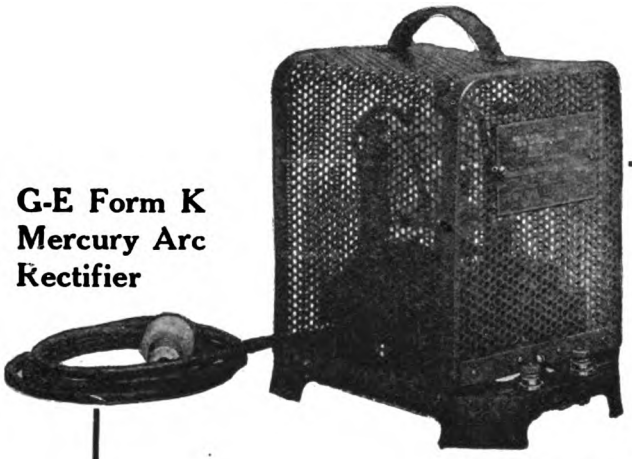
1 Pint Can.....$1.25

W. E. PRUDEN HARDWARE CO.
862-864 Eighth Ave., NEW YORK

Complete catalogue of Automobile Supplies sent to Trade on request.

Agents

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G-E Form K Mercury Arc Rectifier

Simplicity

All that is needed for charging your starting battery at home is a G-E Form K Rectifier and a hydrometer.

Simply connect the Rectifier to lamp socket and battery.
Simply rock the Rectifier once or twice to start it.
Simply leave charging until specific gravity on hydrometer stops rising.
Simply disconnect.

Isn't it simple to keep batteries fully charged—and isn't it a mighty big satisfaction to be assured of positive starting even in zero weather?

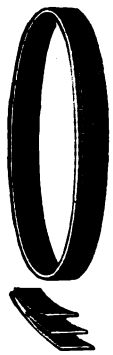
You can have a power plant for your batteries right in your own home at a very small expense and trifling operating cost.

If your dealer does not stock the G-E Form K Mercury Arc Rectifier, write our nearest representative.

General Electric Company

General Office, Schenectady, N. Y. Sales Offices in all large cities

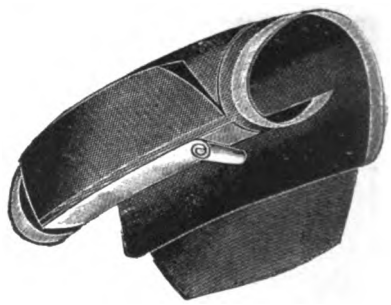
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NO STRETCH FAN BELT FOR FORD CARS.



CEMENTLESS PATCHES.



VULC-TITE PATCH

America's Biggest Selling Accessories

SELL ON MERIT.

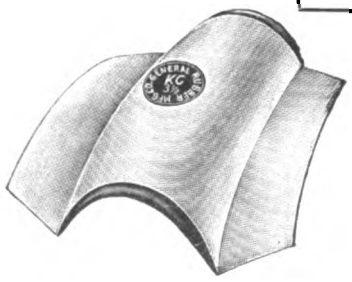
For Reliner, Patch or Fan Belt Catalog

Address Accessory Department

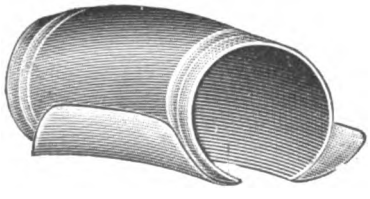
The General Tire & Rubber Co., AKRON, OHIO.

Formerly Western Tire & Rubber Co., Kansas City, Mo.

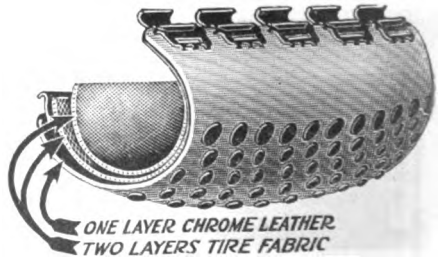
RUBBER TIPPED MOULDED PATCH.



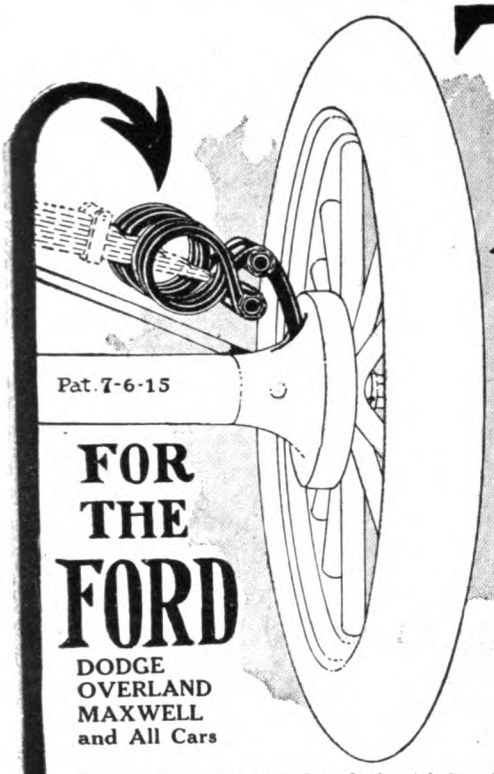
CORKER PATCH.



NO STRETCH ADJUSTABLE BOOT.



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THE NEW TWIN SPRING SHOCK ABSORBER

FOR THE FORD
DODGE
OVERLAND
MAXWELL
and All Cars

PLAIN SPRING TALK
In the Spring by Spring People

We are asked every day to explain wherein the **Twin Spring** differs from the **Shock Absorber** in general use today. The great majorty of **Shock Absorbers** are nothing more or less than a *brake* applied on the *leaf springs*, which retards their action and prevents them from doing the work for which they were intended. They *reduce* the spring capacity of your car instead of *increasing* it. There are other **Shock Absorbers** of the *cylinder* or *plunger* type made on the principle of the *door check.* They absorb the first shock but are slow to recover for the next; while your car is waiting for that recovery you are riding practically without springs of any description.

The **Twin Spring** is a *supplementary spring,* instantaneous in its action. The principle and result obtained therefrom is entirely foreign to the so-called **Shock Absorber. Twin Springs** are *free to act* in every way in conjunction with the *leaf spring.* They not only leave the *leaf springs* free to perform the work for which they were designed, but they assist them to perform that work. **We challenge contradiction to our claims.** Get an expert's opinion. Every road shock coming from the wheel passes through the **Twin Spring** (see those coils) on its way to the body of your car. The *shock* is transformed and reduced, the *life* is taken out of that *shock* right there, and that without in any way disturbing the action of the *leaf springs.* Call them **Shock Reducers** or **Shock Transformers,** anything you like, they are the only **Result Producers. Let us prove to you, Mr. Car-Owner,** that **our statements are correct.**

Write for our agents' proposition and prices.

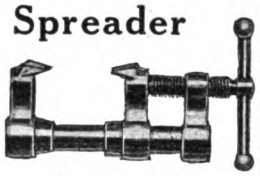
TWIN SPRING COMPANY - 998 Boylston Street, Boston, Mass.

Knowlson's Spring Spreader

SPRINGS must be lubricated to preserve them.

Stops the Squeak and Gives 100% easier riding.

Drop forged, nickel plated and highly finished.



Pat. Aug. 18, 1914
Pat. June 8, 1915
Pat. Nov. 9, 1915

Protected by Basic Patents.

Price $1.50

GUARANTEED

At all dealers—or sent direct upon receipt of price. Money refunded if not satisfactory.

Write for Trade Discounts



Spring Leaf Lubricator Company
1000 Forest Ave., Ann Arbor, Mich.

Piston Rings

Mitre · Step Cut · "3 in 1"



The Stevens "Non-Set" piston rings are made from individual castings, ground to absolute accuracy. All sizes and patterns in stock—one quality, the best. A supply that will meet any demand.

THE STEVENS PISTON RING ASSORTMENT

Containing 125 of the best quality rings and includes 14 sizes. Rings that are used on practically all popular cars.

For repairmen, we stock and sell complete line of Piston Rings, a great convenience and a most profitable line for jobbers and dealers to sell. The box of assortment is only an added attraction. Send for catalogue.

Every Ring Guaranteed **List Price, $20.00**

STEVENS, & Co. 375 BROADWAY, NEW YORK CITY.



PATENTED
PERFECT-LOCK PATCH

"20th CENTURY" PATCHES

are the ONES that interest the JOBBERS and DEALERS—because of the HIGH QUALITY and LOW PRICE that increase sales. The ONES that interest the MOTORIST—because of the GUARANTEE of Absolute Satisfaction or Money Refunded.

Handled by Jobbers and Dealers Everywhere

20th CENTURY TIRE PROTECTOR COMPANY
MIDLOTHIAN, TEXAS
Largest Exclusive Patch Manufacturers in America



RELIABLE CLINCHER PATCH

It's ➡ all in the lock joint



PEERLESS PISTON RINGS

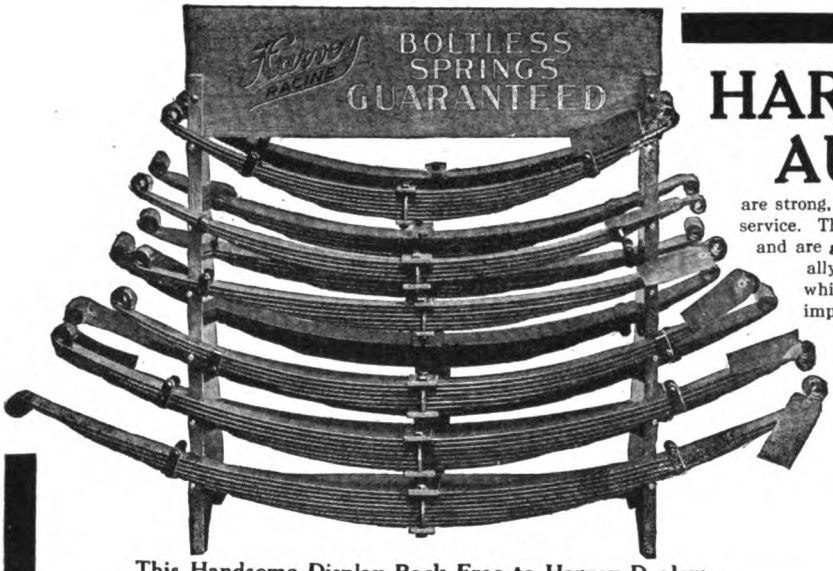
Made in Chicago

The only Efficient, Economical, Sensible and Simple Rings on the market today. A one-piece ring that is sold on a money-back guarantee. Absolutely compression tight and carbon proof.

Write for Details Now.

Distributors: LARSON & HILKER, 19 S. La Salle St., Chicago, Ill.

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This Handsome Display Rack Free to Harvey Dealers

HARVEY BOLTLESS AUTO SPRINGS

are strong, durable, resilient, and are built to give long, continuous service. They are made without a hole at center, have no weak spots and are *guaranteed from end to end.* The plates are scientifically formed and tempered on the Harvey patented machines, which make them with an accuracy and uniformity that is impossible to obtain with hand labor.

Over 10,000 Springs carried in stock at factory for quick shipment. Each spring painted black, wrapped in burlap and tagged with complete description. Complete assortment of Harvey Springs also carried in stock at all leading jobbing centers. Write for name of your nearest jobber.

Write for the Harvey Auto Spring Book. It contains a complete list of springs for over 300 of the leading makes and models of automobiles and is mailed free.

THE HARVEY SPRING CO.
849 17th STREET, RACINE, WIS.



Patent applied for.

MORE POWER LESS GAS

R & M CONFORM—The "Mechanically Right" Piston Ring

Made in Indianapolis. 100 per cent efficiency.

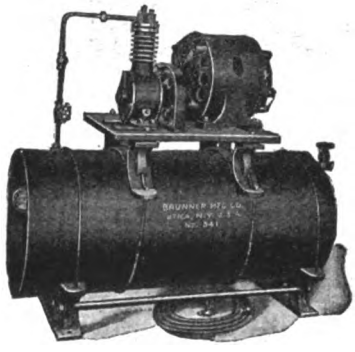
Piston rings give the best satisfaction which permit the least loss of compression and which cause the least loss of power from friction. The R & M Conform Piston Ring is guaranteed to do this, also to cut the cost of maintenance by reducing gasoline and oil consumption and greatly eliminating carbonization and spark plug troubles. The R & M Conform Piston Rings are specially adapted for aluminum alloy pistons, and give most efficient results.

Jobbers and dealers wanted in every city. Write for prices. Distributors,

SUPERIOR AUTO PARTS CO., 938 Fort Wayne Ave., Indianapolis, Ind.

Be Honest with Yourself, Mr. Garage-man—

Don't Buy Till You Look Over the



New Brunner Equipment

At the Chicago Show

Two sizes—High-grade metal construction throughout—No troublesome belts—No wooden parts to warp and throw compressor out of alignment.

Take it from shipping crate—wire up the motor—attach hose or pipe line to outlet valve and fill your tires.

Specify "Brunner" on you 1916 air compressor order and start the new year right.

Send for the name of the Brunner Jobber who covers your territory, and our new No. 13 catalogue.

BRUNNER MFG. COMPANY
Dept. D UTICA, N. Y.

$15 For a Set of FOUR

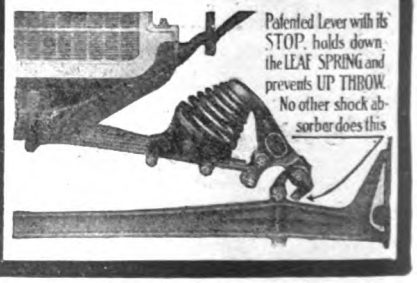
One Man Bought 1000 Sets of HASSLER

Shock Absorbers for Ford Cars

at the New York Show. This man is a progressive dealer. He has studied shock absorbers from A to Z. He knows Hasslers are superior in giving perfect riding comfort—easy steering and safe driving to any other, and he knows that among owners everywhere, they are "Recognized as the best."

This man knows he can sell Hasslers. You can sell them too.

Write for our trial set proposition. Not sold through jobbers—we protect you.



Robt. H. Hassler
INCORPORATED
Indianapolis, Indiana

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Don't do without an engine Now!

It is cheaper now to have a WITTE engine than to do without. Easy to start, without cranking; easy to manage; and easy to own on any suitable, reasonable terms of payment during a year.

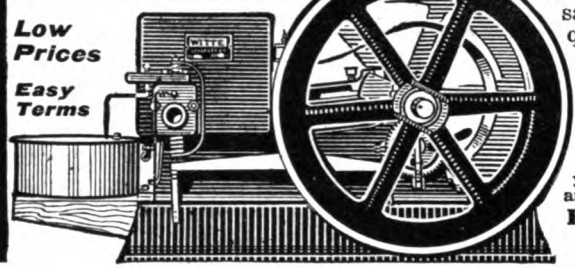
Fuel-Saving WITTE ENGINES

Gasoline, Kerosene, Distillate and Gas

Let me send you an engine to earn its own cost, while you pay for it. *Ed. H. Witte.*

Low Prices

Easy Terms



Stationary engines for prices averaging less than $17.50 per horse-power. Eight sizes, stationary and portables, four sizes saw-rig outfits. Guaranteed high quality—through and through—as durable as superior design, the best of materials and workmanship can make. Get my engine facts before decide to get any engine.

Book Free: My book, *"How to Judge Engines,"* will show you how to save and make money in getting and using an engine. Write for it today, addressing nearest office.

ED. H. WITTE, Witte Engine Works,
2494 Oakland Ave., Kansas City, Missouri.
2494 Empire Bldg., - Pittsburgh, Penna.

Look at These New Prices!
(F. O. B Factory)

SIZE H-P	STATIONARY ENGINES	PORTABLE ENGINES
2	$ 34.95	$ 39.95
3	52.45	60.50
4	69.75	82.75
6	97.75	127.75
8	139.65	174.65
12	197.00	237.00
16	279.70	329.70
22	359.80	412.30

Engine Saw-rigs Complete.
4 H-P, $124.25; 6 H-P, $152.25
8 H-P, 202.15; 12 H-P, 267.00

5-Year Guarantee

Cash or Easy Terms

LESS THAN $17.50 Per Horse Power WITTE ENGINES Why Pay More

SAVE ONE-HALF THE COST OF A NEW AUTO TOP



by using our patent applied, copyrighted, top cover order blank.

GET OUR PRICES AND LEARN HOW TO SAVE MONEY

BUOB & SCHEU, 300 E. Court St., CINCINNATI, OHIO

"Alive With Power"

Detroit



Batteries

Made for Every Car and Starter

List Prices Reduced 50%

All prices are net, printed plainly, and mean what they say, protecting both dealer and consumer against paying exorbitant prices. You know what you are doing when you buy a Detroit Battery.

Detroit Batteries are proven by the tests of an engineering expert first in capacity, first in capacity for weight, and first in durability. They are made to fit every American car and starter. Sales are limited only by the cars in your community, and every sale means a satisfied customer and more business.

Write for Dealer's Proposition

Detroit Battery Company
Detroit, Michigan

DON'T BURN GASOLINE BURN AIR



An auxiliary air valve in your intake manifold, operated automatically by the suction of your motor.

THE AEROFRAM

A GASOLINE SAVER

THAT SAVES.

Costs but one dollar, can be attached to any car in 10 minutes. Gives more power, keeps down carbon, and makes the motor run more smoothly. Nothing to adjust—positively automatic.

On accurate tests made on more than 100 automobiles, an average increased mileage of 5.7 miles per gallon was shown.

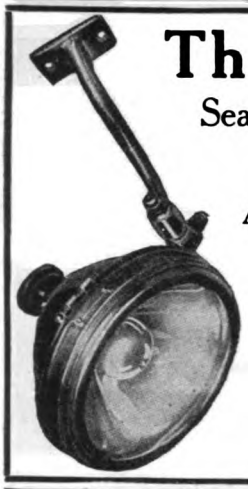
Send $1.00 and an AEROFRAM will be sent you by return mail.

THE AEROFRAM COMPANY, Inc.,
105 Massachusetts Ave., BOSTON, MASS.

A GUARANTEE IN EVERY BOX.

AGENTS WANTED.

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The Nite-Lite

Searches out DANGER
Reads SIGNS

An Absolute Necessity for Night Driving

21, 40, 50, C. P.
Nitrogen Bulb included

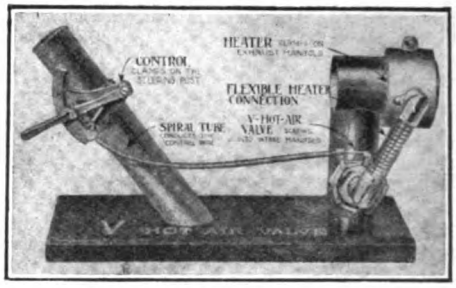
The V Hot Air Valve

Screws into the intake manifold just above the carburetor so it will admit superheated air into the gas as it passes from the carburetor to the cylinders, PREVENTING ALL CARBURETOR TROUBLES. SAVES ONE GALLON OF GASOLINE OUT OF EVERY FOUR, AT THE SAME TIME INCREASING THE POWER OF YOUR CAR.

WRITE ABOUT THIS TODAY—IT IS IMPORTANT.

We also carry a general line of accessories.

CARBON REMOVED by oxygen process.

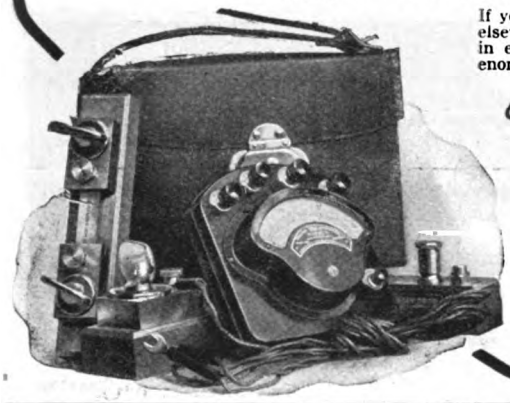


Manufacturers Distributing Company of America

BATTERIES REPAIRED RECHARGED REPLACED

246 West 56th St. NEW YORK

Don't Send Your Customers to Another Garage!



If you cannot intelligently repair electric starting and lighting equipment, your customer will go elsewhere for this service. He will take the rest of his trade with him. There is more money in electrical repairs than in any other department of the garage business. The demand is enormously increasing.

Weston

Model 280

GARAGE TESTING INSTRUMENT

Is the best, the most reliable and therefore the cheapest electrical equipment for you. It enables you to promptly and accurately determine the condition of the electrical equipment of any automobile, just where the trouble is and just how to remedy it.

Write for our *Special Proposition.*

Weston Electrical Instrument Co., 2 Weston Ave., Newark, N. J.

Branch Offices in the Larger Cities.

WILMO ONE PIECE COMBINATION MANIFOLD

Specially designed for make and model of motor

Easily and quickly installed
No cutting or fitting



Solves problem present day low grade gasoline

Make a "4" Run Like a "6"

INCREASES POWER — MOTOR MORE FLEXIBLE — ELIMINATES CARBON TROUBLES

REDUCES COST OF OPERATION — PAYS FOR ITSELF IN A FEW WEEKS

PRICE - - $10.00 F.O.B. Chicago
SPECIAL for FORDS - - - $5.00

Liberal Discounts to Dealers and Agents

WILMO CO., 209 South 5th Avenue, CHICAGO, ILL.

HIGH H-S SERVICE

REPAIR PARTS FOR FORD CARS

HILL-SMITH METAL GOODS COMPANY

88 Pearl St. Cor. HIGH St. Boston, Mass.

Trade **"NO-LEAK-O"** Mark

A Scientific Oil Packing Piston Ring
A Ring With A Reason

There's no mystery about "NO-LEAK-O" Rings. A simple, plain mechanical fact.

Piston movement, uneven expansion and contraction makes perfect fitting impossible. It's the OIL that forms the seal, prevents escape of gas and lubricates.

Mr. M. J. Brandon, Mechanical Engineer of the Avery Co., Peoria, Ill., writes: "They cut the consumption of lubricating oil in two; a great saving in gasoline; spark plugs are clean and about 10% more power can be gotten out of the motor."

The grooves convey enough OIL to form the seal, which means perfect compression without WASTE; maximum power with less GASOLINE; perfect lubrication without CARBON, smoke and oily plugs.

We absolutely GUARANTEE each ring for QUALITY, ACCURACY, and satisfactory service.

ONE PIECE LOW COST HIGH EFFICIENCY
Carbon Eliminated by Controlling the Oil.

Write for circular and special trial offer.

AUTOMOBILE ACCESSORIES CO.,
816 West North Ave., - Baltimore, Md.

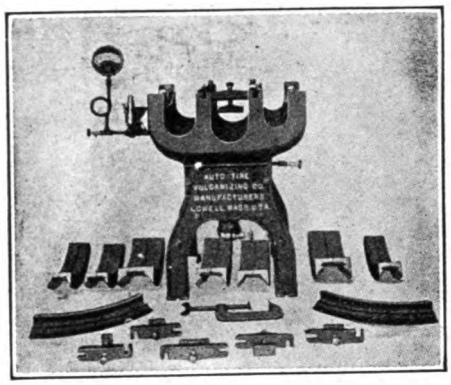


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EXCEPTIONALLY LARGE PROFITS

Can be made by Repair or Garage Men

WITH No. 8 NEW ADJUSTABLE SECTIONAL VULCANIZER



It's different, superior, economical in operation, in fact beyond comparison.

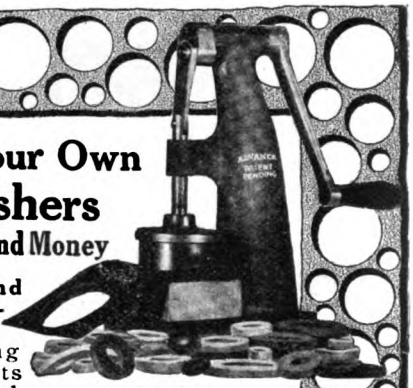
Complete and thorough work can be accomplished with this vulcanizer at all times.

Don't Lose A Minute, Write Today.

AUTO-TIRE VULCANIZING CO., 140 Powell Street, Lowell, Mass.

Cut Your Own Washers

Save Time and Money



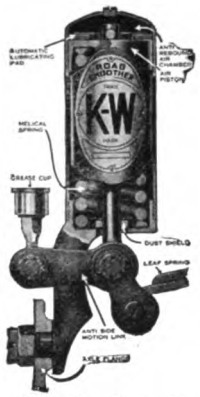
Jobbers and Dealers— Don't waste time writing for shipments of Special Washers. Cut them yourself, in a minute, with your own Patent "ADVANCE" Machine. When a washer (FELT, RUBBER, LEATHER, or ASBESTOS) on a Packard, Pierce Arrow, Cadillac or Chalmers needs replacing at present, you must send to a service station or the factory, with a delay of a week or more, and at a much greater expense.

ADVANCE
QUALITY + SERVICE
Patent Washer Cutter in Operation

With the Patent "ADVANCE" Machine you select the goods desired from your own stock, and cut the size washer desired, for any car, in a minute, at the maximum cost of a few cents.

The "ADVANCE" is the only washer cutting machine made, THAT CUTS. A regular hand punch press, complete with a full set of dies. Will cut Felt, Leather, Rubber or Asbestos. **Guaranteed to Give Satisfaction.**

Advance Felt Specialty & Cutting Co.
Sole Factors
159 West Harrison Street, Chicago
Sales Offices: New York Detroit San Francisco



Don't wait until Spring to buy your

TRADE K-W MARK

Road Smoothers

REG. U.S. PAT. OFF.

Quickly applied to your Ford Car

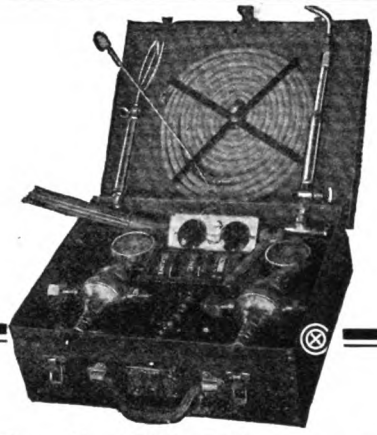
$15 Set of Four
One for Each Wheel

Put a set on **now**—you can do it in half an hour and get big, heavy car comfort from your light, economical Ford all winter. Frozen roads are rough and rutty and hard to drive over if your car is **not** equipped with K-W Road Smoothers.

K-W Road Smoothers are sold by reliable dealers everywhere. If you don't know yours, sent direct on receipt of price.

TRADE THE K-W IGNITION Co MARK

2817 Chester Ave. CLEVELAND, OHIO. U.S.A.



A Real Welding Outfit

$50.00

SIMPLE — DURABLE — RELIABLE

It is all that the Cox Standard implies—so complete you can hitch it to your gas tanks and handle any job that comes to you after a little practice. Scientifically built to do good work by experienced welder manufacturers and to do this work cheaper than you can do it now by any other means. Guaranteed against mechanical defects by a company that has made high grade successful Welders for years.

You can do any automobile or machine welding job with it. You can straighten bent frames and axles—add metal to weak or worn parts and put new teeth in stripped gears.

It has been done. Can you think of any better proof that this

$50.00

Welder is right!

Send for full information, then equip your garage or shop to make bigger profits.

COX BRASS MFG. CO., Dept. M, Albany, N. Y.

1733 Broadway, N. Y. City 2129 Michigan Ave., Chicago, Ill.

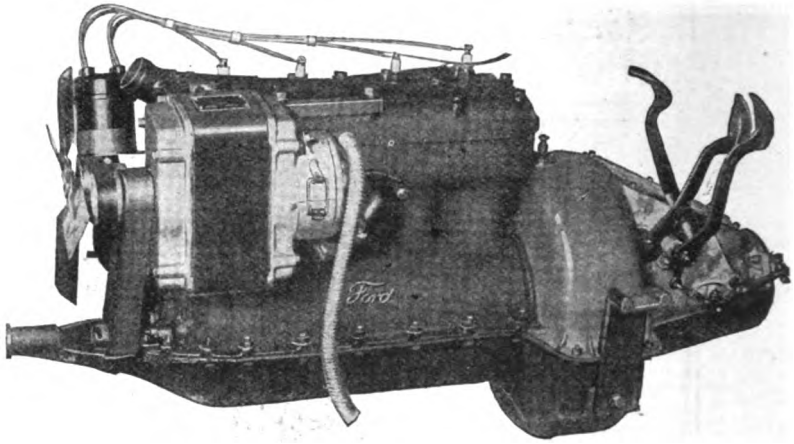
We make welding and cutting outfits for all classes of work.

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Westinghouse Starting-Lighting-Ignition
For Ford Cars

The new Westinghouse equipment for Ford Cars is now ready. It has been thoroughly tested on Ford Cars in all conditions, and over all sorts of roads, and has demonstrated its thorough reliability.

The Starting and Lighting unit is mounted on adjustable brackets, and is driven by a Westinghouse compensating sprocket through a special silent chain three tons strong. Everything necessary for the equipment comes with it—switches, armored wires, storage battery, pressed steel battery box, and all details. Deliveries can be made immediately.



For further information write to the nearest station or agency listed below.

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BALTIMORE, MD., The Richardson Garage.
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BUFFALO, N. Y., Motor Parts Co.
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DENVER, COLO., Shaffer Auto Supply Co.
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OKLAHOMA CITY, OKLA., Severin Tire & Sup. Co.
OMAHA, NEB., Powell Supply Co.
PHILADELPHIA, PA., Motor Parts Co.
PITTSBURGH, PA., Pittsburgh Auto Equipment Co.
SPRINGFIELD, MASS., Motor Parts Co.
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Westinghouse Service Stations: Chicago, Cleveland, Detroit, Indianapolis, New York and Pittsburgh.

Westinghouse Electric & Manufacturing Co.
AUTOMOBILE EQUIPMENT DEPARTMENT SHADYSIDE WORKS, PITTSBURGH, PA.



OVERLAND TYPE

PISTONS FOR THE DIFFERENT MAKES OF CAR

GRINDING FINISH — INDIVIDUAL CAST RINGS



FORD TYPE
Complete with Bronze Bushings, Rings and Pins

STANDARD OR OVERSIZE



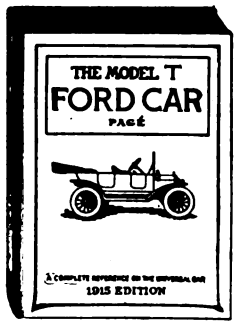
BUICK TYPE

WRITE FOR PRICES

THE G. H. DYER CO., CAMBRIDGE, MASS.

A NEW, COMPLETE BOOK
FOR EVERY FORD OWNER, DEALER, SALESMAN and REPAIRMAN

THE MODEL T FORD CAR
ITS CONSTRUCTION, OPERATION AND REPAIR



By VICTOR W. PAGÉ

Member of the Society of Automobile Engineers.
Author of "The Modern Gasoline Automobile," etc.

300 (5x7) Pages
Over 100 Specially Made Engravings
AND TWO LARGE FOLDING PLATES

Price $1.00

This is the MOST COMPLETE and PRACTICAL instruction book ever published on the FORD CAR. Illustrated by specially made drawings and photographs. All parts of the Ford Model T Car are described and illustrated, in a comprehensive manner—nothing is left for the reader to guess at. The construction is fully treated and OPERATING PRINCIPLES MADE CLEAR TO EVERYONE. Complete instructions for *driving* and *repairing* are given. Every detail is treated in a non-technical yet thorough manner.

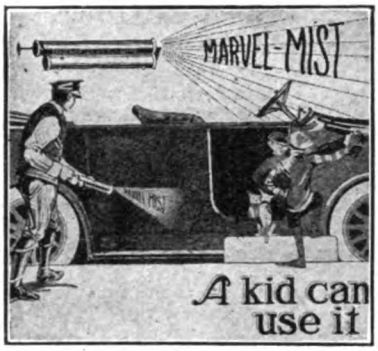
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Address MOTOR VEHICLE PUBLISHING CO.,
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Brighten Up Your Car With

MARVEL-MIST



Removes Road Tar, Oil and Grease. Prevents Rain Streaks.

Guaranteed Not to Injure Paint or Varnish.

Non—Combustible —Inflammable —Poisonous

Keeps Your Car Looking New

Midget Outfit, With Cloth, $1.00 Giant Outfit, With Cloth, $1.25

Refillers—Pint, $0.75 Quart, $1.00 ½ Gallon, $1.75 Gallon, $2.75

1 Pint Marvel-Mist is equal to 1 gallon of ordinary polish.

Write for our attractive Dealer's Proposition.

MARVEL-MIST MANUFACTURING CO.,
56 Greenpoint Avenue, BROOKLYN, N. Y.

FOR "LEAKY CYLINDERS"



PISTON RINGS



LESS CARBON-MORE POWER

EVER TIGHT PISTON RINGS have perfect elasticity from three points, meaning an even distribution of pressure all around, and a decrease in friction. You do not have to rebore cylinders.

A FEW "EVER TIGHT" FACTS

EVER TIGHT PISTON RINGS produce perfect compression
EVER TIGHT PISTON RINGS produce more power
EVER TIGHT PISTON RINGS decrease maintenance cost
EVER TIGHT PISTON RINGS eliminate carbon troubles

The Ever-Tight Piston Ring Co., St. Louis, Mo. Indianapolis, Ind., July 8, 1915.

Gentlemen—

With reference to my recent trip from San Diego to New York in a Stutz Bearcat, in eleven days, seven hours and fifteen minutes, I owe much of my success to the EVER TIGHT PISTON RINGS, inasmuch as the car did not lack a bit of power, the way it pulled through the sand and took the hills and mountains was certainly remarkable, the EVER TIGHT PISTON RINGS truly deserve full credit for their reliability.

Yours very truly,
E. G. BAKER

For Sale by all Dealers.

EVER TIGHT PISTON RING CO. 1428 Chestnut St. St. Louis, Mo.

ADAMSON

VULCANIZERS

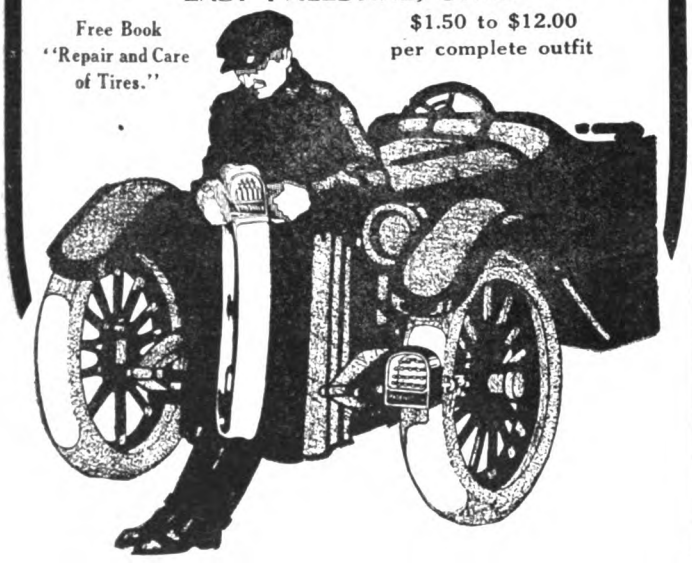
OVER A MILLION are now in use—more than all others combined—and every one pays for itself many times over in time and money saved. Make quick and lasting repairs on your own tires while ***on the road*** or ***at home,*** a cost of only a few cents per repair.

Use a measured quantity of common gasoline; no risk of under-curing or over-curing tire or tube. *Sold by All Jobbers and Dealers.*

ADAMSON MANUFACTURING CO.
EAST PALESTINE, OHIO

Free Book "Repair and Care of Tires."

$1.50 to $12.00 per complete outfit





THOUSANDS OF DOLLARS MADE REPAIRING TIRES

Tire Repairing by the Akron-Williams process opens the way to prosperity and success and big money making on small investments.

The business is growing faster than men can be found to take care of it. There's a man needed in almost every town. The better repair shops everywhere use the

Akron-Williams Tire Repair Outfit

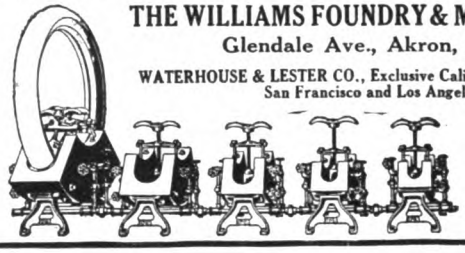
Endorsed by 30 Leading Tire Manufacturers

These men are making from $1,500 to $3,000 a year clear profit. You can do it too—with an Akron-Williams outfit.

The A-W Repair Outfit is used and endorsed by 30 leading Tire Manufacturers. So you take no chance in equipping with Akron-Williams. We'll help you to learn the business. Write for our catalog No. 121 and learn the great money-making possibilities of Tire Repairing and how little money you need to start.

THE WILLIAMS FOUNDRY & MACHINE CO.
Glendale Ave., Akron, Ohio

WATERHOUSE & LESTER CO., Exclusive California Distributors
San Francisco and Los Angeles



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INLAND
1 PIECE PISTON RING



A guaranteed, gas-tight ring in *one* piece—at a *lower* price.

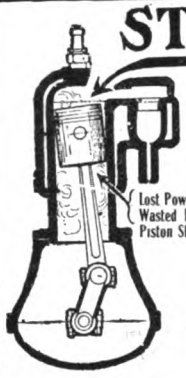
A continuous ring, cut spirally for half its circumference; heat treated so that the free ends hug tightly together. The result is a ring that uncoils in expanding, insuring uniform gas-tight pressure and continually perfect contact with the cylinder walls.

The strongest, gas-tight ring made, because it is one piece and of uniform width and thickness; no weak or thin places. Costs less to buy and less to install; easier to put on and will not break in handling. Made of close grain cast iron. Absolutely guaranteed; money refunded on any ring that fails to give perfect satisfaction after 90 days' trial.

Full description in free booklet.
Dealers and jobbers should write for interesting prices.

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STOP THE KNOCK



WASTED FUEL
LOST ENERGY
PISTON SLAP

When your motor is worn or cylinders scored the explosive pressure will escape down between the sides of the piston and cylinder walls and the fuel used to produce this energy is lost. This condition of your motor causes a waste of fuel, which necessarily increases the cost of operation and causes that misery of nerve-racking noise.

With your cylinders reground and new pistons and rings fitted, your motor will run like new, will have more power, smoother and quieter running. Where the cylinders are scored, we puddle in molten iron and thus retain the original strength of the cylinder walls.

We specialize in this work and have the most modern and complete equipment in the country. This work is done by skilled engine mechanics. Satisfaction is absolutely assured.

AUTO MACHINE WORK, wrist-pins, gears, crank shafts, bushings and valves.

Don't delay—ship your cylinders, or write us.

THE MOTOR ENGINEERING COMPANY
Automobile Engineers, Machinists and Designers
1688 West 3d Street CLEVELAND, OHIO



An Automobile Necessity

That should be in every auto kit and will save you many a dollar at garage and repair shops. It will also do away with the carrying of extra wheel or shoe attached to the car.

That Means The End Of Tire Troubles

as it will enable you to fix instantly, while on the road, or in your garage, any puncture or blow-out, from a pin-head to an ugly gash,

Without A Change Of Wheel Or Tire

or taking the auto to a garage for repairs, that make you dig down deep in your pockets.

The Worcester Automatic Vulcanizer

"Worcester Made"

requires no experience to operate. Every machine is guaranteed, adjusting all tire troubles in the shortest possible time, avoiding all road delays, making permanent repairs in Tube or Shoe, that are lasting, cost little, safe, speedy and strong.

Price $3.50



Money back if not as represented.
Write today or see your dealer.
WORCESTER MFG. CO.
18 Grafton St., Worcester, Mass.

OLD SOL

ELECTRIC SPOTLIGHTS



mean Safety First to every Motorist and every Dealer.

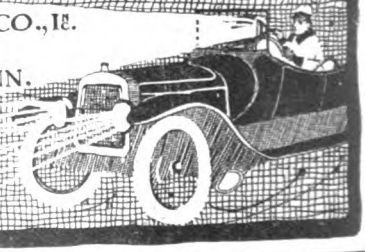
No.70 $6

Their appearance, durability, efficiency and power have made them the most popular lamps of their kind—and their costs are surprisingly low.

Quick sales are further stimulated by the use of an Old Sol Spotlight Silent Salesman—a handsome illustrated colored display stand given ABSOLUTELY FREE to Old Sol Dealers.

The model illustrated and other designs are described in the Old Sol 1916 Catalogue—*Send to-day for your copy.*

HAWTHORNE MFG. CO., Inc.
4 Spruce St.,
BRIDGEPORT, CONN.



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Make Your Ford Delivery A 1916 Model

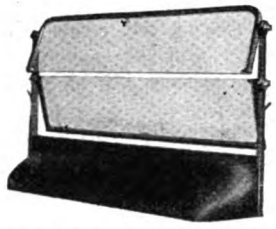
The **Conover Cowl Dash and Windshield** is the only practical cowl and shield made for Ford delivery cars. It can be quickly and easily fitted on any Ford model, new or old. It adds wonderfully not only to the appearance of the car, but to the comfort and convenience of the driver.

Any Model T Ford, new or old, fitted with this cowl-dash and shield, is a 1916 delivery car, and looks the part in every way. All you have to do is to cut down the dash to the same size as the 1916 dash, put on our cowl-dash and shield, and you have a Ford delivery car of the latest design, ready for the body. Our cowl fits 1915-1916 Ford chassis without any change or cutting.

All our shields are rain-vision, ventilating type, and made for long service. Best Plate glass. Cowl is heavy steel stamping, finely finished.

Conover Cowl Shields

For FORD Cars



Conover Cowl-Dash Windshield for 1912, 1913, 1914 and early 1915 Ford cars. Makes your old Ford pleasure car a 1916 model. Price combined Cowl and Shield complete, f.o.b. Adrian..... **$15.00**

Universal Shield for 1915-16 Ford models—Price complete with brackets, f.o.b. Adrian..... **$10.00**

Page Products for Ford Cars

Page Tire Savers for cars up to 2500 lbs. Fine, strong, good-looking and cheap. **$3.50** set four.

Page SafTsteer for Ford Cars. Holds Ford straight in the road. Rights steering gear automatically when one wheel hits an obstruction. All steel pressed, no castings. **$2.50** each.

Page Air Press Pump, for transferring oil, gasoline or other liquids from original barrel to storage tanks, with air from foot pump. Does the work quickly and without slop. **$3.00** each.

PAGE WOVEN WIRE FENCE COMPANY
Windshield Department
ADRIAN, MICH.



Cowl-Dash and Shield complete, f. o. b. Adrian, Mich. **$20.00**

Springs Shipped Same Day Order Received

Springs for all Makes of Automobiles

QUICKEST! MOST COMPLETE SPRING SERVICE SAVES YOU TIME AND MONEY!

Spring delays done away with by our one-day service. We carry 14,000 springs in stock—springs for all makes of cars (no matter how long manufacturer has been out of business). We ship same day order is received.

We also repair broken springs—re-arch and re-temper them, returning them same day. Our charges much less than automobile factory prices. Send all your spring replacements and repairs to us.

LOOK FOR THIS SIGN

Motorists the country over know the Triple Action sign means immediate, economical, satisfactory spring service. Garage and repair stations that display this sign deserve the spring business, and get it.

SERVICE STATION
AUTO
SPRINGS
AND REPAIRS
FOR ALL PLEASURE AND COMMERCIAL CARS
TRIPLE ACTION SPRING CO.
55 TO 67 EAST 28TH ST CHICAGO

DEALERS—
You Need This Service

It will save you money and make you new customers. *Write today*—identify yourself with this big national organization. *Spring catalog and full details mailed free.*

TRIPLE ACTION SPRING CO.
Established 1906
55-57-59 EAST 28th STREET - CHICAGO, ILLINOIS

The Hit of the Shows

We fired the opening gun of our 1916 Monarch Spark Plug campaign at the big automobile Shows—and it hit! We impressed



Monarch Spark Plugs

on the minds of over a quarter million visitors.

Now we're going to do more, Mr. Dealer. We're going to help you as no other manufacturer has helped his trade before to sell Spark Plugs.

Window Trims—Display Cards—Spark Plug Cabinets—these are ready for your use.

Will you be ready to get the orders that will follow?

Write for our Dealer's Proposition To-day

Benford Manufacturing Company
Mount Vernon, N. Y.

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MILLER'S TIRES

MADE IN ANDERSON, IND., U. S. A.

"There is More Fabric in Miller's Tires"

EXTRA HEAVY

Black or White Treads — *Non-Skid "Cog" Tread* — Red or Gray Sides

(Patented Feb. 16, 1915)



Write for Exclusive Agency.

USE —

Miller's Vulcanizers

— FOR

Economy, Speed, Perfect Cure

Made in 53 Different Styles

New 1916 (64-page) Catalog on Request

MILLER'S TIRES

are made of high grade material and workmanship, the common performance being from 6,000 to 12,000 miles of service, and are fast becoming popular among the experienced Automobile Dealers and Owners who have had more or less trouble with the weaker and cheaper grade of tires.

Write for Dealers' Prices and Exclusive Agency which eliminates competition so common with many other tires and enables you to establish and maintain a profitable Tire Business.

Miller's No. 14 Three Cavity Sectional

One of the 53 Styles We Make

Patented July 21, 1908

With Small and Medium Inside Vulcanizer Attachments



Repairs all sizes and styles of tires from 2½ to 5 inches inclusive.

Complete with Gas Burner - - **$100.00**

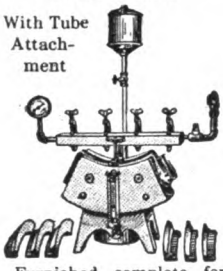
With Gasoline Burner Outfit, extra, **$1.50**

Without Inside Vulcanizers and tube plate **instead, $5.00** less.

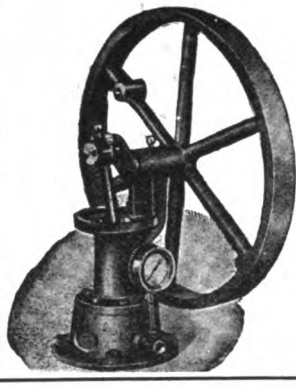


MILLER'S SECTIONAL VULCANIZER

With Tube Attachment



Furnished complete for Steam Line, Gas or Gasoline Burner. Complete with **High Stand** and Gasoline Outfit - - **$36.50**



MILLER'S HIGH PRESSURE AIR PUMP

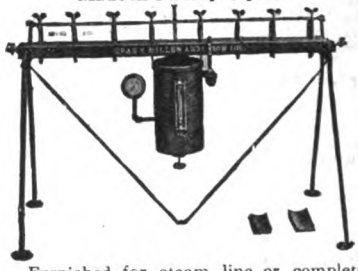
is Oil Cooled with our Fountain Oiling system. The Bearings and Valves are extra large. The Bore of the cylinder is 3¼ inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight 200 lbs. This pump will easily compress air to **300 lbs. pressure.**

Write for details.

Junior, Single, **$25.00**

Pump Only, Price, Single, **$35.00**

MILLER'S INNER TUBE VULCANIZERS
Made in Twenty Styles



Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This Boiler generates an abundance of steam.

PRICES FROM $5.00 to $30.00

We Teach You the Tire Repair Business FREE of Charge in Our Factory or by Mail.

New 1916 Catalog Free on Request

Chas. E. Miller

Anderson Rubber Works

Established 1894

Anderson, Ind., U.S.A.

How to Become an Expert Automobile Mechanician

The quickest and cheapest, but BEST way, is by studying Dyke's Automobile and Gasoline Engine Encyclopedia.

It is a practical simplified instruction on everything you OUGHT to know about motoring.

First you learn the principle of construction of each and every part of a car and engine; from the construction of different type axles to the sleeve and rotary valve type of engine—then the variance of construction—then the adjustments and repairs.

You learn how to diagnose troubles in a scientific manner. For instance, under the subject of storage batteries you learn how to test a storage battery with a hydrometer instead of a pair of pliers.

Step by step you advance until you are a real expert on timing the valves and ignition. You learn the carburetion subject so thoroughly, you can adjust any make.

Delco, Ward Leonard, Entz, Westinghouse and all electric starting systems will be clear in your mind.

It is chucked full of just the things you OUGHT to know and want to know. There are over one thousand seven hundred and fifty illustrations—simplified illustrations, which, in most instances, explain without the use of the text.

As stated above, the illustrations are SIMPLIFIED; take for instance the illustration of the Atwater-Kent Ignition System, the illustrations show in detail all the INSIDE parts, and just how the coil is wound, how the depolarizing switch operates and why it is necessary—in other words, all detail usually omitted by others is included.

You will like this book, in fact we will guarantee you would not sell it for three times its cost if you could not get another.

ADDRESS ALL ORDERS TO

AUTOMOBILE DEALER & REPAIRER

73 MURRAY STREET, NEW YORK

DYKE'S AUTOMOBILE and Gasoline Engine ENCYCLOPEDIA

REVISED, ENLARGED, FOURTH EDITION NOW READY

Price $3.25, Prepaid

THE LATE EDITION AT LEAST ONE HUNDRED PER CENT BETTER . . .

A Complete Ford Instruction

added—as well as many other subjects. Some of the new subjects added are; **Electric Starters, Generating and Lighting** Systems, up to date.

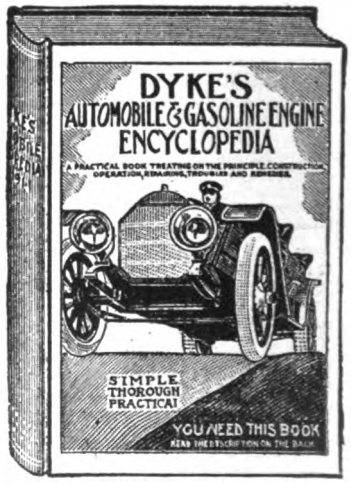
How to Time Valves and Ignition—simplified so a ten-year-old boy can understand.

Six, Eight and Twelve Cylinder Engines; every detail from construction to firing order—simplified.

The Repair Subject—greatly improved and many new illustrations added. This subject improved at least a hundred per cent.

Complete Digest of Troubles which will make an expert of you—one capable of diagnosing troubles, scientifically—by a process of elimination—many other subjects added—such as trucks, tractors, etc.

Over one hundred thousand DYKE books sold, not one returned.



A teacher, guide and reference on everything pertaining to motoring. Simple as the a, b, c's.

It's worth ten times its cost if only placed on the shelf and used as a reference when you are stuck.

Last edition, 1,000 illustrations, 596 pages. This new fourth edition, 1,750 illustrations and 640 pages.

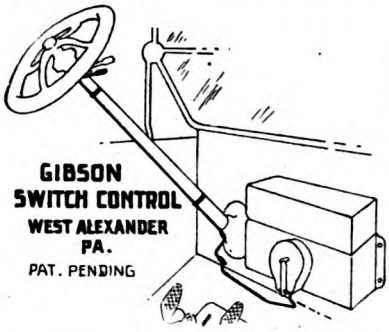
ADDRESS ALL ORDERS TO

AUTOMOBILE DEALER & REPAIRER

73 MURRAY STREET, NEW YORK

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THE GIBSON SWITCH CONTROL



most important control feature brought out in years; a necessity for Ford cars; welcomed alike by expert and beginner; bridges the gap between the driver and his motor, and enables him, by a touch of the finger, to throw switch to any position instantly without removing hand from wheel or eyes from road; saves its cost in brake linings and gasoline in short time. Weighs 14 ounces; inconspicuous and entirely out of way.

For sale by dealers, or delivered by parcel post anywhere in the U. S. for $2.00.

Money back if not satisfied. Liberal discount to the trade.

Full particulars mailed free.

GIBSON CONTROL CO., West Alexander, Pa.

1916
Automobile Mailing Lists for Sale

28,108 Auto Dealers, all kinds, U. S. $40.00, or $2.50 per M by States.
1,187 Auto Dealers, all kinds, Canada, list $4.
7,838 Ford Dealers, price $17.50, or $3.00 per M by States.
285 Ford Dealers, Canada, $1.50.
28,463 Auto Garages, price $40.00, or $2.50 per M by States.
29,306 Auto Repairs, price $40.00, or $2.50 per M by States.
33,171 Auto Supplies, price $40.00, or $2.50 per M by States.
43,109 Dealers, Garages, Supplies and Repairs, combined without duplication, $65.00, or $2.50 per M for States as wanted.
861 Auto Supply Jobbers, price $4 for the list.
4,093 Auto Tire Dealers, price $3 per M.

The above are 1916 compilation, typewritten by States, show financial rating in dollars of each one, and ready to send on receipt of remittance for any one. *Write for further particulars.*

A. F. WILLIAMS, Mgr., 166 West Adams St., CHICAGO

JOBBERS, DEALERS AND REPAIR SHOPS

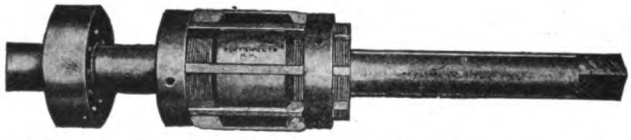
We manufacture speedometer parts, swivel joints, flexible shafts and fibre gears for every speedometer on the market. Goods superior and prices lower than any others.

Request Catalogue.

OGDEN MANUFACTURING COMPANY
PLYMOUTH INDIANA

THE BEST MADE FOR REPAIR WORK.

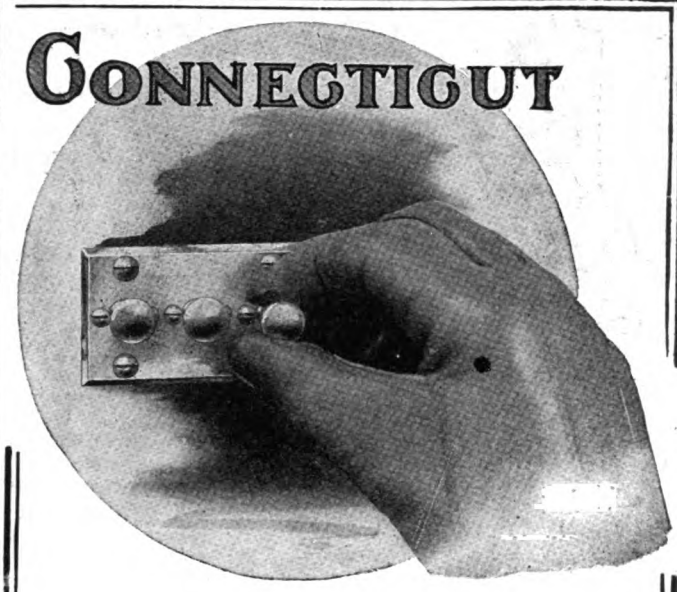
The Critchley Expanding Reamer
For Ford Automobile Cylinders



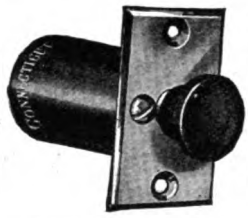
It does good work. Re-bore your cylinders at small cost.

SEND FOR CIRCULAR

CHADWICK & TREFETHEN,
32 Bow Street, Portsmouth, N. H.



Lighting Switches



are the neatest, simplest and most easily installed equipment of their kind on the market.

They are designed to provide every arrangement of lighting control that can be desired.

HEAD LIGHTS
The use of resistance for dimming the use of double filament bulbs, or the use of large or small bulbs.

HEAD, SIDE AND TAIL LIGHTS
Head and tail lamps on and off together. Side and tail lamps on and off together.

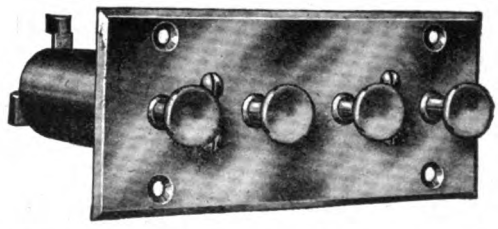
DASH LAMP
Individually of in conjunction with tail light. These are the principal functions of our standard switches but these by no means indicate the limits of control to which we are confined. Every practicable arrangement has its switch.

One switch for all lights, individual switches for each, or any choice of functions individual or in combination.

Simple construction insures unending service and satisfaction.

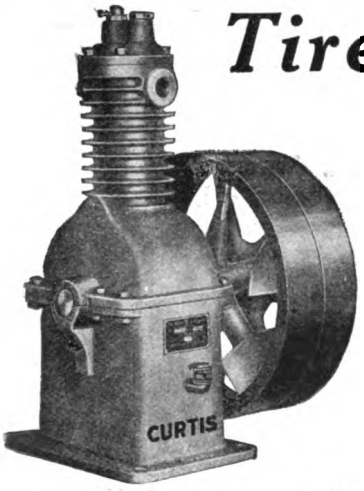
Easily operated with a gauntleted hand.

Trade catalog illustrating and describing full line upon request.



CONNECTICUT TELEPHONE & ELECTRIC COMPANY
MERIDEN, CONN.

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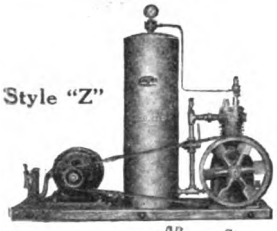


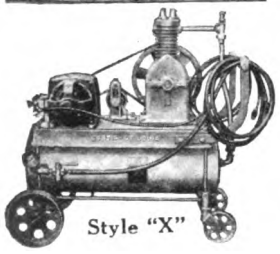
Tire Life Insurance—

{Increased Mileage—Fewer Blowouts
Fewer Punctures—Fewer Repairs}

result from using a

Curtis Air Compressor and Curtis Correct Pressure Tire Filling Station


Style "Z"


Style "X"

Because they furnish AIR FREE FROM OIL and at correct pressure for each size tire.

Does this mean anything to you, Mr. Garageman, Mr. Dealer? It should mean better service to your patrons; service that will bring its own reward in increased sales, increased profits.

The customer simply turns the dial to the size of his tire to get correct pressure, without fear of over or under inflating, without having to borrow a tire tester or using your help, and the air that you furnish them will be AIR FREE FROM OIL.

It interests them when you explain it, it touches their pocket when you show the saving it means to them, and your giving this service free—Say, but it is a drawing card all right.

Check the style outfit you would prefer, clip out and mail this ad. to us and we will send you complete information including prices.

Write for Our New Catalog C5

CURTIS PNEUMATIC MCHY. CO., 1530 Kienlen Ave., St. Louis, Mo.

Branch Office—305 G Hudson Terminal, New York



Curtis Correct Pressure Tire Filling Station

Our Supply Department Is the Largest in the World

The Emblem That Means "Money Back If Not Satisfied"

63,000 Customers get supplies and parts from us not carried by other concerns. To do this our service must be prompt and efficient. Mail Orders filled in 3 hours. Write to our nearest branch for anything you may want in this line. Also

"TIMESCO" TIRES

Guaranteed 4,000 Miles

SAVE YOU 30%. INVESTIGATE!

Write now and get a copy of our Price Wrecker containing accessories and supplies of every description for the automobile at cut prices.

The Emblem That Means "Square Dealing"

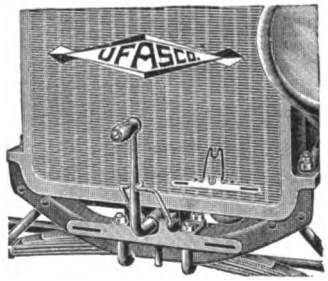
Times Square Auto Co.,

World's Largest Dealers

S. W. Cor. 56th St. & Broadway, N. Y.

1210 Michigan Avenue, CHICAGO

1400 Grand Avenue, KANSAS CITY



Easy Money

Made by Selling

UFASCO

COMBINATION CRANK HOLDER and NUMBER BRACKET No. 80

Stops Wear and Rattle

Ford Owners want it.

Increased Sales Has Reduced Price, but not Quality.

New Price, 50c.

Write for Circulars and Prices.

UNIQUE FINDINGS & SUPPLY CO., PROVIDENCE, R. I.

"WINTERIZE" Your Ford Car

— with an —

ANCHOR SEDAN COUPE TOP

Lowest Prices:

Anchor Sedan Coupe Top

TOURING $65.00
ROADSTER 50.00

Write today for illustrations and complete details about these beautiful tops. Now is the time to get one.

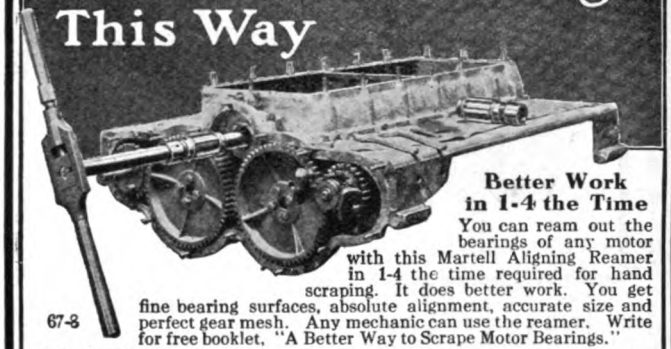
Dealers Wanted Everywhere. Ask your bank who we are, and write or wire for our proposition.

THE ANCHOR BUGGY COMPANY,

Dept. A. R. CINCINNATI, O.

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Ream Motor Bearings This Way



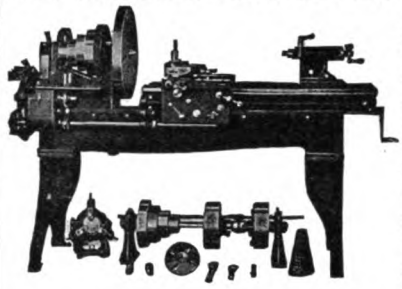
Better Work in 1-4 the Time

You can ream out the bearings of any motor with this Martell Aligning Reamer in 1-4 the time required for hand scraping. It does better work. You get fine bearing surfaces, absolute alignment, accurate size and perfect gear mesh. Any mechanic can use the reamer. Write for free booklet, "A Better Way to Scrape Motor Bearings."

67-8

Harding Mfg. Co., 40 Court St., Boston, Mass.

THE UNIVERSAL GARAGE LATHE IS OUR 14-24" SLIDING EXTENSION GAP LATHE



Saves investing in a large expensive lathe. Swings 14½" over top bed, and 24" through gap. The 7½ ft. machine takes 8 ft. between centers.

Cuts right or left-hand threads, and can be furnished with transposing gears for millimeter threads.

Taper attachment, milling attachment, and other accessories if wanted.

Machine is strong, rigid and accurate, has 2⅛" spindle with 1⅛" hole through same. There are six quick change geared feeds and other new features. Great range and value at a reasonable price.

JUST THE THING FOR GARAGES AND REPAIR SHOPS

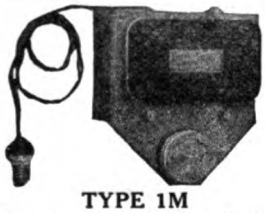
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Barnes Drill Co., Inc. 1907 818 Chestnut St. Rockford, Ill., U. S. A.

Builders of the All Geared Drill

THE ST. LOUIS BATTERY CHARGER

Works While You Sleep
Turns Pennies into Dimes



A simple—practical—fool proof device for charging ignition and starting batteries which operate from alternating current.

Price . . . $24.00

Discount to trade. Write for booklet and discounts.

TYPE 1M

For charging three cell 6-volt batteries from 60 to 120 ampere hour capacity. Will charge two 60 ampere hour batteries per day of 24 hours. A penny's worth of juice brings you 10 cents.

ST. LOUIS ELECTRICAL WORKS

5405 Easton Avenue - - St. Louis, Missouri

"There's a mighty big difference in lubricators!"



Don't blame your car for what it can't help. Many a car is inefficient only because its lubrication is bad. Try Badger Gear Compound **just once** and notice the difference.

BADGER Gear Compound

Is "Always on the Teeth"

It never runs thin and stays where you put it. Will not pack the sides of the gear case. Nothing like it for minimizing wear and quieting rear axles and transmissions. **Every ounce lubricates.** Learn more about this power-saving lubricant—also about the popular F. V. Motor Oil and Badger Lubricants. Ask your dealer or write us. *Dealers, write us*

WADHAMS OIL COMPANY, Milwaukee, Wis.

Coast Distributors: Wadhams Oil Company of Washington, Seattle, Wash., and Vancouver.

THE STALIT HEATING PLUG



Eliminates all trouble in starting a motor in cold weather. No priming of the cylinders or tickling the carburetors necessary.

SIMPLY TURN ON THE SWITCH

a minute before starting, after the Stalit Plug has been attached to the inlet manifold.

THE AIR IN THE PIPE IS HEATED, AND THE RESULT IS MIRACULOUS

Also indispensable when used in conjunction with the electric starter, as it will save the intense strain due to continuously turning over the cold motor.

YOU GIVE THE ENGINE ONE YANK AND OFF SHE GOES

Write today for prices and terms.

GEO. STAATS & CO., 250 Lorimer St., Brooklyn, N.Y.

!CRANK SHAFTS!

AND ALL KINDS OF FORGINGS, SMOOTH FORGED OR FINISHED COMPLETE, READY TO ASSEMBLE : : : : : SEND IN YOUR ORDERS

OBENBERGER DROP FORGE COMPANY

(PLANT AT CUDAHY) MILWAUKEE, WIS.



IMPERIAL WELDING AND CUTTING EQUIPMENT

OXY-ACETYLENE PROCESS

PROFITABLE REPAIR WORK

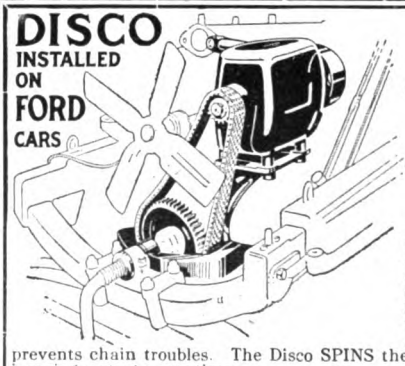
With a relatively small investment in an Imperial Combination Outfit you can make your garage headquarters for *highly profitable repair work.*

Welding, Cutting of wrought iron and steel, and removing of Carbon from gas engine Cylinders can all be done with our No. 4 Outfit. Do not make the mistake of buying a cheap make-shift: you can fully rely on Imperial Equipment as being the best at any price.

Write today for prices, data or cost of operation, etc.

IMPERIAL BRASS MFG. CO., 520 S. Racine Ave., CHICAGO

DISCO INSTALLED ON FORD CARS



ELECTRIC *STARTING* AND *LIGHTING* SYSTEM

The Disco operates on a twelve-volt current and is absolutely the most powerful starter made for Ford cars. Single unit system, simple, light, reliable. Mounted on patent yoke bracket, which maintains alignment and prevents chain troubles. The Disco SPINS the motor, insuring a start every time.

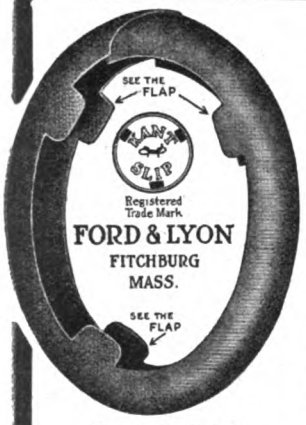
Dealers, Write for Agency.

DISCO ELECTRIC STARTER CORPORATION

Detroit, U. S. A.

$75 Complete

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KANT SLIP
INNER LINER

Is one of the best on the market, as it cannot slip inside of the casing. When this liner is placed inside of the tire, and the tire properly inflated, the liner

WILL STAY JUST WHERE IT IS PUT

And cannot slip.

The Kant Slip Inner Liner is also a complete inside fabric reinforcement, extending the full length of the tire from bead to bead.

NOTICE THE FLAP THAT PREVENTS SLIPPING

Inner Liner can be re-used after old casing has been discarded, wearing twice as long as any other.

Write us at once, if your dealer does not handle them.

FORD & LYON, Fitchburg, Mass.

Manufacturers of KANT SLIP PRODUCTS

Patent Applied For.



THE B-M SWITCH
With Yale Lock, for Ford Cars

1. It automatically locks every time you shut off your motor.
2. Installed in two minutes by anyone—on any Ford car having metal coil box.
3. Yale Key (no duplicates) acts as switch key—can't be pried off or short circuited.
4. Simple—effective—positive. It sells.

ASK WHY
GOODRICH ACCESSORY ASSOCIATION.
WIDENER BLDG. PHILADELPHIA

PRACTICALLY every Automobile race during 1915 was won by drivers using

Dixon's Graphite Automobile Lubricants

Read what they have to say in Booklet No. 184G.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

G-117

Latest Tire Sensation!

BRAENDER

BULL DOG
NON-SKID TIRE



This Tread is made under hydraulic pressure, not cut out, but pressed together into a homogeneous mass, resulting in a **tougher** tread. **Braender Non-Skids are as different from others as a dropped forging is from a casting.**

Braender Rubber & Tire Co.

Main Office & Factory: **Rutherford, N. J.**
New York, 250 W. 54th St.
Chicago, 1350 So. Michigan Ave.
Philadelphia, 1327 Race St.

Send for prices and particulars. *Agents in principal cities.*

Gould
STORAGE BATTERY

The Strong Right Arm *of a* Starting-Lighting System

GOULD STORAGE BATTERY CO.
General Offices, 30 E. 42nd St., New York

Write for our Agency Proposition

Sears-Cross Spedindicator

STANDARD FORD 1915 EQUIPMENT

"Absolutely Accurate"

Special for Ford Cars

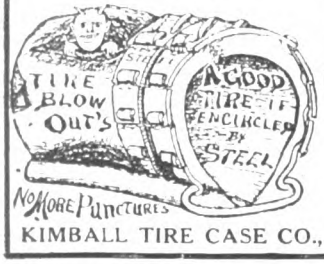
Mounted flush in a bracket on the cowl. A remarkable opportunity for dealers. Write or telegraph for details,

Sears-Cross Company

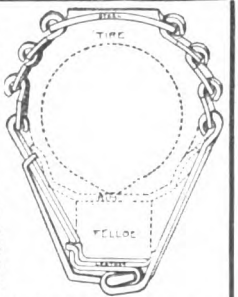
Bush Terminal **Brooklyn, New York**

Hang on to your old tires. They will last as long as you live if covered with steel. The Kimball Steel Protector makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires as flexible as ever.

Special inducements to those in new territory.

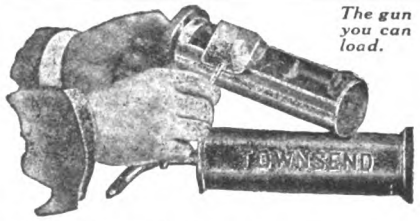






MUD CHAIN can be put on in a jiffy with one hand while standing on the run board. If you get in a mud hole you will laugh out loud. Hook the ends together and pull the little lever and they are on tight. Good for blowouts.

KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa



The gun you can load.

It can be filled— *others cannot.*

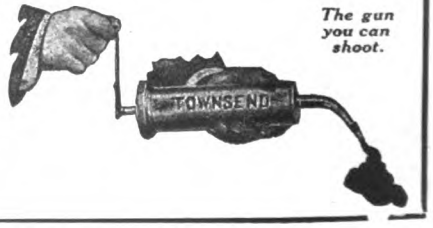
It is clean— *others are dirty.*

Easy of Operation— *others difficult*

Fill with a steel paddle, sent with the gun, slip one tube into the other, secure with cap and turn the handle. You can load and shoot a pound in a minute. Not a particle of grease gets on your hands or clothing.

6 Oz., $3.00 8 Oz., $3.50
12 Oz., $4.00 16 Oz., $5.00

S. P. Townsend & Co.,
Orange, N. J.



The gun you can shoot.

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OIL FOUNTS FOR FORD CARS



Also for all other automobiles where oil lamps are used.

Made singly or in quantities, any size or style.

LAMPS REPAIRED
METAL SPINNING

Send samples, blue prints or specifications for estimates.

EXPERIMENTAL WORK A SPECIALTY

Prompt Service
Expert Workmen
Reasonable Prices

COLLINS & CO.
150½ Elm St., Amesbury, Mass.



MISSING in your
FORD
will be STOPPED
by a
Cuno Timer

PRICE $1.50

Mailed on receipt of price—satisfaction guaranteed—no changes necessary—thousands in use.

Attractive Jobbers' and Dealers' Proposition.

CUNO ENGINEERING CORPORATION, 80 So. Vine Avenue MERIDEN, CONN.

ZENITH CARBURETOR FOR FORDS



$20 COMPLETE
Including Manifold and Hot Air Tube.

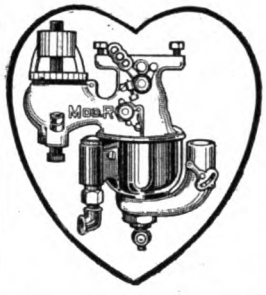
Give to your Ford the same flexibility, power and economy that this carburetor has given to the world's best cars. That unpleasant jerky engine-pull when changing from low to high or when throttled down is entirely eliminated. Insures easy starting and wonderful economy.

Literature mailed free on request.

Trial Offer
If after 30 days' trial the "Zenith" Ford Carburetor is not well worth the price return it at our expense and get your money back.

MOTOR PARTS COMPANY, Sole Distributors, 822 N. Broad St., Philadelphia

Make Your Buick More Efficient



THAT'S easy. Thousands say so. Particularly those with new Buicks. Brand new Buicks act brand new longer, and old Buicks take on new life when equipped with

SCHEBLER Carburetors

You'll say "easy," too, when you read how your present carburetor may be turned in on an attractive exchange plan. So write today for Buick proposition. It's FREE.

JAMES C. NICHOLS, *Inc.*, Direct Factory Distributor
1673a BROADWAY (Phone, Circle 1626) NEW YORK

STOP THAT RATTLE!

Gouin's Anti-Rattlers for Auto Doors and Hoods

Stop that troublesome rattle of the car doors.

DEALERS, WRITE FOR OUR PRICES.

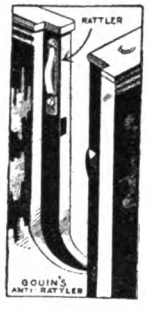
They are money makers for you, and will keep your customers happy.

Price $1 for set of four, prepaid.

Write us for literature.

MANUFACTURED BY
THE L. J. GOUIN COMPANY,
POUGHKEEPSIE, N. Y.

CHANSLOR & LYON CO., 1238 Van Ness Ave., San Francisco, Cal., Distributors for the Pacific Coast.





Repairmen! Get This Tool!

No repairman should be without this tool—the tool that grinds valves accurately and easily—yet does it four times as fast as can be done by hand. The

Fosnacht Valve Reseater

is helping hundreds of repairmen make bigger profits. Motor car and Motorcycle owners will favor the shop with a Fosnacht Valve Reseater. Our book "Bigger Profits For Every Repairman," tells in a simple easy-to-understand manner how repairmen can make and save money. Write for it today.

Address

PARCRID MOTOR APPLIANCE CO.,
SUITE 700,
30 North Michigan Blvd., CHICAGO, ILLINOIS

Kant Slip Fan Belts



For Ford Cars

These Fan Belts are especially made for Ford cars, as this class of owners insist on the

100% SERVICE

Furnished by our Belt.

No trouble or inconvenience, possible from broken belts made of inferior material.

ABSOLUTELY GUARANTEED

Not to stretch and is oil proof, made in endless belt style. No chance for defective seams.

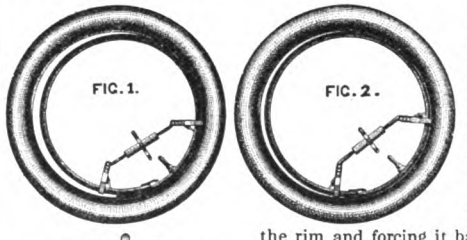
Kant Skip Fan Belts are the best on the market and will outwear any other.

PRICE PER BELT, 30 CENTS EACH

Write us today if your dealer does not have them.

FORD & LYON, Fitchburg, Mass.
Manufacturers of KANT SLIP PRODUCTS.

The NISWANDER TIRE RIM REMOVER





If you have ever had occasion to repair the tires in your auto, you will appreciate the merit of our demountable rim remover. They fit any rim, regardless of make or size, are small and compact, yet strong and substantial, and are so simple that there is nothing to get out of order about them. Fig. 1 shows the device contracting the rim. Fig. 2, expanding the rim and forcing it back into place in the tire. Fig. 3 shows the device folded to a length of Ten inches, and as the weight is but 2½ pounds, it is a great device requiring very little space. They have a polished nickel finish and therefore will not rust. This device can be purchased from any dealer for the sum of $3.00, but if your dealer does not have them, we will on receipt of the above price, send you one by prepaid parcel post.

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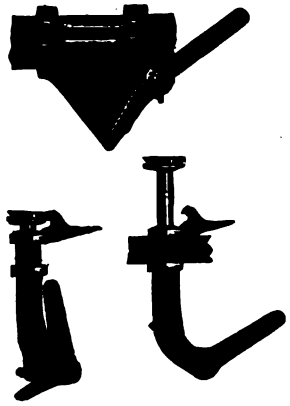
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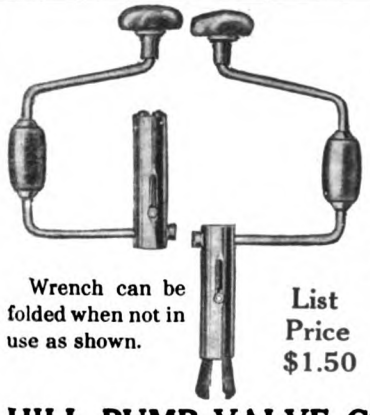
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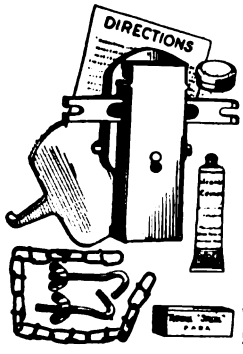
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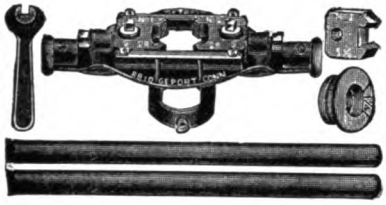
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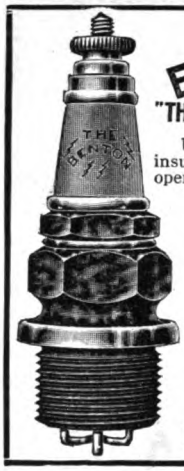
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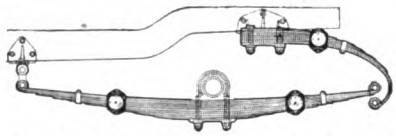
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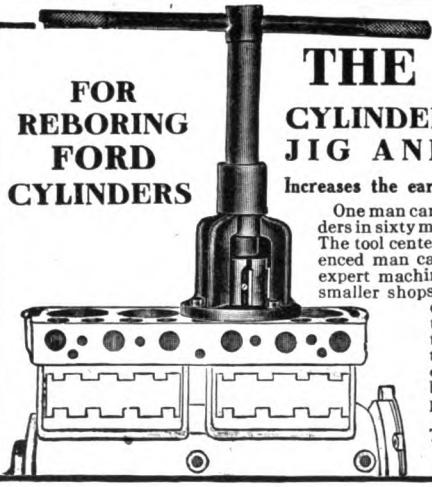
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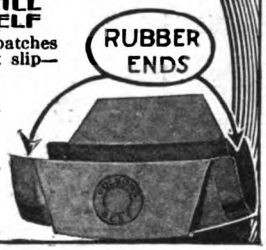
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Let us show you how to cut down on your overhauling bill.

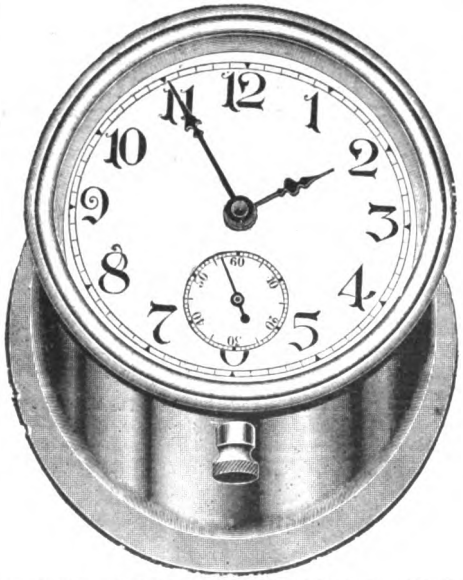
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Favor your customers by keeping their repair bills as low as possible.

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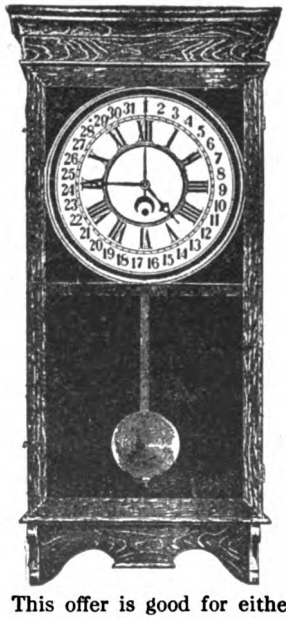


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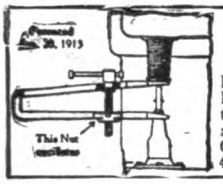
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It works like a vise and holds like a vise. It holds the spring rigid. Used on any car.
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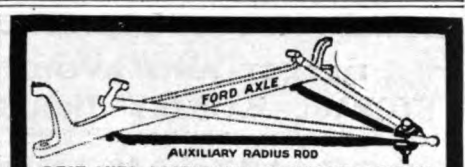
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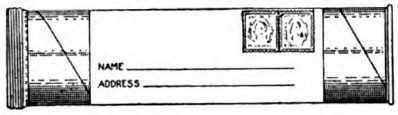
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☐ STATIONARY ENGINEER	☐ Common School Subjects
☐ Marine Engineer	☐ CIVIL SERVICE
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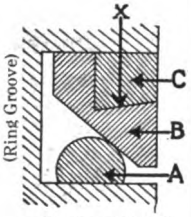


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They are made of soft cast iron, no steel or composition to score cylinders.

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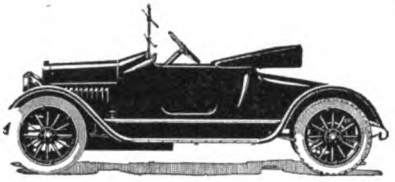


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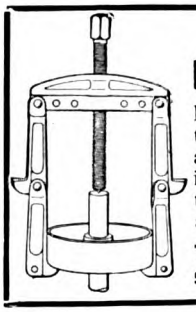
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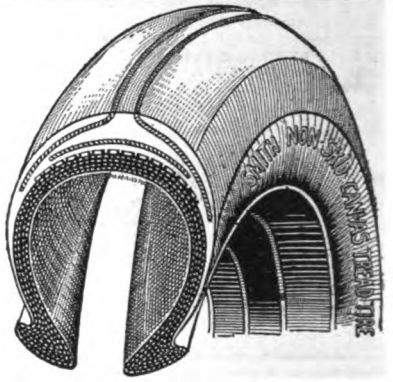
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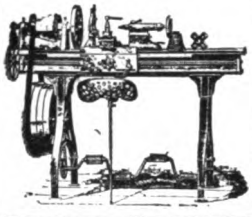


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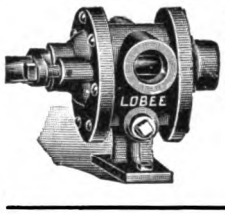
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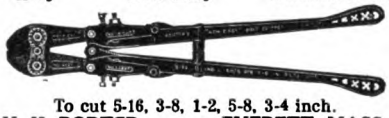


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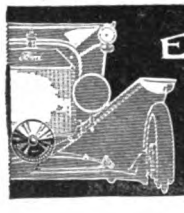


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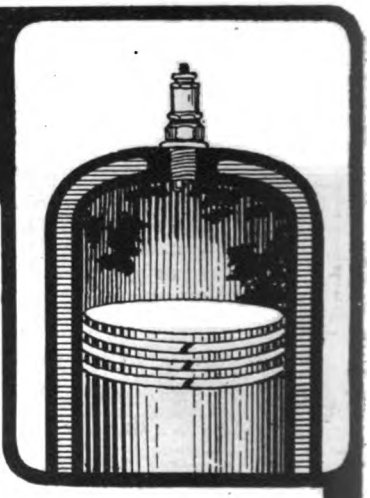
Starting & Lighting System for Ford Cars
American Ever Ready Works of National Carbon Company
Long Island City N.Y.

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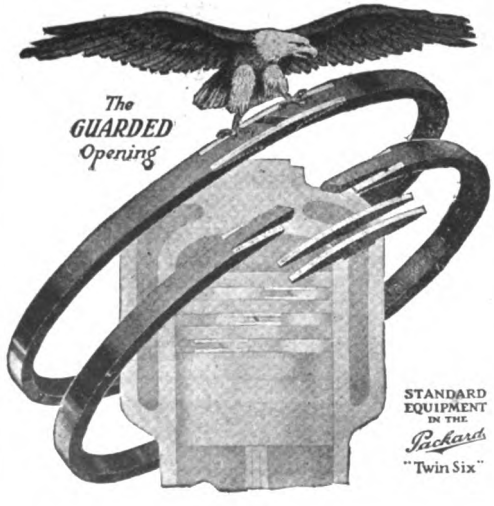
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Dethrone King Carbon



In too many motors carbon is king. It chokes them up, impairs efficiency, reduces power, fouls spark plugs and grinds away at the very vitals of the mechanism. You can prevent his and serve the interests of your customers best by installing

BURD RINGS



The Metallic Guard closes the opening and prevents surplus oil working up into the combustion chamber, there to be burned and formed into carbon. Carbon shortens the life of thousands of cars—sends them to the junk pile long before the have outlived their usefulness.

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Acid oils destroy the fit of bearings, valves and rings. Many oils contain acid matter which decomposes at high temperature and attacks the motor parts. The Heat and Emulsion Tests, which are described in the Veedol Book, tell the whole story. Veedol oils run the gauntlet of these searching tests and show the total absence of acid products.

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Your money should not be tied up this season in any oil, until you have talked with the Veedol salesman and seen the Veedol Dealer's advertising campaign. (It costs the dealer absolutely nothing.)

Your new oil customers will be created by strong local advertising over your firm name. Once they buy Veedol from you, Veedol quality will prove superior, and your sales will be permanent.

Advertising your company name in connection with these quality oils will bring the sales right into your hands. The advertising will, in this way, make new customers for your other accessories.

Before you buy any more oil, see the Veedol salesman. Write today for our special portfolio describing the advertising campaign that we would run over your name, and a copy of the 44-page Veedol book.

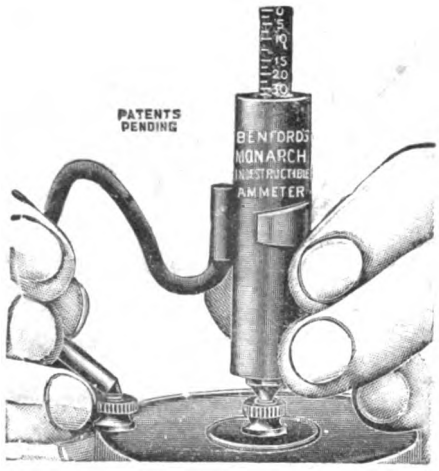
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A little carelessness in handling it and down goes the Ammeter on the floor with a bang. **It is ruined!**

Then you wish for an Ammeter that can be thrown a mile, and be able to test your dry cell when you pick it up.

Here at last is one that can stand hard knocks, bangs and kicks without wincing. Give it all the abuse you can. It won't stop working. When you get ready to test, it registers the correct amperage of a dry cell up to 30 amperes.

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Price $1.00



Monarch Spark Plugs

Dealers, your customers are tired of cheap Spark Plugs. They don't want worthless goods sold under cover of well advertised names.

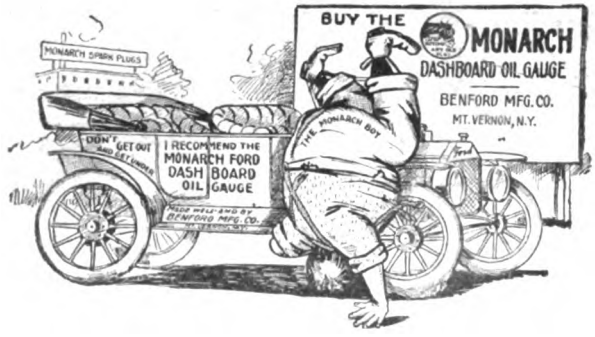
Why not give them Spark Plugs that you won't be ashamed of? Make every buyer so well pleased with the plugs you sell him that he will come back to you again and again.

Sell Monarchs for quality's sake.

Guaranteed for the life of your car.

75c. Each

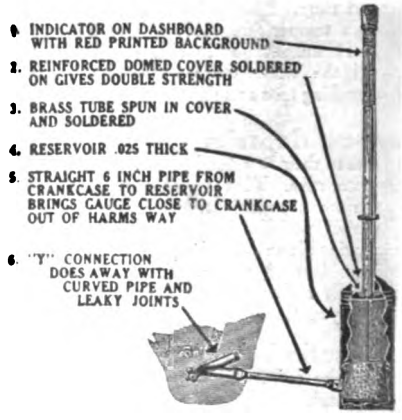




Monarch Dashboard Ford Oil Gauge

Before your Ford car leaves the garage, down you go on hands and knees to see if there is oil in the crank case. You go through that dirty job of searching for the pet cock, probably wishing for some wise head to show you how to find the oil level another way.

Use the **Monarch Dashboard Ford Oil Gauge** and tell how much oil you have right at the dashboard. The instrument is before your eyes as you sit in the driver's seat. You can't miss it. The oil will never run low without your knowing it. For convenience there is nothing like it. For safety, it is unequalled.



Price $1.50

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APR 23 1915

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 19, No. 2. NEW YORK, APRIL, 1915 Monthly, $1.00 per year Single Copy 10 Cents

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The Table of Contents will be found on Page 168

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Mattson Unguaranteed Tires

Experienced Motorists in ever increasing numbers are turning toward

MATTSON
Unguaranteed Tires

They have discovered that they average better value—service and cost considered—than other kinds.

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Short Articles Upon a Wide Variety of Practical Subjects Useful to Car Owners, Drivers and Repairmen.

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 86, 87, 88 AND 89

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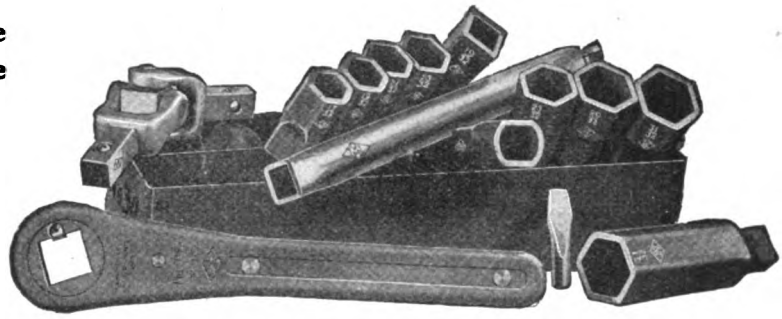
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Price, packed in leather board, $4.00 little enough for *"Real Insurance"*

Contains:—Ratchet Socket Handle (with grasp-spring to lock sockets).
Universal Joint (to turn "round a corner").
Extension Tube (to get into the heart of things).
Screw Driver Bit (makes the ratchet screw driver possible).
Ten Pressed Steel Sockets (heaviest of their kind).

Sizes in the Hex. $\frac{17}{32}$, $\frac{19}{32}$, $\frac{21}{32}$, $\frac{23}{32}$, $\frac{25}{32}$, $\frac{28}{32}$, $\frac{31}{32}$.
Size in the Square $\frac{15}{32}$ to fit main bearing nuts and bolts on 1915 models.
Oval Socket to fit main bearing nuts and bolts on models previous to 1915.
Spark Plug Socket $\frac{31}{32}$, to fit the "Champion X" plug now in common use.

FRANK MOSSBERG CO.

Box F ATTLEBORO, MASS.

Manufacturers of Guaranteed Valve Grinders, Cylinder-Head Nut Wrenches, Hub Cap Wrenches, Thin Model Engineers' Wrenches, Socket Wrenches, Housing Wrenches.

For FORD Cars

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JUN 2 1915

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 19, No. 4. NEW YORK, JUNE, 1915 Monthly, $1.00 per year Single Copy 10 Cents

Saves Washing Car

S. C. JOHNSON & SON, Racine, Wis.

Gentlemen: In answer to your letter of the 24th, I had a hard time to get my boss to try the Wax on a new car he has to demonstrate with, but landed him and now he will not use anything else. He thinks it is great. It has saved me washing the car every day. Once a week or once in two weeks will keep the car looking like new. I take great pains in showing it up. It is great stuff believe me.

Yours very truly,
K. PAUL,
Schenectady, N. Y
25 Elm St.,

Thought Car Was Repainted

S. C. JOHNSON & SON, Racine, Wis.

Dear Sirs: I must tell you a little experience I had the other day. An auto came in to be washed: it was so covered with mud you could not see the auto. I washed it and polished it with Johnson's Wax; the man came back after driving around the city, said everyone thought his car had been repainted.

Yours truly,
A. H. BRILL,
Hastings, Mich.

What Kept Car So Nice?

S. C. JOHNSON & SON, Racine, Wisconsin.

Gentlemen: We used the Wax on the auto and had several inquiries regarding the shine.

One man, a stranger, called up by phone, asking what we used to keep the car looking so nice. He is now a user of Johnson's Wax also.

Yours truly,
E. F. LINGQUIST,
Logansport, Ind.

What Motorists say about JOHNSON'S PREPARED WAX

Leaves Hard, Dry Surface

S. C. JOHNSON & SON, Racine, Wisconsin.

Gentlemen: I have never used anything that anywhere near equals Johnson's Prepared Wax for giving a high gloss that will turn rain and dust.

All polishes that I have ever used before leave such an oily surface that the body will collect more dust after using it than before, but your Wax leaves such a hard, dry, as well as glossy surface that dirt does not stick to it, and for the first time I can now polish my car without getting my hands all over grease and oil and mussing things up generally.

Yours very truly,
Chicago, Ill. B. F. SAWIN,

—is that it is a dust-proof, water-proof, mud-proof and sun-proof polish for motor cars, which gives a hard, dry, glossy finish that **lasts.** Users say JOHNSON'S Prepared Wax is **unequalled.** Judge for yourself. Send for sample can.

S. C. JOHNSON & SON
RACINE Dept. AD WISCONSIN

Makes Car Easy to Clean

Gentlemen: Upon the arrival of your sample can I had the Wax applied to my car in light coats. Each coat was allowed to dry well and then well rubbed before the application of the next. After the third coat the varnish seemed to me to have acquired a gloss of greater depth and the car looked as well as when new. After a few rain storms I had the car washed clean of the mud acquired and was more than pleased to find the car still bright without the application of another coat of Wax. An occasional coat of wax has kept the car looking well and easy to clean during our rainy and muddy winter.

Very truly yours,
ERNEST O. BILLWILLER,
Stockton, Calif.

A Hard Polish—That Collects No Dust

S. C. JOHNSON & SON, Racine, Wis.

Gentlemen: I find that Johnson's Prepared Wax is a very fine preparation to use on automobile bodies. The wax does not collect dust like most body polish. I find that it retains its hardness under this southern sun. The car I used this polish on had lost its original gloss. After applying one coat of the Wax the finish looked like new. Johnson's Prepared Wax is the best polish that I know of for auto bodies. I remain

Yours truly,
JOHN BARON, JR.,
El Centro, Calif.



Send us 10c for a can of Johnson's Prepared Wax—sufficient for one application on a large car.

USE THIS COUPON

S. C. JOHNSON & SON
RACINE, WISCONSIN

I enclose 10c for a can of Johnson's Prepared Wax—sufficient for one polish on a large car.

Name.....
Address.....
City & State.....
My accessory dealer is ..... AD
.....

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 87, 88, 89 AND 90

The Table of Contents will be found on Page 156

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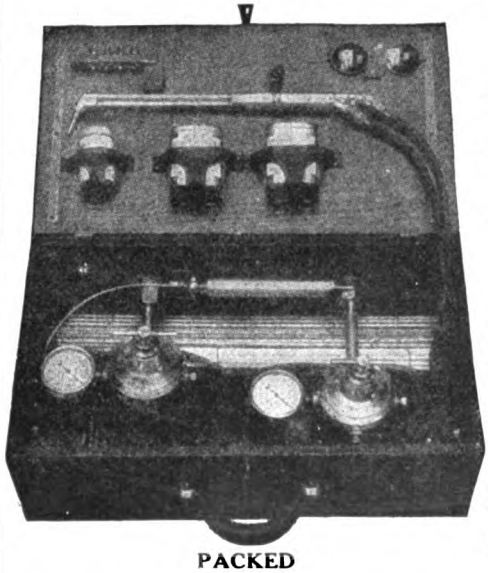
Mr. Garageman: Mr. Repairman:

$ LOOK HERE $

You need a WATERHOUSE Welding Outfit, for with it you can save broken auto parts and make them as good as new at very little cost.

To illustrate, a repairman, with this outfit, repaired a broken crank-case, which in its damaged condition was only worth 14 cents per pound as old junk. After welding it was made precisely as good as a new part, which would cost $68.

Here the repairman saved the car owner lots of money, and by so doing the car owner was willing to pay the repairman a big price for his welding, which meant big profits.



PACKED

The Waterhouse Outfit

	Value
1 B Welding Torch with 5 tips	$17.00
1 Oxygen Reducing Valve with 50 lb. line pressure gauge	10.25
1 Acetylene Reducing Valve with 50 lb. line pressure gauge	11.00
1 Set of Special Welding Hose (20 ft.)	3.00
1 Pair of Welding Glasses	.75
1 Carbon Burning Torch	Free
1 Set Instructions	Free
Net Cost Complete	**$42.00**

If you have a regulator for carbon burning, the oxygen regulator with the outfit is unnecessary, and you can deduct the price ($10.25), from the above total price.



AT WORK

TERMS: 5% discount cash with order or C. O. D. or $20.00 cash with order, balance in two payments, first of $12 in 30 days, $10 in 60 days.

ABOUT TANKS

The two gases used are oxygen and acetylene. The regular automobile lighting cylinders contain acetylene, so you can use them, and oxygen can be bought in loaned cylinders at little cost.

If supplies are desired as well, we will sell for $4.50 additional the following, making you ready for any auto welding:

1 Bottle Aluminum Flux	5 pounds Cast Iron Welding Rods
1 Can Cast Iron Flux	2 pounds Aluminum Welding Rods
1 Can Copper and Brass Flux	2 pounds of Steel Welding Rods
	2 pounds Brass Welding Rods

WATERHOUSE WELDING COMPANY

16 PELHAM STREET, BOSTON, MASS.

See Waterhouse Ad's in previous issues of this paper

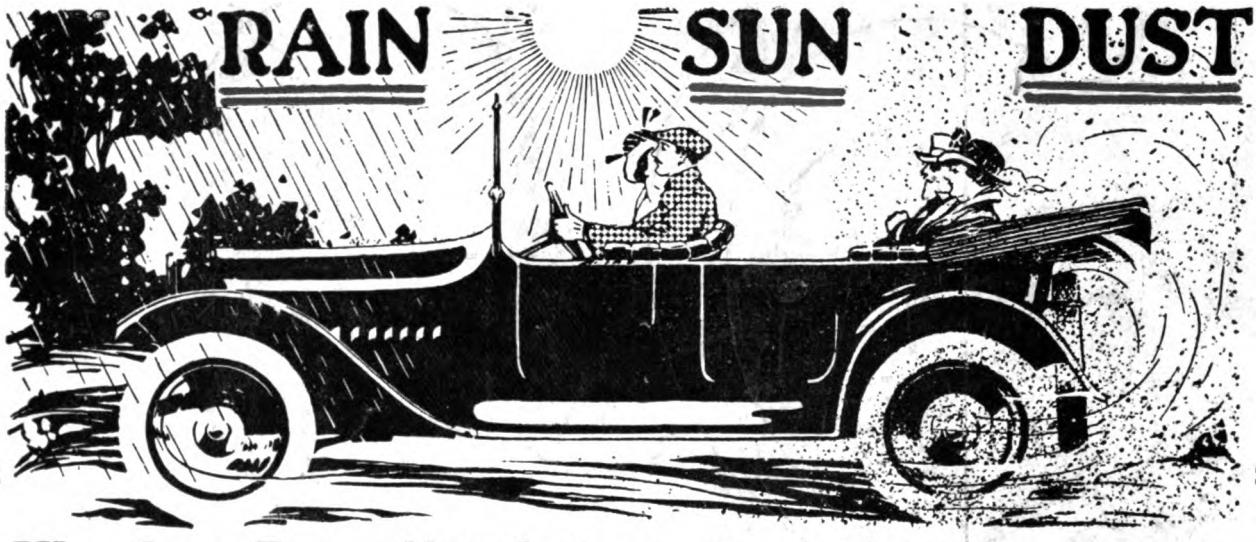
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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 19, No. 5. NEW YORK, JULY, 1915 Monthly, $1.00 per year Single Copy 10 Cents



Weather Does Not Injure Cars Protected With

JOHNSON'S PREPARED WAX

"The Weatherproof Body Polish

Take your car through rain, sun and dust, and bring it out as brilliant and lustrous as when you put the finishing touches on it in the garage. And the reason is that **Johnson's Prepared Wax**

"Sheds Water Like a Duck's Back"

It imparts a hard, dry gloss over the entire body of your car, building up a shining veneer that will not crack or check.
Several coats of **Johnson's Prepared Wax** will revive that appearance of newness, though the varnish on your car may have become rough from wear.
In many cases the timely use of **Johnson's Prepared Wax** saves the expense of having cars revarnished.

Does Not Collect Dust

Johnson's Prepared Wax imparts a perfectly hard, dry, glasslike polish to which the dust cannot adhere. It is quite different from the many oily polishes on the market which gather and hold every speck of dust.
Johnson's Prepared Wax is clean and easy to apply and inexpensive. Increases the value of your car on the market, and gives you the prestige that comes with the appearance of prosperity and class.



One Pint by Parcel Post 60 cents—enough for a season's use.

Send 10c for Sample Can of Johnson's Prepared Wax sufficient for one application on a large car. Agents Wanted.

S. C. Johnson & Son
"The Wood Finishing Authorities"
Racine, Wisconsin

S. C. JOHNSON & SON, (AD7)
Racine, Wisconsin

I enclose 10c for a can of Johnson's Prepared Wax—sufficient for one polish on a large car.

Name.....

Address.....

City & State.....

My Accessory Dealer is.....

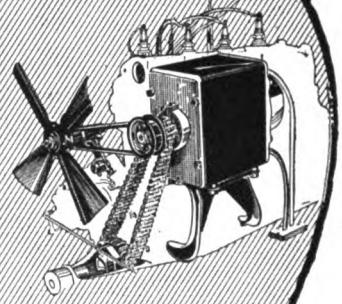
BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 83, 84, 85 AND 86
The Table of Contents will be found on Page 152

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SPLITDORF-APELCO

$65 ELECTRIC STARTING AND LIGHTING SYSTEM





EVERYTHING AN OWNER NEEDS FOR INSTALLATION

FOR Ford Cars

Always has the "punch" to start the motor.
Stalling in traffic loses it terrors.
Electric lights *all the time* if wanted.
Ideal for the women folk who drive.
Simple and very easy to install.
The *best* system for the *least* money.

Motor repairs can be made without disturbing SPLITDORF-APELCO installation.

DEALERS' PROPOSITION We have an attractive offering for the handling of SPLITDORF APELCO outfits. Write for details.

Pacific Coast Price, $73.00; Canadian Price, $85.00, f.o.b. Toronto

BY INVITATION MEMBER OF

SPLITDORF ELECTRICAL COMPANY

ATLANTA.....10-12 E. Harris St.
BOSTON.....1112 Boylston St.
CHICAGO.....64-72 E. 14th St.
CINCINNATI.....811 Race St.
DALLAS.....402 S. Ervay St.
LONDON

DETROIT.....972 Woodward Ave.
KANSAS CITY.....1827 Grand Ave.
LOS ANGELES.....1215 S. Hope St.
MINNEAPOLIS.....34 S. 8th St.
NEWARK.....290 Halsey St.
NEW YORK.....3-5-7 W. 61st St.

PITTSBURGH...5941 Ellsworth Ave.
PHILADELPHIA..210-12 N. 13th St.
SAN FRANCISCO.....1028 Geary St.
SEATTLE.....1628 Broadway
TORONTO.....469 Yonge St.
BUENOS AIRES

Factories: NEWARK, NEW JERSEY

(All SPLITDORF features are fully covered by patent or patents pending)

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AUG 23 1915

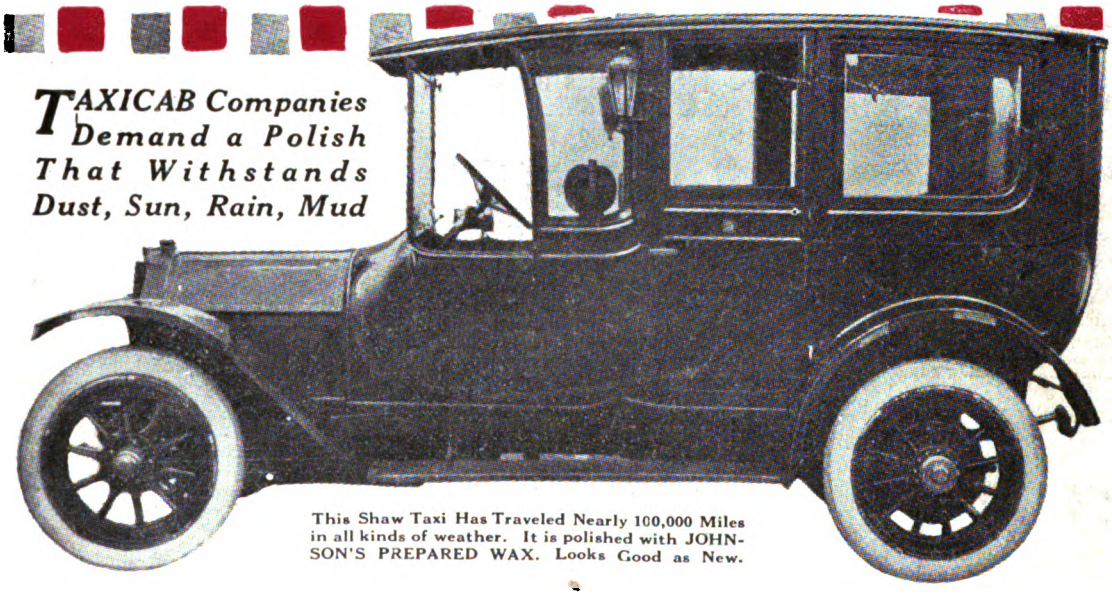
Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 19, No. 6. NEW YORK, AUGUST, 1915 Monthly, $1.00 per year Single Copy 10 Cents

TAXICAB Companies Demand a Polish That Withstands Dust, Sun, Rain, Mud



This Shaw Taxi Has Traveled Nearly 100,000 Miles in all kinds of weather. It is polished with JOHNSON'S PREPARED WAX. Looks Good as New.

Use Your Car In Any Weather

JOHNSON'S PREPARED WAX

Will Keep It Looking Just Like New

Rain, snow, sleet, wind, dust, sun—and the sizzling heat from the motor fail to affect the hard, dry finish of the car that is polished with JOHNSON'S Prepared Wax.

Does Not Gather Dust

Cleans, polishes and finishes in one operation. Contains neither acid nor oil. Is not sticky and does not collect dust. Taxicab companies—whose stock-in-trade is the appearance of their cars—by using JOHNSON'S Prepared Wax, can keep their limousines looking like new despite the hardest service. JOHNSON'S Prepared Wax practically eliminates refinishing bills. Gives a hard, dry, glass-like finish that will not crack, scratch or check.

Sheds Water Like a Duck's Back

Thousands of car owners, whose cars on the boulevard are their special pride, use JOHNSON'S Prepared Wax regularly for the perpetual impression of newness imparted by the dressing that can not be affected by weather.



Send 10c. for Sample Can of JOHNSON'S Prepared Wax—sufficient for one application on a large car. Use the coupon. Or order 1 pint, sent by Parcel Post, 60c—enough for a season's use.

AGENTS WANTED

S. C. JOHNSON & SON
RACINE WISCONSIN

S. C. JOHNSON & SON A-D
Racine, Wisconsin

I enclose 10c for a can of JOHNSON'S Prepared Wax—sufficient for one polish on a large car.

Name .....

Address .....

City and State.....

My Accessory Dealer Is.....

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 84, 85, 86 AND 87
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FOR FORDS

Gemco
MILWAUKEE
TRADE MARK
"THE SIGN OF SATISFACTION"

FOR FORDS

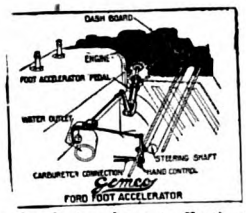
The Big Line of

POPULAR FORD SPECIALTIES

To Invest Your $50.00 Refund In.

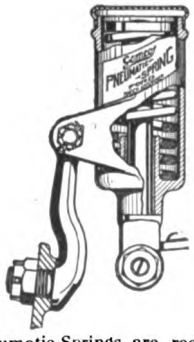


Combination Rear End Tire Holder.
Complete with Straps.....$3.95
Without Lamp and License Bracket..... 3.20



The simplest and most effective Foot Accelerator on the market. It is positive action, easy to attach and is proving a tremendous seller. Directions for attaching furnished with each Accelerator.

Price, Complete.....$1.50



Pneumatic-Springs are real Shock Absorbers that belong on every Ford car. Mechanically perfect and thoroughly guaranteed.
Price, Per Set of Four $15.00

Illustration at right shows the Gemco Mechanical Starter—Shock Absorbers and F-10 License Clamp and Bar. These are three important Ford Accessories.
Starters..... $15.00
F-10, Complete 1.00

GEMCO OFFERS YOU

The most complete line of high-grade Ford Specialties to be had.

More than fifty different articles, including:

Starters	Radiator Caps
Shock Absorbers	Spark Plugs
Tire Holders	Anti-Rattlers
Bumpers	Truss Rods
Steering Wheels	Wheel Pullers
Brake Bands	Robe and Foot Rails
Brake Shoes	Chain Grips
License Brackets	Mud Hooks
Wind Shields	Foot Accelerators
Lamps	Cutout and Horn Outfits
Radius Rods	Standard Bolts and Nuts
Radiator Cradles	Tools, Etc.

The best proposition offered the live dealer this season—Quick Sales, Good Profits and Satisfied Customers. Sold by leading supply houses throughout the country.

Send for Ford catalog today.

The Latest and One of the Most Important Ford Parts

The Gemco Quick Detachable Transmission Bands

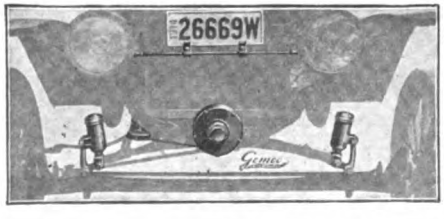
20 Minutes to Attach the New Band.
(See Illustration and Description.)

THE OLD WAY	THE NEW WAY
Means Tearing Down Transmission Case — Three or Four Hours' Time and Several Dollars Expense.	Open Case Cover—Insert Gemco Quick Detachable Band (See Illustration). 20 Minutes' Time. Practically **No Expense.**

Gemco Manufacturing Company,

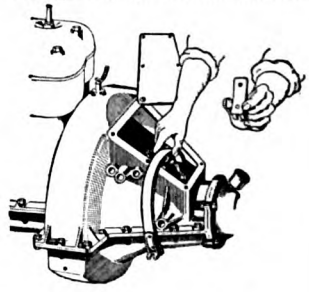
Formerly Garage Equipment Mfg. Company

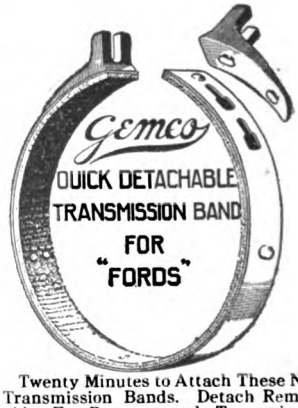
756 So. Pierce Street, Milwaukee, Wis.





Easier Steering—Greater Leverage—More Room.
17 in. Stationary, Plain $3.60
Corrugated 4.50
17 in. Tilting, Plain 4.50
Corrugated 5.50





Twenty Minutes to Attach These New Transmission Bands. Detach Removable Ear-Pass around Transmission and Lock (See Illustration).

The initial expense of this new Band is about one-third of the cost to install the old Band. These Bands can be relined at a small expense and will last the life of the car. Prices:
Gemco Quick Detachable Bands, Lined ..... each, $1.50
Lining Only, Three in a Box, with Rivets..... 1.00

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 20, No. 2. NEW YORK, OCTOBER, 1915 Monthly, $1.00 per year Single Copy 10 Cents



I have a

Money Making Proposition

for you

limited only by your Efforts

Are you live enough
to know a good thing when you see it?

Are you big enough
to handle a REAL PROPOSITION?

Have you standing
in your community?

Have you the courage
of your convictions?

Have you nerve enough
to back your judgment with your cash?

Have you sand?

We ask the above questions because if you cannot answer "yes" to every one, you are only wasting time by reading further.

If you can qualify and are really BIG ENOUGH to measure up to the standards set by REAL MEN, with REAL BRAINS and REAL ABILITY, we've got the product for you to handle.

We don't want you to buy territory or invest money in our Company.

We've got a straight out and out merchandizing proposition and are marketing an article for which there is a ready demand and an unlimited field.

We back the product up with a liberal guarantee, back the guarantee with a substantial corporation, and back you up with an excellently equipped advertising and sales department.

If you are not a real man, don't bother us by writing. We have no time for broken down financiers, "has beens" or "might have beens." We want real live wires. If you are one, get in touch with us at once.

George L. Schofield, Suite 406-410, 1790 Broadway New York City

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 88, 89 AND 90

The Table of Contents will be found on Page 120

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Hudson Wins

THE Hudson is a maker of history. It is the one car feared, envied, admired and copied by competitors. It always is ahead. Thousands of buyers wait to see what the Hudson shows before they decide. The Hudson ranks side by side with the costliest cars. It is the only car whose distinctiveness is unaffected by price. Men buy the Hudson because the name guarantees the qualities they seek in a motor-car. They don't ask whether it is a four, a six, an eight or a twelve. *If it's a Hudson it's right.*

Keep your eye on the Hudson

HUDSON MOTOR CAR COMPANY
DETROIT · MICHIGAN

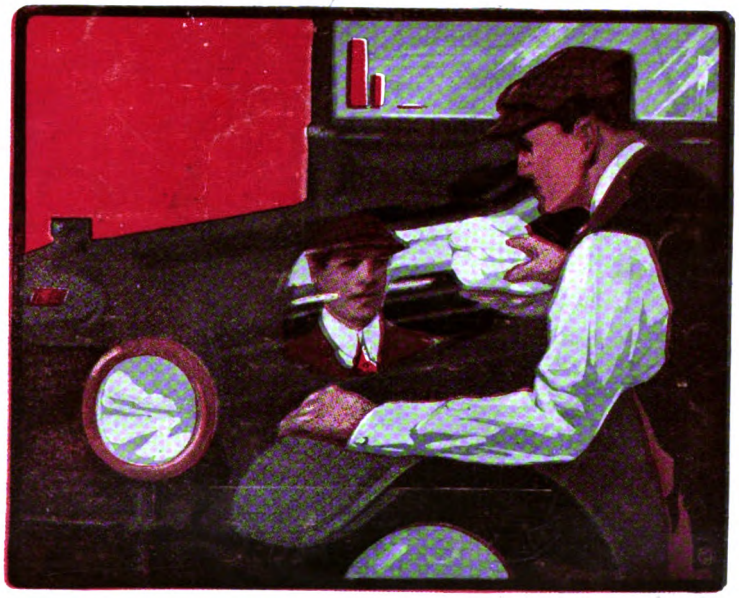
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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 20, No. 3. NEW YORK, NOVEMBER, 1915 Monthly, $1.00 per year Single Copy 10 Cents



A Mirror-Like Polish

HERE'S something new. Johnson's Cleaner for the hood, fenders and body of your car. Saves repainting and revarnishing. Nothing has ever yet been prepared that equals it. Takes out spots, stains, discolorations and grease in a most amazingly quick and thorough manner. Even those spots that are ground in—one application of Johnson's New Cleaner—presto! they're gone. Surface smooth as new. All ready for *Johnson's Prepared Wax*—a dry, mirror-like, non-dust-collecting finish that *keeps* your car fresh and bright.

Johnson's Cleaner

"The biggest and, believe me, most agreeable surprise about the use of the cleaner," writes Mr. B. F. Swain, "is that I don't have to have my car washed more than once a month. The only polish I used to use collected so much dust that the original finish was all gummed over. No one could polish over such a surface and get results. Cost me at least $1.50 a week heretofore for washings. This cleaner will even take off road oil and it's the only cleaner I ever saw that will do that. The fifty cents I spent for Johnson's New Cleaner and Johnson's Prepared Wax last month alone saved me at least three washings or $4.50.

Send coupon for trial cans of Johnson's New Cleaner and Johnson's Prepared Wax.

S. C. JOHNSON & SON, Racine, Wisconsin

"The Wood Finishing Authorities"

S. C. JOHNSON & SON, Racine, Wis. A.D. 11.
I enclose 10c for one can of Johnson's New Cleaner and one can of Johnson's Prepared Wax—sufficient for one application on a large car.

Name .....

Address .....

My Accessory Dealer Is .....

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 85, 86 AND 87

The Table of Contents will be found on Page 120

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THE NATIONAL AUTO SHOWS

Under Auspices of National Automobile Chamber of Commerce, Inc.

At NEW YORK

Grand Central PALACE

Opens New Year's Eve

Closes January 8

—o—

At CHICAGO

Coliseum and 1st Regiment Armory

January 22 to 29

—o—

Passenger Vehicles—Parts Accessories

Both Shows Bigger and Better than Ever

S. A. MILES, Manager **7 East 42nd Street, New York City**

The Usual Courtesies to Visiting Dealers

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NEW YORK SHOW NUMBER

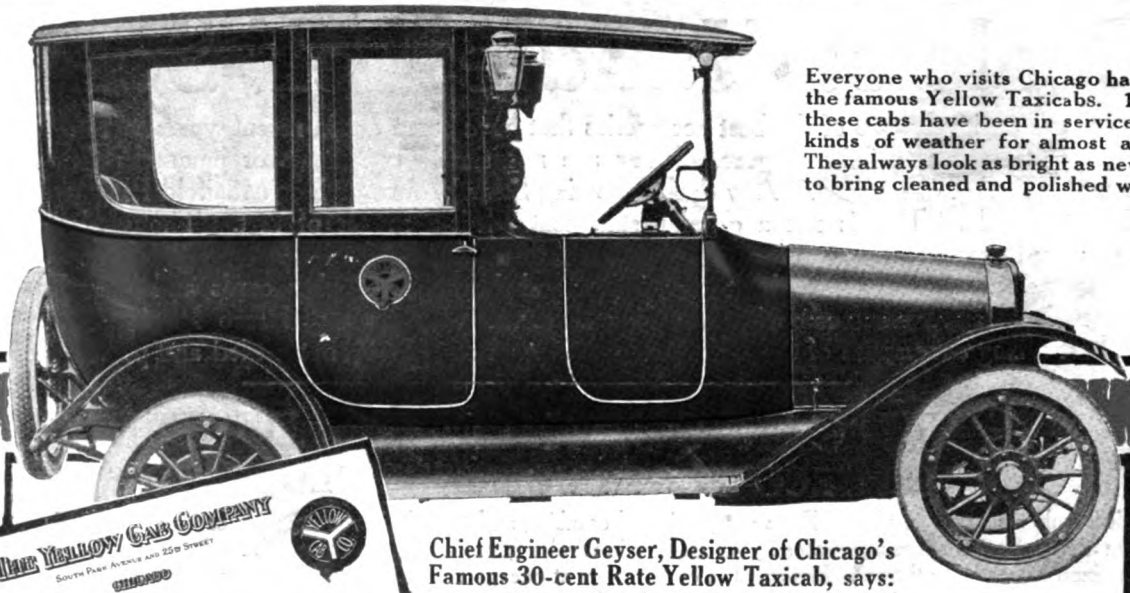
This Magazine is represented at Space D-136, Fourth Floor, Grand Central Palace, New York Automobile Show, December 31, 1915, to January 8, 1916.

Automobile Dealer and Repairer

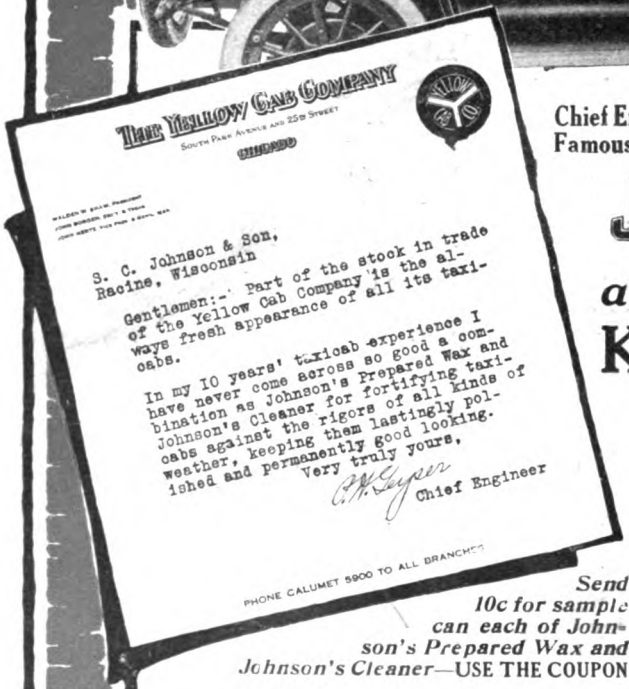
A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol 20, No. 4. NEW YORK, DECEMBER, 1915 Monthly, $1.00 per year Single Copy 10 Cents



Everyone who visits Chicago has seen the famous Yellow Taxicabs. 150 of these cabs have been in service in all kinds of weather for almost a year. They always look as bright as new, due to bring cleaned and polished weekly.



Chief Engineer Geyser, Designer of Chicago's Famous 30-cent Rate Yellow Taxicab, says:

JOHNSON'S PREPARED WAX and JOHNSON'S CLEANER Keep Cars Young!

Johnson's Prepared Wax protects the car finish from snow, sleet, mud, rain and dust—keeps the car always looking like new. It preserves the varnish—prevents checking and discoloring—sheds water and makes a "wash" last twice as long.

Johnson's Cleaner removes spots, stains, scum, surface scratches, mud freckles, accumulations of oil, dust and grime which water will not touch. It doesn't injure or scratch the varnish—simply cleans it and prepares it for a coat of Johnson's Wax.

Send 10c for sample can each of Johnson's Prepared Wax and Johnson's Cleaner—USE THE COUPON

S. C. JOHNSON & SON, "The Wood Finishing Authorities" Racine, Wis.

S. C. Johnson & Son, Racine, Wis. A.D.12

I enclose 10c for a sample can each of Johnson's Prepared Wax and Johnson's Cleaner—sufficient for cleaning and polishing a large car.

Name .....

Address .....

My Accessory Dealer is .....

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 89, 90, 91 AND 92

The Table of Contents will be found on Page 152

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Steer Warms Keep Your Hands Warm While Driving

They make driving a pleasure. On the coldest day they will give out an even high temperature. Steer Warms consist of two neat leather-covered grips, electrically heated, which lace on the steering wheel at any place convenient for driving. They are operated from the storage batteries (or magneto on Ford Cars) and cost nothing to maintain. They are simple, easy to install, durable, and guaranteed for 5 years.

Price { **Standard Gasoline Cars, $7.50. In Canada, $11.00**
Special Ford Type, 5.00. " " 7.25

Dealers: Handle Self-Sellers

These are positively two of the best accessories that have come out in recent years. They are each useful and serve a definite purpose. They are not simply ornaments or jimcracks that flood the accessory market every year. Any dealer showing Steer Warms or Ieco Manifold Plug will sell them without trouble. This is not a general statement. It is a matter of fact. Thousands of dealers are selling them.

Get your stock now—inquire about our window and show case display cards and other sales helps. Our national advertising campaign is making STEER WARMS and Ieco Manifold Plugs two of the best selling accessories of the cold months. Not an experiment but a tried and proven success.

STARTS CAR QUICK ON COLDEST DAY

THE IECO ELECTRIC MANIFOLD PLUG

This is truly a wonderful plug. Does away with all cranking and trouble in starting your car in zero weather. If you have a self starter it saves using up all your battery in revolving engine many times. The Manifold Plug puts a hot vaporized mixture into the cylinders and the engine goes at once. It will positively start on the coldest day. Furthermore, you do not have to raise the hood—you prime from the seat. Used as an auxiliary air plug it will cut the gasoline bill 20% to 30%. It can be used to remove carbon deposits. This plug is especially adapted for the Ford car and gives wonderful results. It is easy to install, simple, economical and guaranteed for 2 years.

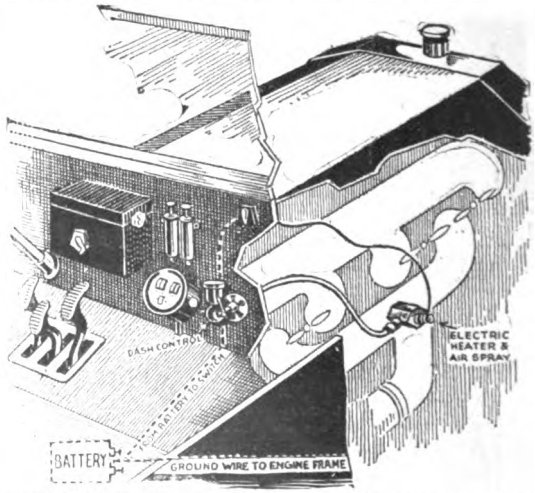
PRICE: FOR ALL CARS, $5.00. IN CANADA, $7.25

Ford cars require 6 Dry Cells. In ordering specify if to be used on storage batteries or dry cells.

INTERSTATE ELECTRIC CO., 1845 Perdido St., New Orleans, La.

PARTIAL LIST OF DISTRIBUTORS

Gual Derr & Shearer Co., Philadelphia, Pa.
McGraw Co., Sioux City, Iowa
Pennsylvania Rubber & Supply Co., Cleveland, O.
Nicols, Dean & Gregg, St. Paul, Minn.
The Gibson Co., Indianapolis, Ind.
Brown & Hall Supply Co., St Louis, Mo.
Western Auto Supply Co., Kansas City, Mo.
Richards & Conover H'dw'e Co., Kansas City, Mo.
Matador Tire & Vulcanizing Co., Chicago, Ill.
Chicago Automobile Supply House, Chicago, Ill.
Central Electric Co., Chicago, Ill.
Automobile Supply Co., Chicago, Ill.
Electric Appliance Co., Chicago, Ill.
Hippee Motor Supply Co., Des Moines, Iowa
Omaha Rubber Co., Omaha, Nebr.
Northwestern Auto Supply Co., Billings, Mont.
General Automobile Supply Co., New York, N. Y.
E. J. Willis & Co., New York, N. Y.
Wood Auto Supply Co., Inc., Utica, N. Y.
J. G. Barclay, Inc., Buffalo, N. Y.
W. S. Nott & Co., Minneapolis, Minn.
Pittsburgh Rubber Co., Pittsburgh, Pa.
The Auto Equipment Co., Detroit, Mich.
The Auto Equipment Co., Denver, Colo.
Union Supply Co., Toledo, O.
Ph. Gross Hdwe. Co., Milwaukee, Wis.



IECO ELECTRIC MANIFOLD PLUG INSTALLED

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CHICAGO SHOW NUMBER

This Magazine is represented at Space No. 7, Armory Gallery, Chicago Automobile Show, January 22-29.

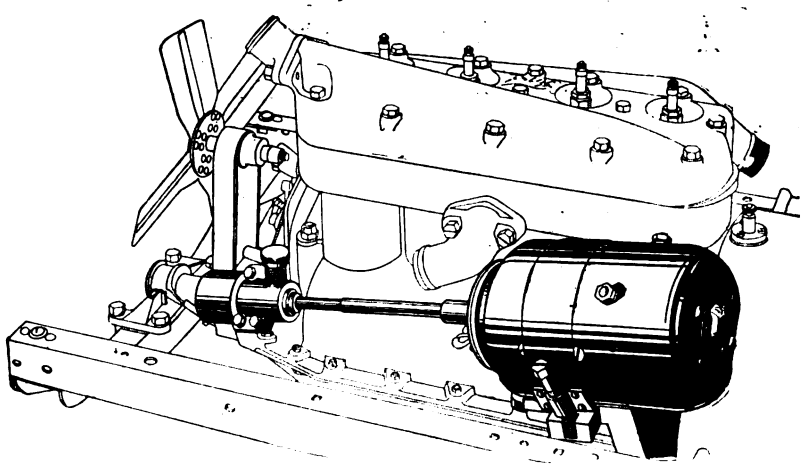
JAN 24 1916

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street, New York

Vol. 20, No. 5. NEW YORK, JANUARY, 1916 Monthly, $1.00 per year Single Copy 10 Cents



The New Shaft Drive Genemotor

Trade Mark

A STARTER AND LIGHTER FOR FORD CARS

A year ago the Genemotor flashed upon the market.

In ninety days it dominated the field.

In eight months it had captured the Gold Medal at the Panama-Pacific International Exposition.

Now here's the 1916 Genemotor—with shaft drive—twelve pounds lighter and a better machine in every way than the Gold Medal Genemotor.

It wipes out chain breakage, noise, hot engines, need of adjustment. No more chain click, wear, or stretch.

Plenty of air circulation around its forward end.

The price of the new Shaft Drive Genemotor remains the same—$75 f.o.b. Lynn, Mass.—but with ten or twenty dollars added in refinement, simplicity and efficiency. The one absolutely last word in Ford car starters is the new Shaft Drive Genemotor.

Built by GENERAL ELECTRIC COMPANY

A. J. PICARD & COMPANY

General Distributors 1720-22 Broadway, New York

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 94, 95 AND 96

The Table of Contents will be found on Page 136

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One of our 10 by 96 foot display signs

MICRO Piston Rings would help you to get more for the money invested in your car.

Money spent in motoring is an investment which you want to keep at a low figure and get the most pleasure from.

Micro Two-Part Pressure-tight Rings substituted for leaky old style rings will save you money and quickly please you by making a permanent service improvement.

You first notice the better compression through quicker get-away, snappier response to throttle and steadier pulling up hills. The saving of gas and oil, by keeping each on the side of the rings on which it does most good, may not be so noticeable, but tests will show this saving to be significant.

The greatest saving and betterment of service, however, result from lessened carbon deposit and consequent coolness of motor, lessened spark plug troubles, absence of smoke in the exhaust, and clean valves, with less frequent regrinding.

Micro Rings remain as tight when old as when new, and being individually cast from very flexible fine-grained gray iron, may be removed any number of times without danger of breakage in refitting.

Here's a typical instance of the benefits from Micro Rings

"I am much pleased with the Micro Rings put into my Ford car last winter to overcome worry, lost compression, excess carbon and waste of oil and gas. In the 9,000 miles I have driven the car since installing the Micro Rings I have used 400 gallons of gas, which gives 22½ miles to the gallon. I have used 15 gallons of oil or 600 miles to the gallon.

"I use the car on a mail route 23 miles long, making an average of 65 stops to the trip, which, of course, uses more gas and oil than a straight run. On October 31, 1915, I made a run of 128 miles on 4 gallons of gas and 1 pint of oil, which, I believe, is a record.

"I have power to spare and the few 8-cylinder cars around here can't do a thing to my Henry Ford on a hill.

"Previously I drove the car 8,000 miles, using two other types of leak tight (?) rings. 600 gallons of gas were required or 13⅓ miles per gallon, and 30 gallons of oil, or 266⅔ miles per gallon. Then I had to remove carbon every 500 or 600 miles, but after putting in Micro Rings, I removed carbon only after 7,500 miles, at which time I removed the pistons to thoroughly clean and tighten the connecting rods. I found the rings in fine shape.

"I couldn't do without Micro Rings now and be satisfied."— W. T. Cobb, La Monte, Mo.

Your judgment in selecting Micro Rings will be more than vindicated on the first installation. Business fairness, extensive manufacturing and rigid inspection to micrometer accuracy put backbone into our guarantee.

If your jobber cannot supply Micro Rings, don't accept a substitute and be disappointed. Write us direct.

Price, each, all standard sizes, $1.50.



Micro Piston Rings
The watchdog of a motor's power.

Manufactured by

Micro Piston Ring Co., Inc.

1960 Broadway, New York



Micro Piston Rings
The watchdog of a motor's power.

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BOSTON SHOW NUMBER

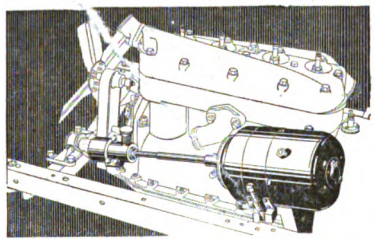
is Magazine is represented at Space 514, Department F, Boston Automobile Show, March

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

OTOR VEHICLE PUBLISHING CO. - - - - 71-73 Murray Street,

. 6. NEW YORK, FEBRUARY, 1916 Monthly, Single



Genemotor

Trade Mark

On account of the sharp advance in the cost of raw materials the price of the 1916 Shaft Drive Genemotor is now $85.00

Built by General Electric Company

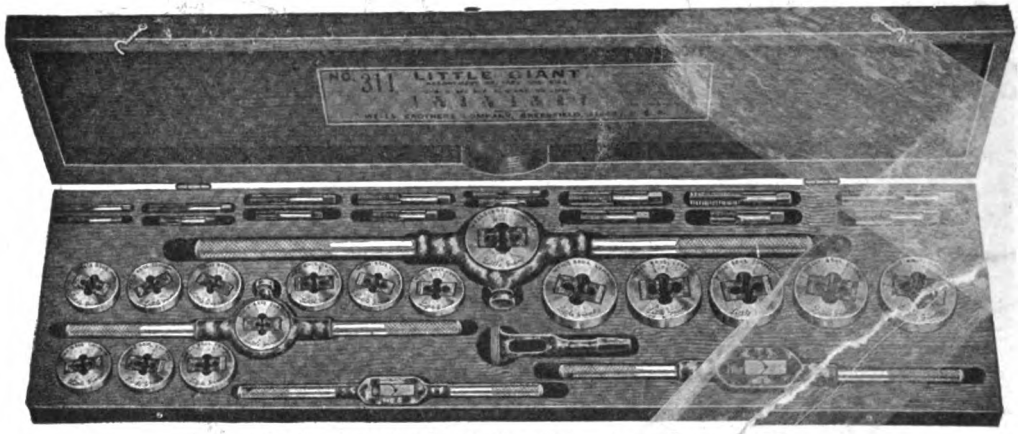
A. J. PICARD & COMPANY

Sole Distributors 1720-22 Broadway, New York City

's Guide and Index to Advertisements Pages 94 95 and 96. Table of Contents will be found on P

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How Complete is Your Screw Threading Equipment?



No. 311. *Little Giant* Combination Screw Plate

Every need of the garage and repair man, or the car owner who makes his own repairs, for tap and die assortments can be supplied from the diversified line of the Greenfield Tap and Die Corporation. For instance, the

Little Giant Combination Screw Plates

(Shown above)

contain both United States and S. A. E. standard taps and dies; each die is contained in its own collet and is adjusted to size. There is also a Bit Brace Die Holder for cleaning up burred threads in hard-to-get-at places.

A few more assortments are shown below.

Send today for the bulletins:
"Tools for the Automobile" and "First Aid in the Up-Keep of the Automobile."



No. 2501
Lightning Garage Repair Set
For Ford Cars

Seven sizes taps and dies. Two reamers for important bushings. Die stock and tap wrench.
A new set that is meeting a real demand.



No. 308
Little Giant **Screw Plate**
In Leather Roll

Seven sizes taps and dies. Stock and tap wrench. Very convenient and compact for emergency cases.

Look for one of these trade marks on any screw plate you buy.

Little Giant

LIGHTNING

GREENRIVER

SMART

Greenfield Tap & Die Corporation

GREENFIELD, MASS.

Wells Brothers Co. Division
Wiley & Russell Mfg. Co. Division
A J. Smart Mfg. Co. Division

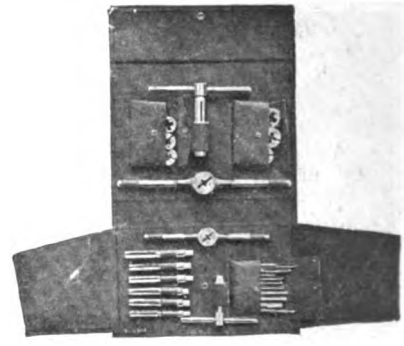
New York, 28 Warren St.
Chicago, 13 So. Clinton St.
Philadelphia, 38 N. 6th St.
Detroit, 55, 57, 59 Wayne St.
London, 149 Queen Victoria St.

In Canada
Wells Brothers Co. of Canada, Ltd.,
Galt, Ontario



No. 305
Little Giant **Screw Plate**
One of the most popular assortments.

Five sizes taps and dies. Die stock, tap wrench and bit brace die holder.



No. 2500
Lightning Emergency Kit
For Ford Cars

Sixteen sizes taps and dies—being practically every screw thread on Model T Ford that ever needs replacing. Thousands of these are in use.

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Built by Specialists

Motor truck building is our sole business. We make nothing else. We specialize on Service Standardized Trucks. For over 5 years, our entire time, thought and attention have been devoted to it.

In addition, every unit in the building of Service Trucks is built by a specialist.

Read this list of reputable unit makers, who contribute their engineering genius and manufacturing efficiency to standardize the Service Truck.

These units represent the utmost in their field. Each unit is the leader in its class. Each dominates in its respective market. Each has stood the test of time in actual use under all conditions. And each has proved its superiority and maintained its supremacy.

Imagine the best unit makers in the country uniting in their skill to create a Motor Truck, then you will get a splendid idea of the quality, efficiency and reliability of the wonderful Service Motor Truck.

Service Standardized TRUCKS

Worm Drive

1—1½—2—3½—5 Ton Models

In designing and building Service Trucks, we go farther for quality than any one maker of Standard units. Our demands average

20% Above Standard

Because every unit is oversized—beyond the maximum requirements needed for proper performance of each Service Truck in actual use. This 20% greater than standard is a margin of safety that forestalls trouble. In a Service Standardized Truck there is always more strength — more power — more flexibility than needed. That's why there are no disappointed Service owners.

Double Guarantee

That's another distinct advantage Service users receive. Every Service Standardized Truck is guaranteed both by us and the unit makers.

Each manufacturer of a Service Standard Unit is concerned and vitally interested in seeing that each Service owner gets full satisfaction. Service Standardized Trucks are backed both by us and the unit maker. It's a double guarantee—a positive assurance of 100% service.

Any Type Body

Service Standardized Trucks are equipped with any type of body for any kind of haulage. Service represents a complete line for every commercial need.

Whenever desired we build to order special bodies to meet any particular requirement.

Catalog for Truck Users

Truck users who are in the market for one or more trucks, write to us for Service Catalog—investigate the Service Standardized Truck and learn the whole Service story.

Attractive Offer to Dealers

We are in a position to offer to responsible dealers—who measure up to our standard—in territory where Service is not now represented, a very attractive proposition. Let us send you details and our complete new catalog *Write today.*

Service Motor Truck Co. 103 Grand St. Wabash, Ind.

(5 Years Experience in Manufacturing Motor Trucks Exclusively)

The Standard Units of SERVICE TRUCKS:

Buda Motor
Timken Axles
Timken Bearings
Stromberg Carburetor
Eisemann Magneto
Longs Radiator
Brown-Lipe Transmission
Ross Steering Gear

NOTE: Should a unit be produced that is more efficient than what we now use, it will be adopted as a part of "SERVICE" Standard specifications.

Mail This Coupon

Service Motor Truck Co.,
103 Grand St. Wabash, Ind.

Send me Dealers' Propostion and Service Manual.

.....

.....

....

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JOHNSON'S PREPARED WAX

Keeps Cars Like New

More JOHNSON'S Prepared Wax was used in 1915 than all other makes of automobile polish **combined.**

JOHNSON'S Prepared Wax is the STANDARD automobile polish—the only polish recommended by the makers of the world's finest cars.



Imparts a hard, dry, lasting polish — does not gather dust—sheds water like a duck's back — makes a wash last twice as long—preserves as well as protects the varnish—saves costly refinishing bills —positively harmless.

S. C. JOHNSON & SON, Racine, Wis. A.D.-2.

I enclose 10c. for a sample can each of Johnson's Prepared Wax and Johnson's Cleaner—sufficient for cleaning and polishing a large car.

Name .....

Address .....

My Accessory Dealer .....

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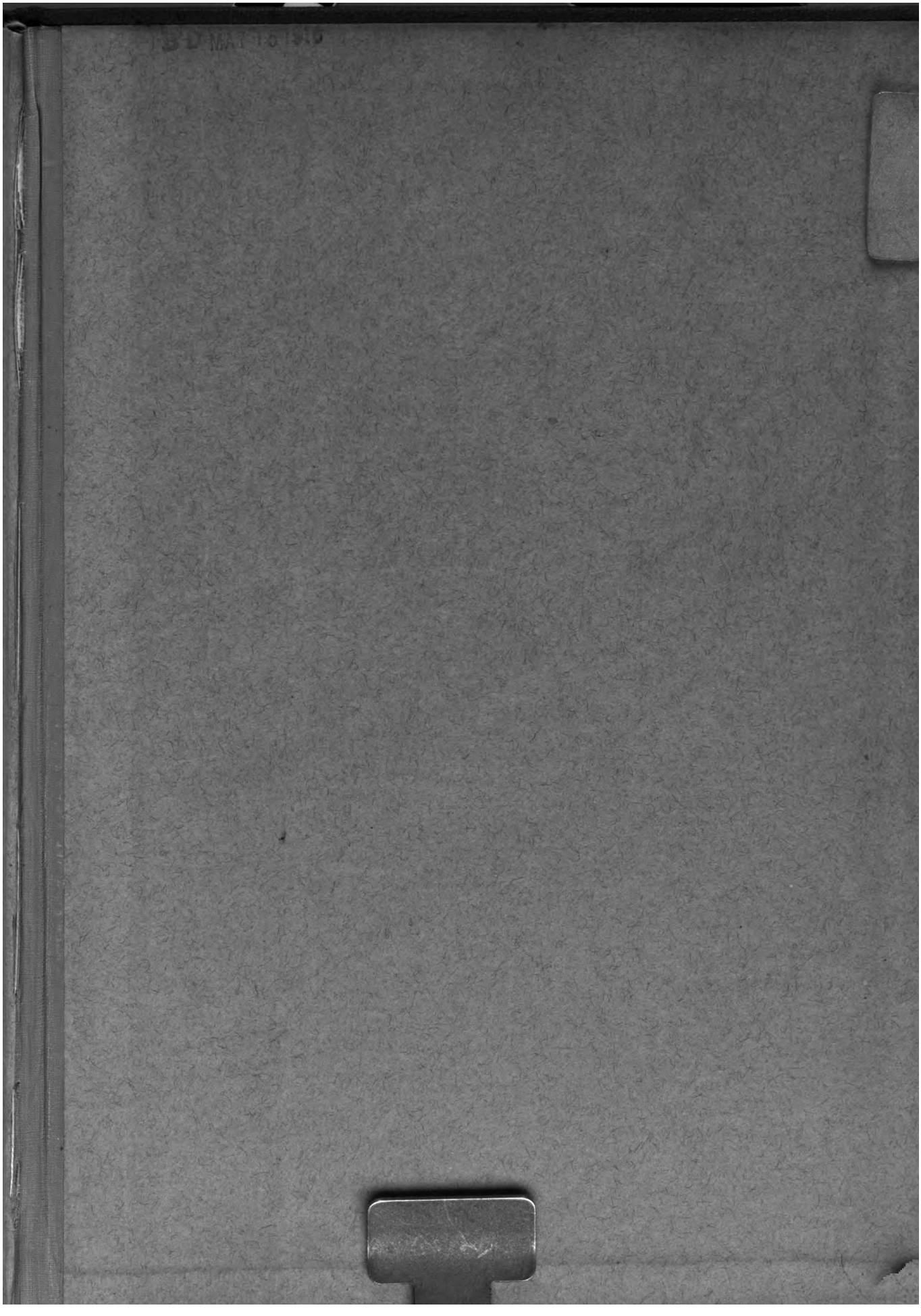
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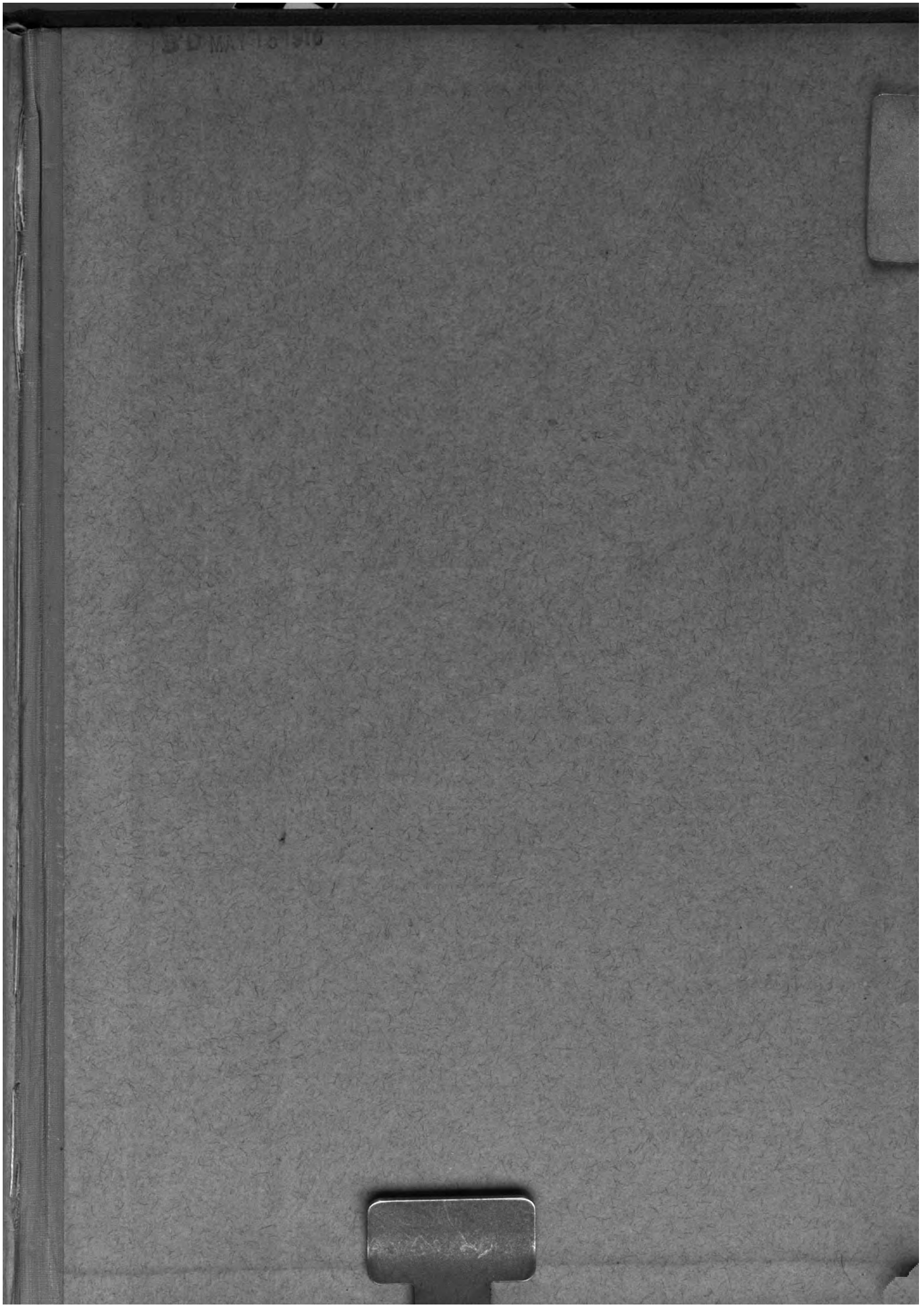
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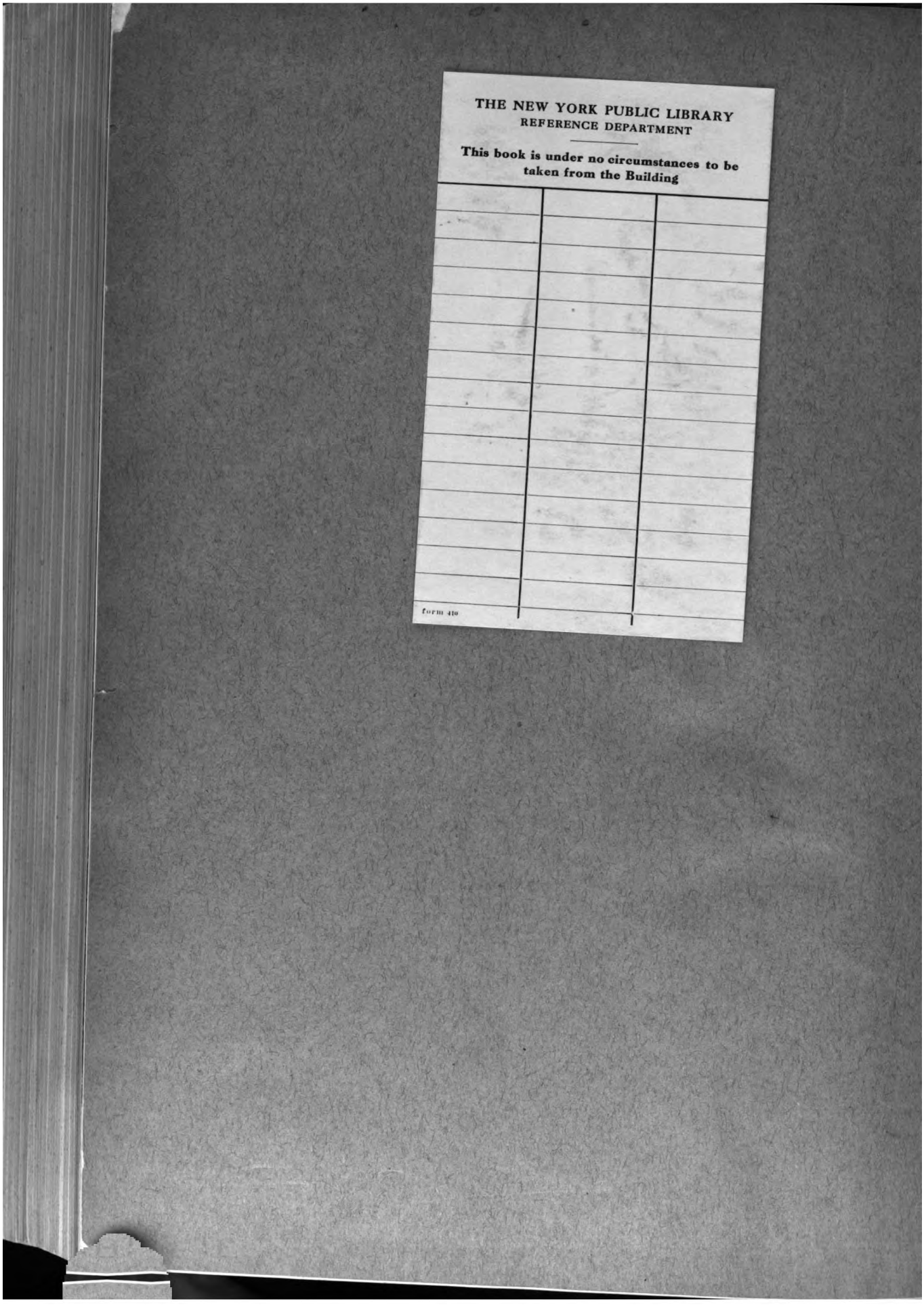
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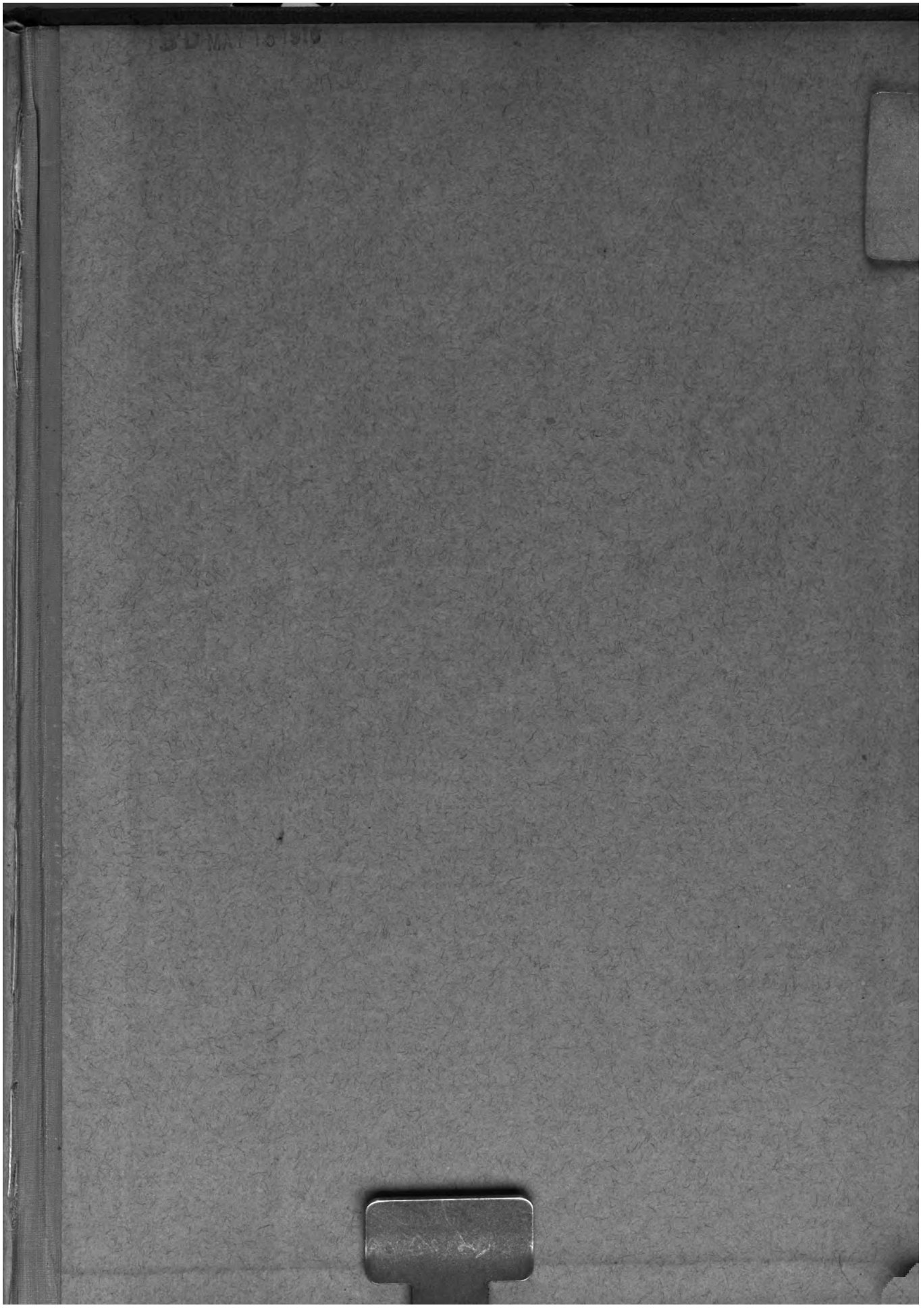

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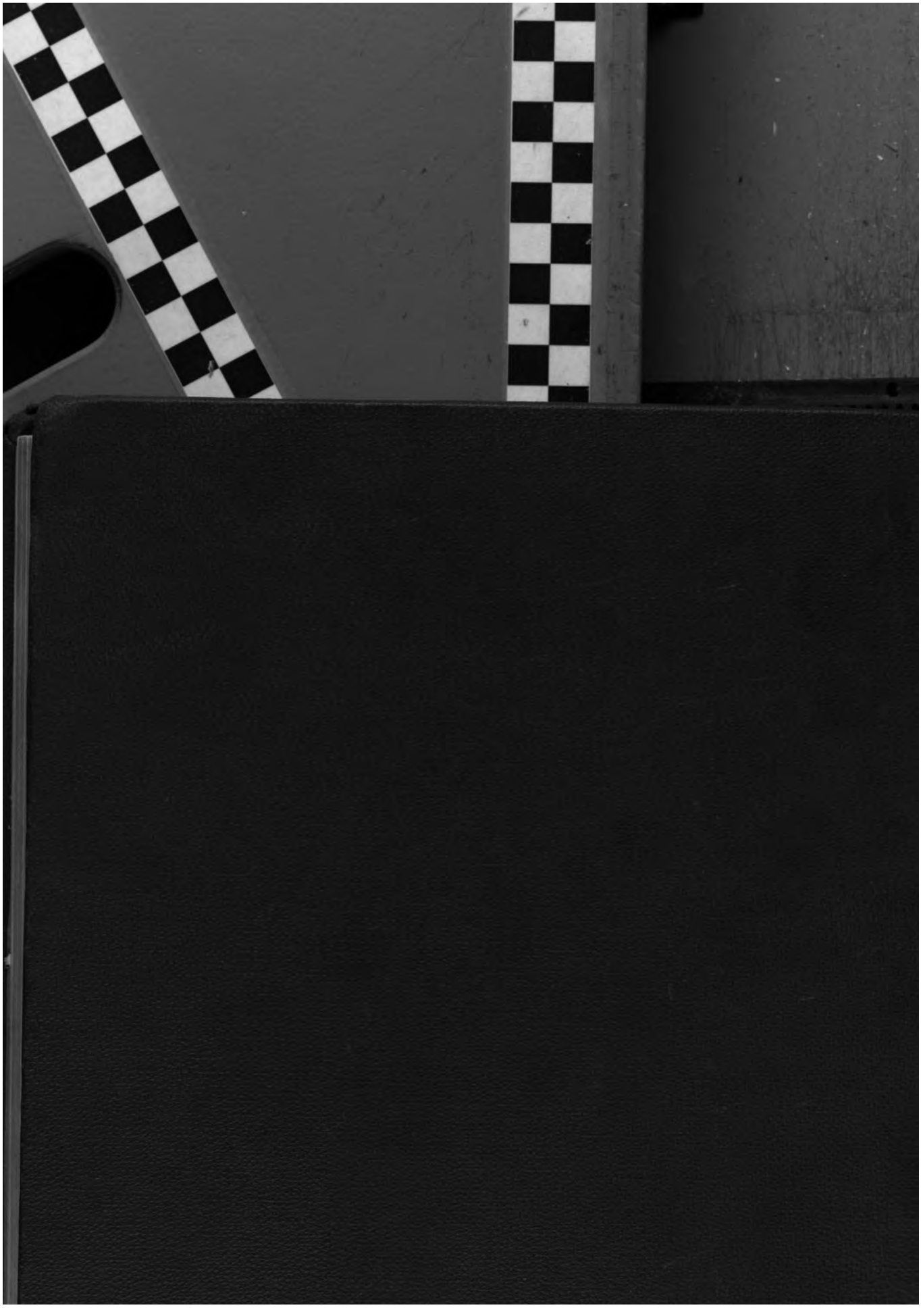
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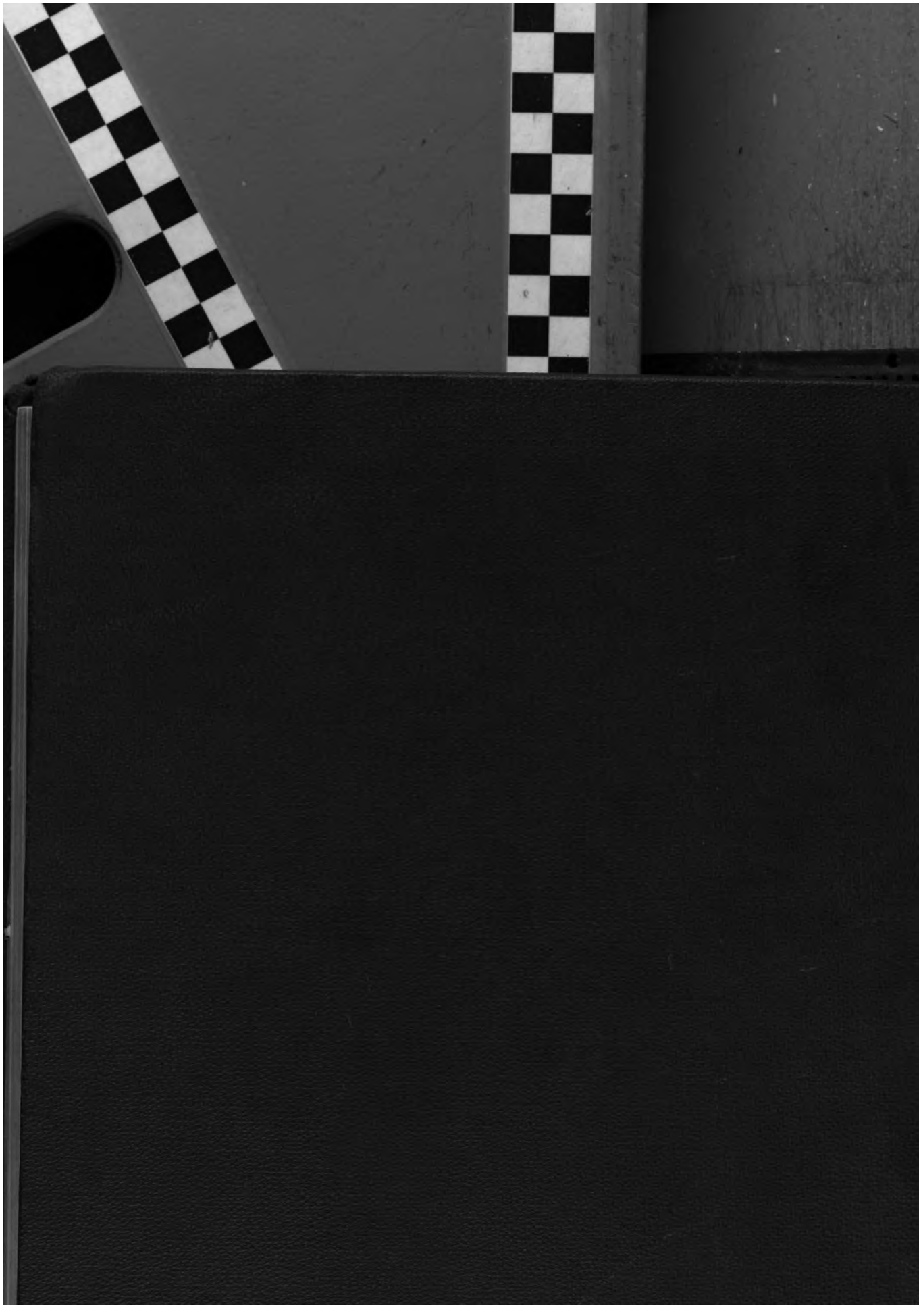
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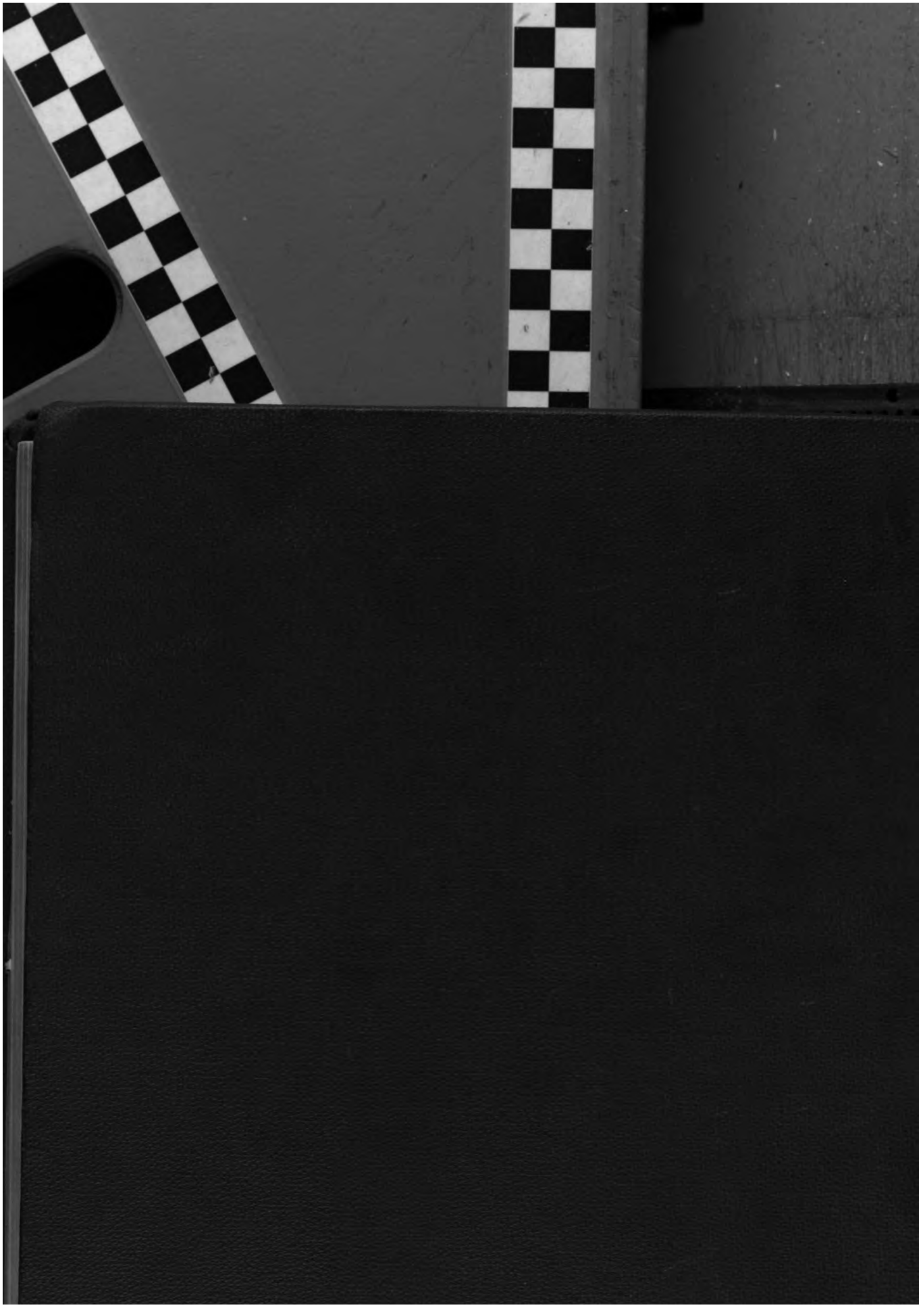
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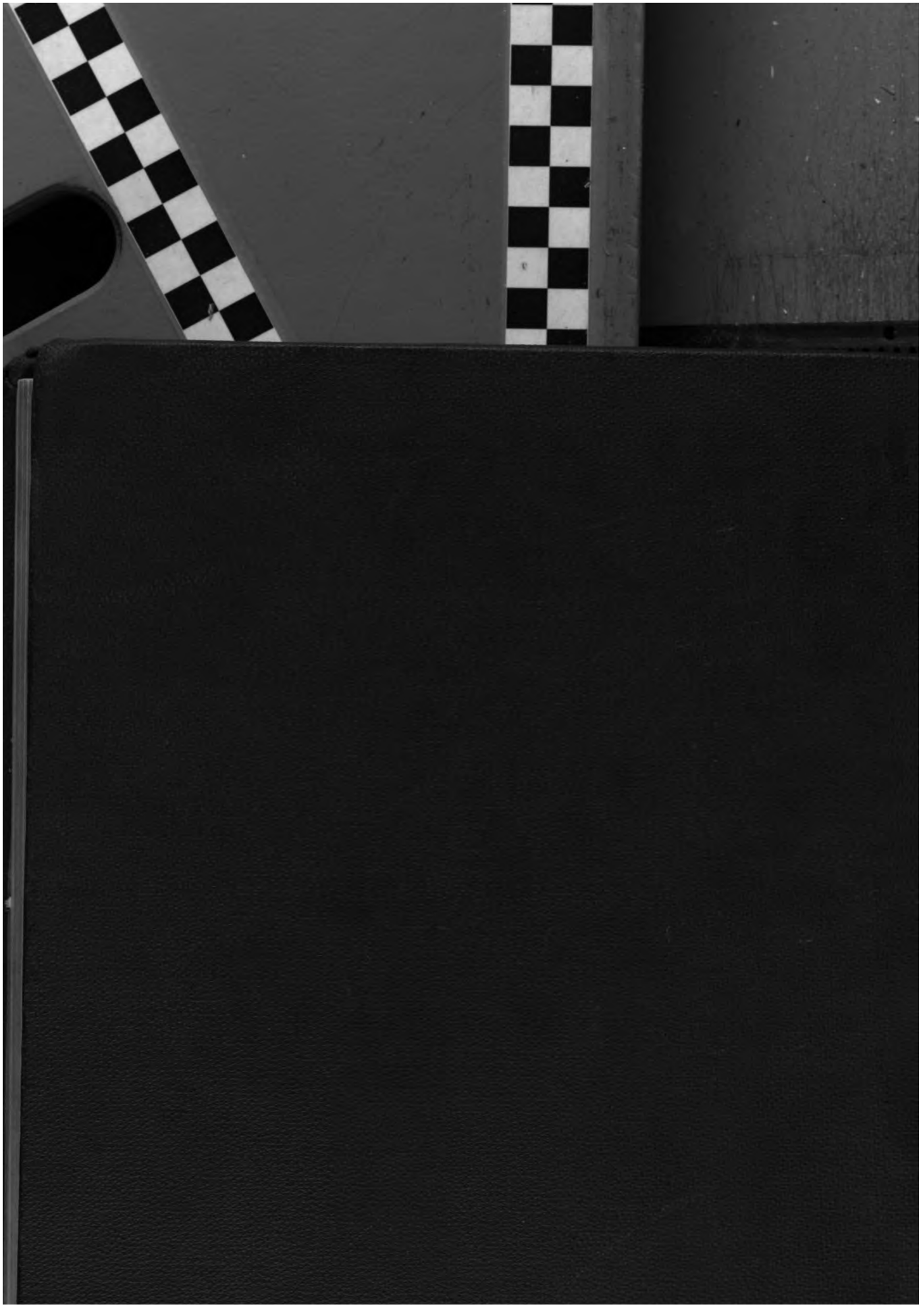


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